

**Students' Perceptions regarding the Tablet Personal Computer (PC) as a
Mobile Learning Device at a Graduate Institute in Tshwane: An Exploratory
Study**

By

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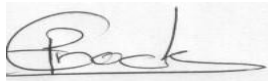
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DECLARATION

I declare that the Research Title **(Students' perceptions regarding the Tablet Personal Computer (PC) as a mobile learning device at a graduate institute in Tshwane: An exploratory study)** submitted for partial fulfilment of the requirements for the degree of MCOM in the subject of Business Management with specialization in Marketing and Retail Management at the University of South Africa (UNISA), is my own work and that all sources/intellectual property used within this research study have been acknowledged by means of complete reference.



03/2020

Signature

(Ms P Enock)

Date

DEDICATION

This dissertation is heartily dedicated to my beloved mom who battles cancer, my father who is burdened with ill-health, and my family that has supported me to the end, without reservation or doubt.

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ABSTRACT

The present study explores the perceptions that graduate students in Tshwane hold of the Tablet Personal Computer (PC) as an online teaching and learning device. The unfolding Fourth Industrial Revolution (FIR) has necessitated immense technological innovations in the educational sphere. With the ever increasing developments in technology world-wide and the ubiquitous use of mobile technologies by the millennial generation, the incorporation of mobile devices such as Tablet PC for learning purposes in higher education institutions have become common. Many colleges and universities in South Africa have introduced the Tablet PC to their students for academic purposes. However, students' perceptions regarding the Tablet PC as a mobile learning device that enhances studying has not been explored in South Africa. This study has done such an exploration. Data was collected from full-time undergraduate students using a web based online survey with a semi-structured questionnaire. The population sample of 277 respondents was selected using non-probability method in the form of convenience sampling. Data was analysed using descriptive and inferential statistics methods. The results of the study indicated that the majority of the surveyed students mainly use the Tablet PC to access study guides, study for online exams and conduct research of their own. The Tablet PC was found to have an advantage of being light weight which makes it portable, a good screen size, enabled students to do research on campus and at home and has versatile connectivity. Difficulties in drawing graphs and diagrams and accessing examination results online were reported as main challenges facing students when using the Tablet PC. Technological access and competence are still a challenge. In terms of technical aspects, the empirical research results found that the Tablet PC is user-friendly, compatible with other devices and can easily install and uninstall other applications. In terms of pedagogical opportunities, the results further indicated that the majority of students observed that the Tablet PC mainly promote independent learning. Based on the results of the study, it is therefore recommended that the Tablet PC be used as a mobile learning device as it enhances learning.

Key Words: Tablet Personal Computer (PC), Perception, Mobile Learning, Mobile Device, Technology, Higher Education, Exploratory, Graduate Institute, Students, Tshwane.

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CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

This chapter delineates the introduction, background and setting of the present study. The study explores the perceptions of graduate students in Tshwane regarding the Tablet Personal Computer (PC) as a teaching and learning device. Education has been significantly influenced by the emergence of new technologies as people of different ages around the world are able to acquire knowledge and skills that enable them to pursue their education anywhere out of school where they can decide what they want to learn, when they want to learn and how they want to learn (Collins & Halverson, 2018: 3). Mobility has been added to education by modern communications gadgets and technologies. The appropriate integration of technology in higher education is seen to be a great combination if used together with the right vision and reason as teaching and learning is made simpler (Saxena, 2013). This chapter begins with a background of the South African higher education landscape, the challenges it faces, diversity in education and the methods of learning used in various universities. This is followed by an explication of various digital media and their use in education. A brief discussion of the Tablet PC as a solution to educational challenges faced by South African higher education institutions follows thereafter. This will lead to the unfolding of the problem statement, research objectives, the perception process, research design, methodology and study limitations.

1.2 BACKGROUND TO THE STUDY

Much like any other country in Africa, South African formal and institutionalised education is intertwined with colonial history. Higher education in South Africa can be traced back to 1829 when the first institution called “South African College” was established. This college provided learning for grade 12 students and offered degree examinations with the University of London (Behr & Mcmillan in Holtzhausen, 2006:18). This functioned as the commencement of the South African higher education landscape with a rich history of development. Between the year 1994 and 2004, the higher education system in South Africa experienced some significant changes in-terms of the universities’ restructuring process (Badat, 2010).

In a report by the National Commission of Higher Education (NCHE) (1996), a document entitled “*A Framework for Transformation*” was released to begin the restructuring process. According to Jansen (2003:294), this document contained suggested information on the shape, size and the different types of higher education institutions that were available in South Africa during that time. In the following year (1997), two important documents were released with titles “A programme for the transformation of higher education” and the “Higher Education Act” (Reddy 2004:61).

This was followed by a document called the “*National Plan for Higher Education*” in 2001 which was released by the minister of education suggesting the reduction of the number of public higher education institutions in South Africa (Reddy, 2004:61; Jansen, 2003:294). During this moment, no one knew about the number of higher education institutions that would exist after the restructuring process and the method that was going to be used by the government to reduce the number of universities. However, a conclusion was finally reached that the number of universities be reduced by means of a merger. A list of universities and technikons that were going to be affected by this restructuring was provided in a report entitled “*Restructuring of the Higher Education System in South Africa*” (Jansen, 2003:294).

Table 1.1: Tertiary institutions were restructured to the current ones

CURRENT UNIVERSITIES	FORMER TERTIARY INSTITUTIONS
TRADITIONAL UNIVERSITIES	FORMER TERTIARY INSTITUTIONS
University of Cape Town	
University of Fort Hare	
University of the Free State	Incorporation of part of Vista University
University of KwaZulu-Natal	University of Durban-Westville University of Natal
University of Limpopo	Medical University of South Africa (MEDUNSA) University of the North

North-West University	University of North-West (UNIBO) Potchefstroom University for Christian Higher Education
University of Pretoria	Incorporation of part of Vista University
Rhodes University	
University of Stellenbosch	
University of the Western Cape	
University of the Witwatersrand	
COMPREHENSIVE UNIVERSITIES	
University of Johannesburg	Rand Afrikaans University Technikon Witwatersrand Incorporation of part of Vista University
Nelson Mandela Metropolitan University	University of Port Elizabeth Port Elizabeth Technikon Incorporation of part of Vista University
University of South Africa	Technikon SA Incorporation of part of Vista University
University of Venda	
Walter Sisulu University for Technology and Science	Border Technikon Eastern Cape Technikon University of Transkei
University of Zululand	
UNIVERSITIES OF TECHNOLOGY	
Cape Peninsula University of Technology	
Central University of Technology	
Durban University of Technology	
Mangosuthu Technikon	
Tshwane University of Technology	

Vaal University of Technology	Incorporation of part of Vista University and NWU absorbed Vista students and staff
-------------------------------	--

Source: Mouton, Louw and Strydom (2013:158)

The history of apartheid and discrimination meant that South African higher education institutions had to be restructured in line with democracy that was attained in 1994. The restructuring process in the form of mergers took place from year 2000 to 2005 and was primarily done with the main aim of attaining government's objectives for equity, efficiency and development for everyone (Bonnema & van der Waldt, 2008:315). According to the Council on Higher Education (2009:3), Bonnema & van der Waldt (2008:315), these mergers led to a new structure of universities to be introduced in to the landscape namely, universities of technology, comprehensive universities and traditional universities as shown in Table 1.1. This amalgamation resulted in 23 publicly funded institutions from a total of 36 which comprised of 11 universities, six comprehensive universities and six universities of technology (Council on Higher Education, 2009:8). Education in South Africa is divided into public and private. Public universities in South Africa are divided into three categories namely; traditional universities, comprehensive universities and universities of technology. These universities are briefly discussed below.

- **Traditional universities**

As shown in Table 1.1, traditional universities such as University of Free State, University of Limpopo and North West University came as a result of merging with other tertiary education institutions. Traditional universities offer a mix of programmes including career oriented degrees and professional programmes such as masters and doctorate research studies. These theoretically-oriented degrees can take a minimum of three to four years to complete (Olwell, 2011). The degrees offered by traditional universities focus on theoretical training in specialised fields giving a qualification that takes a student to a postgraduate study. Examples of traditional universities include

University of Cape Town, Stellenbosch University, University of Pretoria and University of South Africa to name a few as shown on Table 1.1 above.

- **Comprehensive universities**

As depicted in Table 1.1, the formation of comprehensive universities such as University of Johannesburg, University of South Africa and Nelson Mandela Metropolitan resulted from a union of a number of some smaller universities such as Rand Afrikaans University, Technikon Witwatersrand and University of Port Elizabeth among others. Comprehensive universities are institutions of higher learning with teaching and research facilities that typically include a graduate school and professional schools that award master's and doctorate degrees and an undergraduate studies division that award bachelor's degrees (Mouton, Louw and Strydom, 2013; Olwel, 2011). In this case comprehensive universities offer a broad range of degrees, diplomas and certificates and help widen access to tertiary education in the country. In South Africa comprehensive universities such as UNISA as shown on Table 1.1 was an amalgamation of Technikon SA and Vista University and University of Johannesburg resulted from a merger of Rand Afrikaans University, Technikon Witwatersrand and part of Vista University.

- **Universities of Technology**

As shown in Table 1.1, universities of technology in South Africa resulted from the merger of Technikons and universities and amount to six, namely; Durban University of Technology, Tshwane University of Technology and Vaal University of Technology among others. The existence of Vaal University of technology resulted from an incorporation of part of Vista University and North West University. Universities of technology known as "technikons" offer vocational oriented diplomas and degree courses that take about three years to complete placing much emphasis on innovative problem solving courses that are career orientated with practical and experimental learning (Farham, 2012). However, Universities of Technology have not to date acquired all of the traditional rights and privileges of a university such as the ability to offer a wide range of degrees (Student Brands, 2015).

Besides the above discussed 23 state funded universities with the exception of the Northern Cape and Mpumalanga National Institutes for Higher Education that were

recently added to the list to make a total of 25 public universities in South Africa (Higher Education in Context, 2012:1-214), there are several Private Higher Education Institutions (PHEIs) spread across South Africa. These PHEIs are registered with the Department of Higher education and accredited by the South African Qualifications Framework Association (SAQA) and the Council on Higher Education (CHE) among others. Due to the growing demand of higher education globally and the inability of public institutions to accommodate all higher education qualifying students, PHEIs in South Africa are paramount as they increasingly play a pivotal role in accommodating thereby promoting economic and social development (Higher Education in Context, South Africa, 2012:17).

These higher education institutions all compete for students and therefore make use of various marketing tools and strategies to register a large number of students. The rapid developments in technology, particularly the use of the internet and the introduction of mobile devices such as tablet computers, laptops and iPads have been identified by many institutions in both public and private sectors as tools that enhance student learning and can be used to attract students to an institution.

In an attempt to accomplish its objectives such as raising education standards, producing qualified graduates, to resolve industrial skills shortages and to meet students' educational needs among others as mentioned in the Education White Paper 3, higher education faces a number of challenges. These challenges are briefly discussed below.

1.2.1 Challenges facing higher education

Like any other institution, higher education institutions encounter a number of challenges across the globe as it is being reshaped by globalisation and digital revolution (Bryant, 2013). To begin with, higher education in developed countries such as the United Kingdom in particular faces challenges such as rising student expectations where students look forward to a high return on their education investment as they pay more for their studies, increasing learning costs due to investments made in infrastructural facilities, teaching and career support to attract students, a shift in funding and a demand for new educational technologies to improve administration and student support among others (Deloitte, 2015; JISC, 2015).

In South Africa, higher education faces a myriad of challenges. One of the biggest challenges facing higher education in South Africa as outlined in the White Paper is to redress past inequalities and to transform the higher education system in order to serve a new social order, to meet pressing national economic needs and to respond to new realities and opportunities (Mekoa, 2018; White Paper 3:1). According to Mabelebele (2015), higher education in South Africa faces a number of challenges including a decline in state funding, rising costs in education leading to a decline in students completing their degrees. The implementation of Information and Communication Technology's (ICTs) and its implication to universities, internationalisation and transformation of academic programmes and the growth of higher education institutions where students enrolment figures are expected to increase from 1 million to 1.6 million by 2030 still remains a challenge (Mabelebele, 2015). This was in turn supported by Mdepa & Tshiwula (2012) who reiterated that there must be an increase in student enrolments in higher education for South Africa to be able to meet its economic obligations and for it to be globally competent. However, considering the challenges mentioned earlier, this is unachievable.

Lack of institutional support, lack of e-learning culture, exclusion of academia from e-learning development programmes, educator's attitude towards technological changes in teaching and learning and weak ICT support were identified as other challenges facing higher education institutions in South Africa (Isabirye & Dlodlo, 2014; OERAfrica, 2014). This has been exacerbated by lack of lecturers with knowledge and competencies to give appropriate skills needed by students, misallocation and misuse of resources with little accountability and transparency (Dirks, 2013).

In addition, changes in curricula and teaching methods brings big challenges to higher education in South Africa as uniform methods of learning and evaluation are becoming outdated (Gaza, 2012). Hence, in this regard, there is a need for extensive restructuring of qualifications and programmes to equip students with the relevant knowledge, expertise and skills in order to meet the current economic changes (Badat, 2010).

Mlitwa & van Belle (2011) identified a number of technological challenges facing higher education in South Africa. These challenges include a lack of network capacity, inadequate coordination and limited technological support, resistance to change,

internet access issues and poor network systems among others. Additionally, several technological challenges related to digital media such as limited skills in Information and Communication Technology (ICT), low levels of ICT in research and development, lack of high quality research to enhance innovation and high telecommunication costs can highly impact on the students' technical literacy levels (Cloete, 2017).

Language has been found to be a barrier to success for higher education students. South Africa has eleven official languages of which English is the official medium of instruction in many universities. In this regard, many students lack the capacity of expression as required by university standards. Hence, many undergraduate students end up failing. The high failure rate impedes the Council on Higher Education (CHE) goals of increasing graduate enrolments and outputs to support the country's economic and social developmental needs (CHE, 2010). In a study conducted by researchers from Wits University it was identified that poor English language competencies hinder the academic performance of a significant number of undergraduate students for whom the language is not a mother tongue (Makoni, 2017). However, the use of colonial languages as languages of instruction somehow contravenes the Constitution of the Republic Section 29(2) which states that everyone has the right to receive education in the language that he/she understands (Mdepa & Tshiwula, 2012).

In conclusion, higher education in South Africa is under increasing pressure to provide access and quality education to students from diverse and disadvantaged backgrounds as well as the country's citizens at large in order to promote equal opportunities for everyone. The next section discusses diversity in higher education.

1.2.2 Diversity in higher education

In higher education diversity refers to human multiplicity and plurality and also the multiplicity and plurality of knowledges and languages. Diversity is one of the largest and most difficult challenges universities and colleges have ever faced and are still facing today (Freedman, 2010). South Africa is known for its ethnic diversity with eleven official languages (Mdepa, 2012: 20). It is often referred to as the "Rainbow Nation" where people of various cultures, languages and backgrounds meet (Chutu, 2013). The term diversity can have different meanings depending on the context in

which it is applied. Diversity can be defined as "... a collection of people coming together from different races, nationalities, religions and sexes to form a group, organisation or community" (Tenas, 2012). This generally means that diversity is the acceptance and understanding of other people irrespective of their gender, ethnicity, culture, nationality, citizenship status, religion, age and background among others. South Africa is one of the countries with a culturally diverse population where integration and changes in the educational system particularly the restructuring of universities has brought a number of challenges to both students and educators.

In previous decades, South Africa's education sector primarily targeted and served a minority ethnic group, but with the changes in legislation, the need to equitably represent everyone in all aspects of education became relevant (Mdepa, 2012). Due to the ever increasing pressure from the South African government to accommodate everyone, the issue of student diversity in higher education institutions poses greater challenges as educators need to teach all students regardless of their culture, race, level of affluence, academic preparedness, education background and language (Yale, 2015; Meier & Hartell, 2009:180). However, some universities are not able to improve diversity in the classroom as it is a complex and politically linked issue.

South Africa has both rural and urban education universities where many students come from diverse family backgrounds (Dirks, 2013). Rural universities are differentiated from urban universities in the sense that, rural universities are characterised by poor infrastructure, insufficient learning resources and mostly use traditional teaching methods of learning such as face-to-face and regular meetings that take place in a fixed location using resources such as chalk board, text books, manuals and paper (Nazzal, 2014). Whereas urban universities have satellite computers and use a wide range of teaching and learning methods/techniques that are technologically oriented such as computers, digital media, internet, online and mobile learning (Bhaumik, 2012).

In today's classrooms, college and university lecturers encounter a diverse student body. Some students come from different racial, cultural, ethnic, religious and language backgrounds and some have different learning styles, levels of motivation and understanding, cognitive aptitude and different perceptions about the world around them. Therefore, for a fair and equal treatment of students, lecturers are encouraged to recognise and accommodate these differences in order to promote

harmony and understanding among everyone (Flanigan, 2018). More so, today's lecturers in higher education are expected to seek out what are called 'cultural building blocks' which are already possessed by the students in order to build a framework of understanding. This recognition of cultural differences among students creates a positive foundation for effective learning and an interesting and safe classroom environment. Due to the fact that every student responds differently to the curriculum, lecturers need to constantly adjust their teaching and learning methods both in theory and practice (Lynch, 2016)

Diversity can also exist in a classroom set-up where there are high achievers and slow learners who need more attention than others. In such cases, it becomes the responsibility of lecturers to recognise and plan their lessons in order to reflect students' differences (Lynch, 2016). By using this approach, lecturers will encourage students to appreciate themselves as individuals.

The issue of diversity remains debatable as it has both positive and negative effects in higher education. Studies show that lack of cohesion between students and lecturers of different race, culture, sex, background, language among others is due to mistrust and stereotyping issues. Hence, it is important to have a diverse student body as it encourages students to grow outside their boundaries, promotes teamwork, make informed decisions, experience and appreciate other people's backgrounds and beliefs as they learn something new about other cultures which they may not be familiar with (Tenas, 2012).

Diversity in universities and colleges encourages collaboration and fosters innovation thereby benefiting all students as they learn with people from a variety of backgrounds. Research shows that the overall academic and social effects of an increased racial diversity among students on campus are likely to be positive ranging from higher levels of academic achievement to the improvement of near and long-term intergroup relations (Kerby, 2012). On the same diversity can shape and influence the behaviour and personality of students towards their studies as it triggers the introduction and implementation of a variety of teaching and learning methods which caters for every student needs and preferences to enhance learning (Sara via-Shore, 2016). However, diversity among higher education students has been criticised by some scholars for its failure to bring about important structural reforms and address deep-rooted racism among students (Meier & Hartell, 2009:182). Some individuals

are not able to appreciate and share their culture with others hence they decide to keep to themselves and shut everyone out from them thereby creating tension and misunderstanding among others (Tenas, 2012). The following section describes the various methods of learning used in universities.

1.2.3 Learning methods used in various universities

Due to increased diversity in higher education, the stereotype view that “one size fits all” in education no longer applies as most students have different learning choices to make (TopDog Education, 2017). Universities and colleges are taking a bigger stance in responding to students’ diversity by offering various methods of learning such as face-to-face, digital learning, online learning, distance learning, blended learning and mobile learning to cater for diverse student needs and preferences (Mohseni, 2014; Bencheva, 2010). These learning methods are briefly explained below.

- **Face-to-face learning:** Face-to-face learning refers to a traditional method of learning where the student and lecturer have direct or physical interaction between them. Face-to-face learning normally takes place in a classroom setting where the teacher stands in front of students to teach by writing on the board and explaining verbally to students who will respond directly to the teacher in return (Mohseni, 2014). Many universities in South Africa today still rely on face-to-face teaching and learning as it is believed to enhance better interaction between students and lecturers. A study by Govender (2015) revealed that the face-to-face learning method is one of the most commonly used learning method in South Africa as it is useful when teaching large groups of students and can present factual information logically.
- **Digital learning:** Digital learning is a modern type of learning which involves the computer and network transfer of skills and knowledge through the internet by using electronic applications and processes (Bencheva, 2010). Digital learning involves the use of electronic gadgets or media such as desktop computers, web-based computers, audio-video tapes, projectors, CD-ROMs, satellite TV, Learning Management Systems (LMSs) and many others to deliver learning content. Due to rapid changes in technology, a number of higher education institutions in South Africa and around the world are using

digital learning for educational purposes to facilitate teaching and learning among students and instructors.

- **Online learning:** Due to changes in technology, online learning has become common in comparison to the traditional learning methods used in the past decades (Telkom, 2015:3). Online learning is a form of learning that is typically self-directed and classes can be conducted using the internet, video conferencing, animation, discussion boards, e-mails or online tutoring (Mohseni, 2014; Bencheva, 2010). Online learning classes are usually conducted on scheduled dates and times where the tutor has direct interaction with the student via a screen. With online learning students have 24/7 access of learning material via an online platform using the internet. In an article written by Maboe (2016) about the perspective of distance higher education students on online interaction revealed that students benefited from online interactivity but encountered more challenges than the benefits of online learning. The challenges encountered were mainly academic, institution and administrative related. However, the study recommended that the university should consider utilising other social media platforms such as Twitter, Facebook, LinkedIn and Instagram in order to promote online interaction and facilitation of teaching and learning (Maboe, 2016).
- **Distance Learning:** Distance learning is a form of learning that take place over the internet. The lecturer and student will be separated by time and physical location. This means there is no face-to-face interaction between the student and the lecturer (Bencheva, 2010). With distance learning, students are able to receive their learning material and interact through postal mail, teleconferencing or over the internet using a Learning Management System (LMS), multi-media discussion forums among others. The University of South Africa (UNISA) is the largest higher education institution offering learning through distance-learning.
- **Blended learning:** Blended learning is a type of virtual learning which combines several different learning methods such as face to face, e-learning and self-paced instruction. The goal of blended learning is to provide the most efficient and effective instruction experience by combining various delivery modalities (Bencheva, 2010). A number of universities in South Africa and

across the globe offer blended learning due to the unlimited benefits it offers to students as it cater for students with diverse learning needs (Huneycutt, 2013). The use of blended learning helps to maintain a balance among students by using educational technologies that accommodate every student unlike the face-to-face learning method (Govender, 2015).

- **Mobile learning:** Mobile learning also known as m-learning refers to learning using mobile devices with wireless connectivity such as mobile phones, smart phones, tablets, or any other handheld devices that offer learners the opportunity to enhance their learning experience anywhere and at any time (Barreh & Abas, 2015). As mobile devices have become ubiquitous, many higher education institutions have embarked on a number of mobile learning initiatives in order to supplement and support their traditional learning methods. Through mobile learning, students and educators are able to access teaching and learning material anywhere anytime regardless of time and location (Mehdipour & Zerehkafi, 2013). In the early 20th century, a countable number of higher education institutions in South Africa took the initiative of introducing mobile devices to students in order to enhance their learning.

World-wide there is a strong move towards the use of technology in teaching and learning. Since 1980, research in to higher education explored the digital shift in technology taking place in higher education institutions around the world (Elzarka, 2012). Countless reports have been emerging from all corners of the globe suggesting that if institutions wish to remain competent and viable in the 21st century they need to embrace the opportunities offered by technology particularly in teaching and learning practices (Edmunds, Thorpe and Conole, 2012). However, researchers such as (Norris & Sloway, 2015; Reich, 2012) argued that technology is no silver bullet in transforming education or improving learner outcomes, instead, technology can be reserved for students with special needs and is regarded as an enrichment activity with little effect on how the basic curriculum is delivered.

Using technology in education has its own benefits and drawbacks. Technology provides avenues for anywhere-anytime learning, lead to student active participation and learning thereby enhancing relationships between students and lecturers as they are able to collaborate among themselves through various technological applications (Wainwright, 2016). Technology integration in education provides no limitations to

study as students are able to work on their own pace and have greater access to research and study material as well as increased motivation and academic achievement (Norman, 2016).

Moreover, with the use of educational games and videos, teaching and learning becomes more fun and interesting (Wantulok, 2015). Technology helps to bridge the learning gap in students of a diverse nature as various learning methods and devices are incorporated (Blair, 2012).

A study by Oner & Adandan (2011) noted some learning benefits when using technology. These technological benefits include easy access to learning content, timely collaboration with peers and ease of assignment submission. The study supported specific characteristics of technology driven instruction such as online discussions which encourage students to present well researched information.

According to Goode (2010), technology in many institutions of higher education has become part of college or university life where students are able to perform many tasks online such as applying for a college online, choose their courses online, use electronic textbooks for studying, perform research online, and submission of assignments online. Therefore, technology development can be singled out as the most important factor that can initiate and expand learning through the use of various digital media. The next section describes various digital media that can be used for educational purposes.

1.2.4 Various digital media and their use in learning

The history of digital media can be traced back to 1930 (Hamilton & Spongberg, 2017). With the advent of Web 1.0 and Web 2.0 technologies, the use of digital media has become the most predominant conception as it enhances the quality of teaching and learning in education. Digital media refers to any electronic content that can be transmitted over the internet or computer networks. Cant & van Heerden (2017: 334) defined digital media as "... channels of communication with which the audience can participate actively and immediately". Today, many higher education institutions use various forms of digital media to perform various activities such as developing company websites, search engines, e-mailing, blogging, viral marketing, mobile marketing and social media marketing among others (Cant & van Heerden, 2017: 357-358). Digital media content can be created, viewed, distributed, modified

and preserved on digital electronic devices such as computers and other electronic devices for example textbooks can be downloaded in electronic format using a computer or any mobile device connected through the internet.

Digital media is not generally used by people in their everyday lives only but also has become the central source of information in higher education as it enhances the delivery of quality teaching and learning content (Zekan & Peronja, 2012). Students in colleges and universities in South Africa and around the world use various forms of digital media such as social media, multimedia, micro-blogging, wikis and online videos through YouTube among others in order to engage more with their course material (Taylor, 2016; Chien, 2014). These forms of digital media are briefly discussed below.

- **Wikis:** Wikis refers to an institutional web page that shares the history and general information about the college or university including its products and services. The use of wikis was supported by a recent study by Huang (2019) about the use of wikis in education by online graduate-level theories class revealed a positive students' participation patterns in the wiki learning activities, the relationship between their participation and course performance and the students' experiences with the scaffolding strategies designed to support their cooperative activities.

Jako (2014) conducted research among university students who were using wikis as an open source online dictionary and as a teaching and learning resource in an Afrikaans sociolinguistic module. The results revealed that the use of wikis provided for effective facilitation of blended learning approach which was discussed earlier and positively contributed to the promotion of learning Afrikaans. However, some students preferred handing their assignments in hand as some students were not computer literate and had limited access to the internet. In a recent study by Huang (2019) about the use of wikis in education by online graduate-level theories class revealed a positive students' participation patterns in the wiki learning activities, the relationship between their participation patterns in the wiki learning activities, the relationship between their participation and course performance and the students' experiences with the scaffolding strategies designed to support their cooperative activities.

- **Microblogging:** Microblogging refers to a process which allows customers to interact, comment or discuss about a certain specific topic on an online platform such as Twitter. Universities such as University of Cape Town (UCT) and Cape Peninsula University of Technology (CPUT) in South Africa as shown in Table 1.2 has a profile on Twitter which is linked to their website where students and faculty can actively engage on this microblogging platform.
- **Business networking:** This platform allows universities and colleges to have their profiles on social websites such as LinkedIn so that interested institutions or students registered with the site are able to search and see information about the university. The Faculty of Engineering at UCT shown in Table 1.2 is one of a business networking example.
- **Videos:** With YouTube, students in universities can create, download and share a variety of videos. Universities and colleges can also upload videos on YouTube for various purposes such as marketing, lecture video, demonstrations and orientation for first year students. CPUT is one of the universities in South Africa which orient first year students about survival skills using YouTube as shown in Table 1.2.
- **Social media:** The growth of social media networks such as LinkedIn, Twitter and Facebook in particular has led to a number of institutions to consider them for educational purposes. A number of colleges and universities use Facebook as a marketing tool which provides registration information, notices, events on campuses, news articles, marketing, achievements of staff and students (Kilfoil, 2015: 21). Through the Facebook platform students and faculty can comment, like or share information though some Facebook pages are controlled by the institution if one needs to interact or start a conversation. The use of Facebook has been supported by a research study by Harran and Olamijulo in 2014. The study explored how social media or social networking sites such as Facebook facilitate communication as well as literacy development in higher education language classroom context. The results of the study revealed that student participants preferred Facebook because of its convenience, mobility, learning freedom and teamwork it provides. The research findings revealed that although students often used informal texting, the use of Facebook could facilitate teacher-student communication if managed well (Harran & Olamijulo, 2014).

In South Africa, social media platforms referred to as the “Big 5” that is, Facebook, Twitter, LinkedIn, You Tube and Microblogging (GetSmarter, 2012:13) are highly being used by many colleges and universities to facilitate learning and collaboration among students and their lecturers. The following table shows various uses of social media platforms by some universities in South Africa.

Table 1. 2: Use of Social Media Platforms in South African Universities

Institution	Application	Social Media platform Used
University of Cape Town (UCT) Architectural Department	First-year students create a private group where they share information, documents, images and jokes related to their field and arrange lifts to hardware stores and studio clean-up days	Facebook
(UCT) Centre for film and media studies	A Twitter backchannel platform is used during a seminar for classroom discussions and feedback	Twitter
Cape Peninsula University of Technology (CPUT) Department of Bio diversity and Conservation Management, Faculty of Applied Sciences	Use a closed Facebook group to allow students to connect and interact during work-place based learning.	Facebook
CPUT First-year Experience (FYE)	Create videos containing information for first year	YouTube and Facebook

Fundani Centre for Higher Education Development	students on how to survive in the university, disseminated through the FYE YouTube channel, linked from the university's Facebook page.	
CPUT Faculty of Engineering	Students connect in professional groups to get feedback on their projects	LinkedIn
CPUT Public Relations Department, Faculty of Informatics and Design	First ever lecturer done via Twitter globally. Lecturers prepared a whole lecture split into 140 characters, students engaged using hashtag(#)	Twitter
University of Western Cape (UWC) Department of Sports, Recreation and Science	Students create and share collaborative content using Wiki and a blog for discussion and reflection on learning	Wiki space and blogger
UWC Postgraduate Programme in Public Health, School of Public Health	Use Google group to connect distributed learners, to develop social presence of the course leader and students and for enhancing peer-to-peer learning	Google groups
Stellenbosch University, EduTech	Sharing of presentations used in staff development activities	Slide share and YouTube
University of Pretoria, Department of Psychology	Use Facebook to communicate with first, second and third year	Facebook and YouTube

	class representatives. Students also post videos using the platform	
Cape Higher Education Consortium (CHEC) Emerging Technologies in Higher Education short course	Use Google drive for sharing participant reflections and collaborative learning. Use of WhatsApp to facilitate peer support and communication between participants and facilities	Google Drive and WhatsApp

Source: Kilfoil (2015:21)

As shown in Table 1.2 above, students engage with various social media sites such as Facebook, Twitter, LinkedIn and WhatsApp among others in order to get a better educational experience as they learn to use multi-media tools that are available 24/7 on the internet. Though schools and educators remain optimistic and willing to bring technology into the classroom, South Africa’s readiness for e-learning is still hampered by lack of skills and infrastructural resources (Staff Witter, 2014). In an attempt to produce graduates that are knowledgeable and competent at the workplace, the department of higher education in South Africa has embarked on a programme to upgrade the technological skills of many faculty members by equipping them with proper technical and information and technology (IT) skills through training (IT News Africa, 2018). This is evidenced by a programme that was implemented by the University of Johannesburg where over 100 academic faculty members were sent for training programme that ended in 2018.

By using digital media in education, learning has been put right in the hands of students as they are able to reach out and easily gather useful information for academic purposes (Chien, 2012). Several studies by (Plowman et al., 2010; Gee, 2008; Resnick, 2006; Buckingham & Scanlon, 2003; Wellington, 2001) has revealed the benefits of digital media in education and these benefits include integration of an

enjoyable learning experience, development of technological fluency, improved motivation by participating in designing of educational games among others.

Given that, students use various forms of digital media to access learning content, South African higher education still faces a number of challenges that are digitally related. Challenges such as limited skills in Information and Communication Technology (ICT), low levels of ICT in research and development, lack of high quality research to enhance innovation and high telecommunication costs can highly impact on the students' technical literacy levels (Cloete, 2017). A lack of network capacity, inadequate coordination and limited technological support, resistance to change, internet access issues and poor network systems among others remains a problem (Mlitwa & van Belle, 2011). The various forms of digital media cannot just be used by anyone, instead proper technical training and knowledge skills is required.

With the rapid developments in mobile technology and ownership among the millennium generation, the use of mobile devices in education such as laptops, smartphones, Personal Digital Assistants (PDAs) and Tablet Personal Computers (PCs) in particular has been on the rise across the globe (Kyong eun Oh & Gwizdka, 2016). These mobile devices have wireless networks that extend beyond the classroom and facilitate access to information and learning material beyond the classroom (Uysal & Gazibey, 2010; EDUCAUSE, 2016). Among the mobile devices, the Tablet Personal Computer (PC) has been seen as a “game changer” in accessing learning material, therefore many colleges and universities have decided to introduce the tablet as an option to enhance student learning. Further discussions regarding the Tablet PC will be addressed in Chapter 2 which deals with technology.

1.3 PROBLEM STATEMENT

Previous studies on mobile and online learning have not, this study observes, focused on the perceptions students have of teaching and learning gadgets such as the Tablet Personal Computer. The use of portable mobile devices such as Tablet Personal Computers to access and share information is on the increase in higher education and is redefining the manner in which learning takes place regardless of location (Rossing, Miller, Cecil and Stamper, 2012; Miller, 2012; Geist, 2011). Previous studies on JSTOR, EBSCOhost, Emerald, ProQuest and SAGE have

addressed a wider exploration of the innovative uses of the Tablet Personal Computer (Auer, 2016; Percival & Claydon, 2015; Mang & Wardley; 2013; Stewart, 2013; Elzarka, 2012; Qureshi & Naeem 2011; Brown-Martin, 2010) as well as its merits and demerits in higher education institutions in developed countries (Vaportzis, Clausen and Gow, 2017; Lim, 2011; Prey and Weaver, 2007). However, to date no research has been done on students' perceptions regarding the Tablet PC as a mobile learning device in South African graduate institutes. Given the fact that students are no longer restricted by the four walls of the classroom to get education, this study attempts to explore students' perceptions regarding the Tablet PC as a mobile learning device to enhance learning.

As the Tablet PC is given to students to use for educational purposes, it is of paramount importance to explore the students' opinions and experience regarding the use of the device as it is used to enhance learning. The reason why this study is being undertaken is to explore students' perceptions regarding the use of Tablet PC in higher education to enhance their learning. Given the fact that students mainly used traditional methods of learning in the past, the question that this study attempt to answer is:

Do students perceive the Tablet PC as a tool to enhance learning in higher education institutions?

1.4 RESEARCH OBJECTIVES

A research objective can be defined as "... a goal statement which explains the type of information which will be needed in order to solve a management decision" (Cant & van Heerden, 2017:130). Research objectives are classified into two categories namely: primary research objectives and secondary research objectives.

1.4.1 Primary research objective

The primary research objective of this study was to explore students' perceptions regarding the efficiency and contribution of the Tablet PC as a mobile learning device in order to justify the adaptation of study material. This objective was supported by the following secondary objectives:

1.4.2 Secondary research objectives

- To explore the uses of the Tablet PC as a mobile learning device used by students to enhance learning at a graduate institute.
- To empirically identify the advantages of using the Tablet PC as a mobile learning device used by students to access learning material.
- To discover challenges facing students when using the Tablet PC as a mobile learning device at a graduate institute in Tshwane.
- To determine the performance of the Tablet PC in terms of service quality as it is used by students for academic purposes.
- To determine the pedagogical opportunities offered by the Tablet PC as a mobile learning device.
- To determine if students' perception of the Tablet PC varies with age, gender and years of instruction.

Due to the fact that students are given the Tablet PC to use for learning immediately after registering with the institution under study, it is important to understand the students' perceptions of the device as they use it during their study period. A discussion of perception is briefly given below.

1.5 PERCEPTION

To perceive may be to make sense of and shape an understanding of an object or subject. The concept of perception has been treated as a true reflection of reality in business and personal life by numerous researchers (Monger, 2015). In general, perception can be described as a way or manner in which a product is understood or interpreted by a customer. However, perception is subjective and can easily be distorted (Hanna, Wozniak and Hanna, 2017: 81). As this study focuses on students, they are classified as customers. Customer perception is typically determined by the individual use and personal experiences of the product. Hence, customers encounter choices and make decisions through four main stages of perception namely; exposure, attention, interpretation and storage/memory (Roberts-Lombard & Parumasur, 2017: 154). These stages are briefly discussed below.

1.5.1 Customer perception process

- **Stage 1- Exposure to stimuli**

This is the first step of the perception process which refers to the extent to which a person takes cognisance of stimuli via his or her senses (Roberts-Lombard & Parumasur, 2017:150). Exposure to a marketing message, product/service or stimuli can mean that the message has been received, seen or heard by the customer with no guarantee that he or she will pay attention to it.

- **Stage 2- Attention to stimuli**

Attention can be defined as the extent to which the processing activity is devoted to a particular stimulus (Roberts-Lombard & Parumasur, 2017:151). During this stage, the customer voluntarily chooses to attend to stimuli that are consistent with his or her current needs.

- **Stage 3- Interpretation of stimuli**

Interpretation is the third stage of the perception process which refers to the meaning that a person assigns to sensory stimuli (Roberts-Lombard & Parumasur, 2017:153). The customer tends to interpret the marketing message or stimuli according to the existing beliefs, attitudes, general disposition and experiences (Joubert, 2013: 60). During this stage the customer tries to assign meaning to the marketing message or stimuli chosen to attend to in Stage 2.

- **Stage 4- Storage (Memory)**

The last stage of perception is storage or memory. According to Roberts-Lombard & Parumasur (2017: 154), storage or memory refers to the stage where information will be retained in the customer's memory so that it will be available when the customer is considering buying the product. During this stage the customer tries to recall the stimuli he/she has interpreted in Stage 3 to guide for future purchase decisions. However, due to the fact that customers tend to forget the marketing message when they want to make a purchase, advertisers normally come up with several strategies to make sure that the product information will be retained in the customer's memory (Joubert, 2013: 60).

Based on the description of the perception process above, the explanation in relation to students is that, students are exposed to the Tablet PC the moment it is handed to them after registering to study with the institution under study. Due to the fact that the students need to use the Tablet PC for learning purposes, they pay particular attention to usage information that helps them easily access learning content in order to excel in their studies. This information may include how to access study guides, log in to Moodle, download e-books and perform back- ups among others they see important. After paying attention, the student interpret the Tablet PC by assigning meaning to the major uses and functionalities in comparison with other similar mobile devices they know. Lastly, under the storage/memory stage, the student's ability to recall and share information about the Tablet PC is displayed. This stage is associated with the ability of the student to remember usage information about the Tablet PC for the entire study period in carrying out academic tasks and activities and the ability to share that information and experience with others. The customer perception process will be discussed further in Chapter 3.

Taking the above discussion into consideration, this study attempts to explore students' perceptions regarding the use of Tablet PCs as mobile learning devices at a graduate institute in Tshwane. The next section describes the research methodology for this study.

1.6 RESEARCH DESIGN AND METHODOLOGY

The current study aimed to explore perceptions of students regarding the Tablet PC as a mobile learning device used to enhance learning at a graduate institute in Tshwane. This study was exploratory in nature as it intended to acquire more information about students' perceptions, opinions and experience of using the Tablet PC as a mobile device for learning purposes. Exploratory research and the research methods used in this study will be discussed further in Chapter 4. A quantitative method in the form of a survey was used to collect data from respondents in this study. Use of quantitative methods place emphasis on the objectivity of the research as quality is assured in minimising bias and subjectivity when collecting and analysing data (Frey, 2018). In order to collect data about the students' perceptions, the online questionnaire was administered to students through Lime survey.

The target population for the proposed study were all full-time undergraduate students registered with the Faculty of Business, Economics and Management Sciences (BEMS) at Richfield Graduate Institute of Technology (RGIT) in Tshwane. These undergraduate students were chosen for the purposes of this study as they are all given a Tablet PC to use for learning purposes in their first year of study therefore they possess the knowledge and experience required in answering the research questionnaire of this study. The unit of analysis were all individual undergraduate students registered to study at RGIT.

For the purpose of this study, primary data in the form of quantitative research methods were used to gather data from respondents. A self-administered online questionnaire composed of open and closed-ended questions was used to collect data in this study. Non-probability sampling in the form of convenience sampling was used to select respondents. This method was chosen as it gives an equal opportunity for every individual conveniently available during the data collection period. The aim of this study was to achieve an ideal sample size of 169 responses. Permission to conduct research was given by RGIT and the study was ethically cleared by UNISA ethics committee and no respondents below 18 years of age were allowed to participate in the study.

A semi-structured online questionnaire was designed to obtain relevant and specific information about students' perceptions regarding the Tablet PC as a mobile device to enhance learning. The questionnaire was composed of five sections. The first section of the questionnaire focussed on the Tablet PC usage by students and consisted of closed and open ended questions. Section two focussed on the academic application of the Tablet PC and students were asked about the advantages and challenges they face in using the Tablet PC and consisted of open and closed ended questions as well. Section three of the questionnaire focussed on the technical aspects of the Tablet PC and students were asked to determine the overall performance of the Tablet PC as they use it for learning purposes. Section four explored the pedagogical opportunities offered by the Tablet PC. Lastly, Section five focussed on the demographic information of the respondents namely; gender, age and year of instruction.

An e-mail with a link to the online survey was sent to the students over a period of one

week. The survey was open from 30 May to 30 June 2019. No incentives were given to respondents to complete the questionnaire. The online questionnaire is found on Annexure 1.

The online questionnaire was pre-tested on a representative sample of respondents before being fully administered. The respondents were asked to highlight questions they misunderstood and the questionnaire was adapted accordingly.

1.7 CHAPTER OUTLINE

The present study is structured in six chapters. Chapter 1 which is the present chapter presents the background and context of the study that concerns South African higher education. This is followed by an explication of the challenges facing the higher education sector. The importance of diversity in higher education, various methods of learning and the use of digital media by universities in South Africa are elucidated. The problem statement, research objectives, the perception process, research design and methodology and finally the study limitations are fleshed out thereafter.

Chapter 2: This chapter discusses the evolution of technology in higher education and the technological changes in the education sector. This is followed by a literature review of students' perceptions of the use of the Tablet Personal Computer as a mobile learning device in higher education.

Chapter 3: This chapter focuses on customer perception. Students in this regard are considered customers. Factors that influence perception are discussed. The chapter concludes with a discussion on the stages of customer perception.

Chapter 4: This chapter focuses on the research methodology that is applied in this study. An overview of the research process is presented followed by the research design, sampling approach, data collection and the data analysis of results.

Chapter 5: This chapter presents the research findings of the empirical research. These findings are analysed and presented in detail and then used to formulate conclusions and recommendations in the final chapter.

Chapter 6: This concluding chapter provides a summary of the interpretation of the findings presented in Chapter 5. Conclusions, recommendations and future research

opportunities for institutional decision making purposes are presented in this chapter. It is in this chapter that the contribution of this study to discipline of Business Management can be evaluated.

CHAPTER 2: TECHNOLOGY IN HIGHER EDUCATION

2.1. INTRODUCTION

This chapter explores the impact of technology in the higher education context of South Africa. This exploration aids this study in specifically understanding the uses and impacts of the Tablet PC as perceived by students in a selected higher education institution in Tshwane. Technology has revolutionised the way students are taught as from the spread of computers in the classroom to the growth of massive open online courses (MOOCS) with almost 70% of educational institutions in the world using mobile devices such as Tablet PCs (Barclays, 2017) for educational purposes. Rapid developments in digital technology and the world-wide-web have changed the manner in which teaching and learning is conducted as new methods of interaction are engaged and incorporated among students (Ahmed, Shuja & Chaundry, 2014). This has led to the use of technology and digital devices in education to become a priority as most institutions try to meet students' needs and preferences as they pursue with their studies (Costley, 2014). As this study is conducted from a student perspective, it is however significant to address the integration of technology in higher education and students' perceptions of using mobile devices such as the Tablet PC to enhance learning outcomes in order to draw relevant conclusions at the end.

New technologies are transforming every aspect of a business and the manner in which work is done (Collins & Halverson, 2018:9). With the proliferation of the internet, the web and digital media the role of marketing in particular has changed since the launch of the first website (<http://info.cern.ch>) in 1991 (Chaffey & Ellis-Chadwick, 2016:6). The rapid changes in technology have transformed three main areas of marketing namely; speed, relevance and reach of campaigns. With the use of digital marketing, speed in accessing information has increased, relevant information and messages can now be sent to the targeted specific groups of customers and media campaigns are able to reach specific customers within a short period of time. Many organisations have tried to align themselves with technological changes by becoming more technologically savvy, data analytic, creative and constantly upgrade their technical skills as consumers' tastes and preferences change with time.

Technology in the form of digital media has transformed how organisations interact with their customers through the use of various devices such as desktop computers, laptops, tablets and smartphones among others. By using the internet, consumers have access to a wider choice of information from different organisations with just a click of a button and can make product comparisons, find lower prices of products, read other customers reviews and comments and can even give feedback or communicate with other consumers about the quality of a product and its performance. With technology, organisations have the opportunity to expand into new markets by showcasing through the internet, offer new services, interact with customers in new ways and compete on a more equal footing with other businesses. For example, some online companies such as Amazon, iTunes and Expedia among others have managed to capture a bigger market share by using the 5Ds of digital marketing to get closer to customers than ever before in order to stay on top of the game among other existing competitors (Chaffey & Ellis-Chadwick, 2016: 6).

This chapter begins with a brief description of the evolution of technology in education. This is followed by technological changes that took place in the education sector and the use of technology in education. A discussion of mobile technology in education and various studies conducted regarding the Tablet Personal Computer follows thereafter. The chapter enables the study to make sense of the factor and impact of technology in general and the Tablet Personal Computer as perceived by some graduate students in the Tshwane part of South Africa.

2.2 EVOLUTION OF TECHNOLOGY IN EDUCATION

Gone are the days when there was a one room schoolhouse with rows of wooden chairs, benches and desks. Today's classrooms are likely to be a computer lab, a room with rows of computers, students using, mobile devices such as tablets, laptops, cell phones, computers or otherwise listening to a podcast or watching a video lecture (LeeBanks, 2015). The historical shift of technology in education began in the 1950s up to today and this perspective has led to changes in the education system with the introduction of computers (Roblyer & Doering, 2013).

With the proliferation of the internet in the 21st century and the rapid evolution of digital media, it is undeniable that technology has changed the manner in which customers receive, interpret and respond to information. A change in technology can highly impact on the marketing aspect of an institution as it affects the manner in which

business is normally conducted. These institutional changes may include communication strategies and channels, organisational structure, management procedures and processes, organisational culture and marketing strategies that can be used to sell the company's products and services to the customers. Through the internet, social media and electronic mobile devices, customers have found new and better ways to communicate with their institution of choice. Hence, institutions need to listen to the voice of the consumer and put the customers' needs and preferences first in order to ensure good customer relationship and satisfaction.

The implementation and adoption of technology by higher education institutions have affected the manner in which teaching and learning is done and has brought a number of changes. These include delivery of teaching and learning material, the manner in which classes and assessments are conducted, student enrolment and registration, marketing of an institution's programmes and marketing strategies in retaining and attracting students. By embracing the benefits that comes with technology, many colleges and universities have managed to improve their market position and created a competitive advantage for themselves. The next section will discuss the historical evolution of technology in South African education specifically and in the world in general.

According to Dunn (2011), the introduction of technology in education commenced with the use of wooden paddles known as "Horn-Books". These horn-books had printed lessons written on it and were used to assist students in learning verses in the colonial years. Later in the 1870s, technology progressed to include the Magic Lantern which was an original version of a slide projector that anticipated images printed on glass plates. This was followed by the chalkboard in 1890 and the pencil in 1900. In the year 1920, the radio was introduced as a new wave of learning to transmit sound and information. Students began to use on-air classes where any student who was within the listening range of the radio would access the information. In 1930, the overhead projector was introduced followed by the ballpoint pen in 1940 and the headphones in 1950. After one year, in 1951, the use of video tapes was introduced as a new and exciting method of instruction. This was followed by the handheld calculator in 1972 which was used in classrooms by students for quick mathematical calculations.

In the 1930s, the first computers were developed. This was followed by the first

portable personal computer which was introduced in 1981 by IBM (International Business Machines) an American multinational technology company in the United States. This computer was named “*Machine of the Year*” in 1982 by the *Time magazine*. This laid the foundation of an immediate learning capability for students as computers began to be used by everyone and everywhere.

Apple’s infamous Mac which later evolved into a Power-book was available in 1984 and later Toshiba released its first mass market consumer laptop known as the T1100 in 1985 (Purdue University, 2019). In 1993, the first Personal Digital Assistants (PDAs) were released by Apple Computer Incorporation. As from then, computers became a part of everyday life. In the developed countries such as United States, by 2009, 97% of classrooms had one or more computers and 93% of classroom computers had Internet connection. The next section discusses technological changes experienced in the education sector.

2.3 Technological changes in the education industry

Technology has been part of teaching and learning for a long time (Owston, 1997; Papert 1973). “From the days of carving figures on rock walls to today, when most students are equipped with several portable technological devices at any given time, technology continue to push educational capabilities to new levels” (Purdue University, 2019) However, education is busy transforming and there is a new focus on the use of technology in education.

In a fast paced environment with continuous advances in technology, mobile electronic devices are the order of the day. Many people around the world are taking their education out of school into their comfort zones where they can decide what they want to learn, when they want to learn and how they want to learn (Collins & Halverson, 2018:3). This has contradicted and challenged the traditional face-to-face classroom mode of learning. The new learning niches use technologies to enable people of all ages to pursue learning on their own terms. This transition in technology is making businesses, institutions and everyone to go through another revolution on the same level as the Industrial Revolution known as the “Information Revolution” or the “Knowledge Revolution”. The Knowledge Revolution is driven by new media technologies such as computers, video games, the internet, tablet computers, smart phones, FitBits and artificial intelligence (Collins & Halverson, 2018:4). Many young

adults today are leading the way in using mobile computers to play games, networking and research due to the fact that computers and smartphones have become common as televisions and microwaves (Collins & Halverson, 2018:5). With knowledge-age technologies, students can find information about any topic, communicate with others, participate in games and activities that and get feedback wherever they are compared to industrial-age learning technology which is uniform, fixed and teacher controlled. However, the challenge of technology-driven learning opportunities rests on questions of information access and usage.

In traditional times, educational books were rare and only a few people had access to education. People had to travel for long distances to attend classes in various learning centres. Today, the educator's role as the primary source of information has shifted to the "guide on the side" as students take more responsibility of their own learning using technology to gather relevant information (Purdue University, 2017; EdTech Review, 2013). This can lead to the success of many students as they participate in a competitive digital world.

The issue of technology in education has been a debatable topic among researchers and the society (Heggart, 2016). Since 1980, research into higher education explored the digital shift taking place in universities and colleges around the world (Elzarka, 2012). Countless reports have been emerging from all corners of the globe suggesting that if institutions wish to remain competent and relevant in the 21st century, they need to embrace the opportunities offered by technology particularly in relation to teaching and learning practices (Edmunds, Thorpe and Conole, 2012). Though some researchers argue that technology is no silver bullet for transforming education or improving learner outcomes (Reich, 2012), it is reserved for students with special needs or regarded as an enrichment activity with little effect on how basic curriculum is addressed in the classroom (Norris & Soloway, 2015).

Traditionally, classrooms had been isolated and collaboration was limited to other students who were in the same classroom, but today, technology enables all forms of communication and team work that no one had ever dreamt of. The walls of the classroom are no longer a barrier as technology allows for new methods of learning, communication and collaboration to be engaged (Purdue University, 2017). This implies that technology has profoundly transformed education in many ways, from the use of audio and video technology to podcasts, interactive tutorials to e-learning and

real time online lectures (Banks, 2015).

As from the 20th century, the effective use of technology has changed the face of education. The use of digital learning tools has expanded course offerings and increased student's engagement and motivation towards learning (Ramey, 2013). There is also a move amongst educational institutions to adopt cloud based technologies in order to reduce costs and provide anywhere anytime information access to staff and students alike (Johal, 2015). Through the use of the internet, students have gained access to multitudes of data that is timeless, critical, and verifiable from across the globe. With just a click of a button students are now able to get information about an institution's products and services right at their fingertips. By having access to the internet, students can perform various activities from comparing programmes being offered by one institution to registering for a qualification of choice online without physically visiting the institution.

Online education is an example of how technology in education has grown in 'leaps and bounds' and has changed the face of traditional learning (Luppicini, 2012:176). Mobile technologies such as tablets and e-book readers are fast becoming the norm replacing textbooks and written work (Eicker-Nel & Mathew, 2014). This implies that higher education needs to innovate through technology as effective and reliable digital platforms are believed to vividly strengthen teaching and learning (Telkom, 2015).

2.4 Use of technology in higher education

The use of technology has increased in both the society and in education in particular (Cibulka, 2017). Modern technologies such as mobile devices have become so powerful and more accessible among adults and the youth across the globe. With the increased presence of electronic mobile devices and internet access, the assumption that technology and classroom learning are two separate concepts has been challenged. Technology have become an important aspect of education as it provides the necessary communication platform and tools and offers cognitive and social tools that enhance performance and evaluation of learning activities (Cibulka, 2017:2).

In previous decades, books were rarely used and only a few people had access to education. Some individuals had to travel very long distances to get education. Technology has massively expanded access to education. Large amounts of

information are now available at one's fingertips through the world-wide use of the internet, the web, online learning and some electronically portable devices making learning easier (Boundless, 2016).

Students nowadays are no longer restricted by the four walls of the classroom, technology has brought online, mobile and distance learning as mentioned in Chapter 1 as methods of learning among others. This has enabled lecturers and students to collaborate using these online platforms making education even more interactive and easy (Perkins, 2018).

Technological changes have led to a growth in the use of social networks such as Facebook, Twitter, Instagram among others have given greater access to students to be able communicate online using these social sites. As a result, higher education institutions need to ensure brand integrity and market their products on these social sites as students are found to interact through them. Constant changes in technology can highly impact on student's decision making and choice in selecting a study programme and a specific institution to study with. Many colleges and universities are now incorporating technology into the institution's curricula as it serves as a Unique Selling Proposition (USP) for the institution's offering. A USP can be described as a defining factor or characteristic that differentiates a company's products from its competitors. It is the most powerful, dynamic, unique and important benefit that a customer get for using and purchasing a company's product. A USP is a feature of a company's offering that will attract customers to purchase a company's products more than the competitors.

Without a USP, a company's products will fade into shadows, struggle to survive in the market and will never ring a bell in the minds of customers. In other words, a USP can either make or break a business and can limit the long-term success and growth of a company's products (Jordan Hunter Digital Marketing, 2015). For Figure 1 example, in this study technology in the form of the Tablet PC is used as a USP to attract students to the institution under study as it is used to make learning easier and enjoyable. Having a strong USP can drive an institution's sales, improve communication with potential customers, differentiate products from competitors, help employees and customers to understand the value attached to the company's products and can open doors for more business opportunities of an institution (Jones, 2009).

With the rapid changes in technology, higher education has become more competitive than ever before, therefore knowing how your college or university can stand out in search marketing is key to success. In a stiff competition environment, it is important that institutions focus on their USP. The USP involves creating a plan that highlights a difference of a company's product offering that is what the institution want to be known for when conducting marketing activities to prospective clients. For example, a college and university can use any form of technology as a USP in order to achieve a competent advantage among others.

Like any other business, a university or college need to understand students' needs and the factors they consider in selecting an institution to study with, then tailor make its marketing strategies and offering towards that in order to remain competitive and survive among other service providers. A study by Agrey & Lampadan (2014: 392) identified factors such as academic programmes, institution's reputation, educational facilities, learning environment, location, cost of education, safety among others as factors considered by students in choosing a university to study with. Hence, modern day institutions need to have their own USPs and consider the benefits that comes with technology in order to tap into students' tastes and preferences in order to remain competent.

Technology offers decision support systems and intelligence systems which help students to create information through online analytical processes to facilitate decision making tasks that might require more effort and analysis (Keser, Uzunboylu and Ozdamli 2011). This indicate that technology is a powerful tool that can support and transform education in many ways, from making it easier for educators to create instructional materials to enabling new ways for students to learn and work together (Purdue University Online, 2017).

The integration of technology into education has led to the growth of online learning platforms discussed in Chapter1 which students are able to choose for their learning. In an attempt to improve student performance and throughput rates in 2009, a South African University approved e-learning as a teaching and learning strategy to deliver content in its curriculum (Gogela & Ntwasa, 2015:109). This was internally branded as Wise-up Blackboard and was engaged as a Learning Management System (LMS) of choice by this particular institution. Since then, the use of e-learning and technology has been on the rise in South African higher education.

Using technology for educational purposes has a number of benefits (Ramey, 2013). These benefits are discussed below:

- ***Easy access to educational material:*** Technology has led to the growth of the internet and the world-wide-web thereby helping students to gain access to open educational resources that are freely available to anyone and simplifying interaction between students and lecturers. These educational resources include electronic books (e-books), pod-casts, digital libraries, educational videos and instructions, tutorials and more. Both lecturers and students can easily access course material through the internet and other electronic devices available to them thereby saving time.
- ***Student motivation and engagement:*** The use of computer based instructions and other new technological devices in class make students to be in control of their learning and be able to solve various academic challenges (Norman, 2016). This is due to the fact that most of the students are familiar with recent technological devices as they use them every day for entertainment purposes such as playing educational games, puzzles and video games. This makes learning funny and enjoyable. This benefit was supported by Coffey (2012) in his study on literacy and technology which found that integrating technology and peer-led discussions of literature can produce increased student engagement and motivation. Technology that was used in these small group discussions of literature included wikis, online literature circles and online book clubs which enabled students to connect with readers from other educational institutions, states and countries thereby motivating them to other's ideas and cultures.
- ***Increases student participation and collaboration:*** By using portable and mobile devices such as tablets and laptops, students are able to access information anywhere anytime thereby allowing them to be innovative, creative and actively participate in the classroom and beyond (Wainwright, 2016). The use of advanced communication platforms such as social networks, mobile texting and social bookmarking sites helps lecturers and students to effectively communicate and work together as information is quickly shared (Smith, 2013). Researchers such as Baytak, Tarman and Ayas (2011) in their study about

the experiences of technology integration in education found that most students believed that their learning improved when technology was integrated into classroom curriculum.

Students who participated in the study reported that using technology in education made learning fun and helped them learn more. They believed that technology made learning interesting, enjoyable and interactive. This revealed that using technology in education has the potential to create increased student motivation, social interactions, positive learner outcomes, enhanced student learning and student engagement. This will however have a positive influence on students' decisions to study with technology as they believe that technology can improve their learning outcomes.

- **Facilitates decision making:** Technology helps students to make quick decisions as it gives an opportunity to browse through massive amounts of information and quickly choosing the best and supports group decision making as students are able to work cooperatively together and learn from each other by reading work of their colleagues (Keser, Uzunboylu and Ozdamli, 2011).
- **Improves student's writing and learning skills:** The use of computer applications like word processors make it easy for students to write and edit notes. These applications have built-in dictionaries which help students to improve their vocabulary, grammar and spelling mistakes. Also, students can create and publish their work on blogs to express themselves and share information with others which is more interesting than taking down notes with a pen (Littlejohn, Margaryan and Vojt, 2010). This fact was supported by Lin and Lin and Yang (2011) conducted a research study to determine whether technology improved students' English writing skills. The results of the study showed that students benefited from using technology as they were able to receive immediate feedback, learn vocabulary, spellings and sentence construction by reading work of their classmates. This means technology can facilitate communication and improve student performance.

- ***Encourages personalised learning:*** The use of technological tools such as cell phones, tablets and the internet give students a greater opportunity to learn and discover information by themselves. This exposure allows the student to be knowledgeable of various options of solving tasks and problems on their own.
- ***Prepares students for future job opportunities:*** With the increasing advancement in technology, most of the careers in future will require applicants to have some form of technical skills and knowledge. Therefore, the use of technology in education plays a pivotal role in preparing students for the real world environment to meet workplace economic demands.

However, using technology for educational purposes has its challenges. To begin with, technology makes life more difficult for many instructors as it pushes them to come up with strategies of balancing new technologies with the existing curricula that education policy makers had never dreamt of (Collins & Harvelson, 2018: 6). Using technology such as mobile devices in higher education settings causes distractions among students such as instant messaging for personal reasons, game playing, movie watching or downloading, internet surfing, loss of concentration on academics, cyber bullying which results in lack of self-discipline (Kay & Lauricella, 2011). A study by Ronan (2017) cited some drawbacks of using technology as, lack of privacy, unreliable information from the internet, laziness in studying and student cheating in assessments.

Due to the unpredictable changes and upgrading in technology, many institutions fail to strategically plan their educational programs, pay for new technologies with exciting educational applications as well as train their faculty members to utilise technology effectively and this remains a challenge that many colleges and universities fail to resolve satisfactorily. In spite of the challenges mentioned above, technology continues to move to the next level due to the massive growth of wireless connections and mobile computers such as smartphones, handheld devices and mobile phones which are now being integrated in educational institutions and the daily lives of many people irrespective of their age, nationality and gender (Hlagala, 2015). The next section will discuss mobile learning in higher education institutions.

2.5 Mobile-learning in education

In a fast paced environment and perpetual advances in technology, mobile computing devices are the order of the day. The increased penetration and ownership of mobile devices such as smartphones and tablet computers among the youth has seen universities in developing countries taking notice and capitalising on this to enhance learning (Ruxwana & Msibi, 2018:1). Hence, mobile devices play a bigger role in facilitating mobile learning.

Mobile learning known as m-learning is one among other learning methods used in various universities as mentioned in Chapter 1 Section 1.3.2 and is generally considered as the next step after e-learning and distance learning (Abu-Al- Aish, 2014). Mobile learning refers to a process of obtaining educational content by using portable handheld devices through wireless connection (Barreh & Abas, 2015). Mobile learning is perceived as an independent part of electronic learning which brings study material right on the student's fingertips by using mobile technologies (Park, Nam and Cha, 2012). Mobile technology can be described as the use of all small handheld devices such as iPods, MP3 players, Personal Digital Assistants (PDAs), USBs, e- book Readers, smart phones, laptops, tablets and many others to access information (Kendrick, 2013).

Due to the fact that many students in higher education own a mobile device and use it for educational purposes on a daily basis, the implementation of mobile learning has become more useful and convenient in many colleges and universities (Mohseni, 2014). Many higher education institutions and planners have thought of introducing mobile devices in education in a systematic and more official way due to its commonality. Researchers such as Ally (2005) stated that mobile learning is not about the technology but it is about the learner who is mobile, therefore access to learning material and information to the learner at any time is very imperative. The learner is the one who is mobile and is at the centre of learning therefore mobile technology can pave way for learning to take place with no boundaries (Mohseni, 2014:145). With the unpredictable changes in technology and introduction of various mobile devices, it is possible that another powerful generation of smart mobile devices with more powerful virtual capabilities can be introduced in future compared to the ones at present. Therefore, higher education will need to prepare and equip itself for such new ventures

and innovations.

The implementation of mobile learning is supported by a project at Birmingham United which was initiated with the idea that students should have access to learning whenever and wherever they wanted (Educational App Store, 2014). In South Africa, the University of Pretoria was the first university to participate in a student survey about mobile learning in 2013. Among the students who were interviewed, 42% indicated that mobile learning was important and 51% indicated that mobile learning was very important to them (Kilfoil, 2015).

Mobile learning has a number of benefits which makes it more superior from other forms of learning Mohseni (2014:90). These benefits are as follows:

- Facilitates anytime anywhere learning.
- Permits students to carry around small handheld mobile devices and access information with no difficulty.
- Mobile learning provides for any time anywhere communication through the use of mobile devices.
- Supports independent learning as students are able to study at their own time and place of choice.
- Mobile learning ensures permanent connectivity as mobile devices are normally switched on every time. This can therefore enable students to receive real time notifications, emails, messages and stay connected with other students and lecturers.
- Allows for interaction between students and lecturers on social platforms and stay connected.
- Mobile learning facilitates sharing of information through shared networks or paired devices.
- Mobile learning leads to increased interactivity and enhanced collaboration as students are able to form groups and chat rooms to communicate.
- Mobile learning promotes active learning as students have course material in advance.

The above benefits of mobile learning, makes it a very useful and wonderful initiative for institutions to implement. However, like all other forms of learning, mobile learning is associated with some challenges.

Mobile learning challenges can either be technical or educational (Mohseni, 2014). The technical challenges associated with mobile learning involve the cost of implementing it as large amounts of funds are required. The majority of the technical challenges in mobile learning involve the issue of battery life of mobile devices. If the device runs out of battery in a location where there is no power source then learning is likely to be disrupted. Also some mobile devices such as tablet computers and cell phones have a small screen size which cannot be convenient for reading and browsing for a longer time.

Additionally, some mobile devices have a small virtual keyboard that makes typing difficult and mistakes in typing correctly can be experienced. Some mobile devices support some file formats and decline on other devices thereby failing to facilitate mobile learning in case of performing some activities that needs a particular file format. If it happens that a person loses the mobile device or it gets damaged, all the material and files saved on the device is lost. With the increased advancement in technology, most of the discussed challenges can be addressed and improved as current devices are now having longer battery life, have more precise keyboards, are bigger in size, lighter in weight, have better touch screens and have a high memory capacity. The next section will discuss educational challenges affecting mobile learning.

In terms of educational challenges facing mobile learning, the majority are related to curriculum development, planning and management of learning by an institution. Many universities and colleges still find it difficult to define and develop an appropriate theory for m-learning. Since m-learning takes place at any place at any time, sometimes students might find themselves in distracting environments which disturbs their concentration on the required task to perform and understanding of learning material thereby negatively affecting the quality of learning. Due to the fact that not all students can afford to buy a mobile device and do not have access to some m-learning tools and software, m-learning becomes a challenge, hence it can be proposed that higher education institutions take the initiative to offer mobile devices to their students as part of curriculum in order to solve problems associated with the digital divide. Additionally, with mobile learning, it is difficult and impossible to assess learning outside of the classroom as students will be mobile. Use of mobile devices for learning can cause distractions among students, lecturers and their peers if not well managed and used.

Due to the rapid changes in technology, changes in device model and functionality might be experienced leading to the need for redesigning of learning material and learning delivery methods in order to align with the new functionalities and platforms (Mohseni, 2014).

Mobile learning can cause disruptions to students' personal and academic lives and does not allow for realistic practice in a classroom setting and can be associated with high installation costs, repair and maintenance of facilities, hardware and software upgrades, resistance to change by students, lack of infrastructure and funds to support full access to the service. However, as students and institutions get used to mobile learning with time, most of the challenges can be resolved. Hence, students and institutions need to take mobile learning seriously and take advantage of the learning opportunities that it offers.

Several studies have been conducted to understand the implementation and adoption of mobile learning by students in higher education institutions. In a recent investigation by Brown (2019) about the use of mobile learning by faculty revealed that mobile learning techniques and tools were beneficial for use in teaching and learning, in the development of classroom instruction strategies, professional learning, provided no restrictions when acquiring knowledge and that mobile learning was useful for facilitating teacher to student communication.

A recent study by Al-Adwan, Al-Madadha and Zvirzdinaite (2018) with the purpose of exploring factors that impact on students' intentions and readiness to adopt m-learning in higher education revealed that students intentions to adopt m-learning was influenced by several factors. These factors included relative advantage, complexity, social influence self-management learning and perceived enjoyment. Hence m-learning programme developers were recommended to effectively guide the designing and implementation of m-learning systems.

Similarly, Crompton and Burke (2018) conducted a study about the use of mobile learning in higher education. The study identified that the largest demographic mobile device users fell between the age categories of 18-29 years which is a typical age of the majority of college students. The study revealed that the majority of the studies focussed on the impact of mobile learning on student achievement with language learning being the most researched subject matter. Therefore, higher education

institutions were encouraged to consider the opportunity to expand their learning possibilities beyond the classroom by taking advantage of mobile learning.

Grenier (2018) conducted a study with the purpose of examining the relationship between mobile learning using mobile technology and academic achievement in terms of final grades in an online environment. In spite of the fact that m-learning indicated the freedom and flexibility of the learner establishing a new paradigm in education in the literature conducted, the overall results of the study did not show a significant relationship between m-learning and academic achievement. Instead, the results indicated that a larger study need to be conducted which can include location and quality of institutional support for mobility as it would lead to a better understanding of the impact of m-learning on academic achievement in an online environment.

In a study by Alasmari (2017) to investigate the acceptance of mobile learning among Saudi education students revealed that effort expectancy, learning expectancy, social influence and mobile learning characteristics were significant predictors of students' intentions to use mobile learning technology regardless of age, gender and e-Learning experience.

Another study by Alajlan (2017) whose objective was to explore mobile learning experiences of 7865 female students at King Saud University and the opportunities provided by mobile technology to enhance and foster learning experiences of 52 higher education students through interviews. In analysing themes such as mobile learners' ubiquitous use, mobile learners' movement and mobile learners' strategies for achieving learning goals emerged. It was concluded from the study that, mobile learning framework is about active learners showing their agency through appropriate use of tools and resources, crossing boundaries of contexts, personalising their learning using mobile technology as a cultural resource and boundary-crossing tool to accomplish learning tasks, purposes and goals particularly in a country with gender segregated education system and very strong cultural demands on women which allows them to negotiate their way through the various constraints, restrictions and boundaries that prevent them to learn as they have to maintain their cultural values, principles and traditions.

Tabor (2016) examined students' adoption and use of mobile learning materials and study aids that enhanced engagement and success. The study revealed a number of findings. Firstly, students indicated that the m-learning process encouraged

engagement and added value to the course. Secondly, the active users of mobile learning reported better exam performance when using mobile study tools supporting the notion of activity theory by Vygotsky (1978) and user control leading to a positive change. Thirdly, students who were more willingly to exclusively use the provided tools for exam preparation could see the ultimate advantage of the medium. Fourthly, some students were supportive in trying new methods and indicated to use m-learning tools when available, however, others were less interested in using what they considered personal entertainment devices for learning purposes. Lastly, the students who were not technologically savvy known as the “digital natives” or the “millennial generation” expressed a lack of interest or skill set to adopt some technologies. This finding served as an important aspect of successful adoption as some students will require more training and encouragement to adopt mobile learning methods. This perspective was also supported by Parajuli (2016) in his study who recommended that undergraduate students needed to be given guidance by the institution or faculty on mobile learning as the successful use of mobile technology in learning highly depends on appropriate pedagogy and lecturer support.

Another study conducted by Alhassan (2016) with the purpose of exploring the attitudes and level of students’ readiness and possible barriers to implementing mobile learning as part of a ubiquitous learning, to what extent college students are interested in mobile learning, the readiness of college students to use mobile learning technologies and the level of students experience using electronic learning found that college students had a positive attitude towards mobile learning and they have the necessary technical knowledge to make use of mobile learning. Mobile learning was found to provide the possibility of learning outside the classroom and access to learning material at any time. However, mobile learning was found to annoy students as they received too much text messages in a day.

Barreh & Abas (2015) conducted an investigation about a framework of mobile learning to enhance learning in higher education of second year university students in Djibouti. The study results revealed that mobile learning motivated learner engagement when learning and offered them the opportunity to learn anytime anywhere. It was further found that mobile learning helped learners to stay focussed on their studies, facilitated student learning and also assisted the students to better manage their studies.

Guo & Benson (2017) explored Chinese international students' acceptance of mobile learning by applying the Unified Theory of Technology Acceptance (UTAUT) model. From the descriptive data collected, it was found that the majority of participants owned mobile devices such as smartphones, tablets, iPads, MP3 and MP4 players which they frequently used for various learning activities. In addition, the results of the study revealed that there was no significant difference of the students' behavioural intention to use mobile learning based on gender, age, level of experience and voluntariness of use. Effort expectancy and facilitating conditions were significant predictors of participants' behavioural intention to use mobile learning. It was also found that facilitating conditions and behavioural intention were not significant predictors of participants' behaviour of mobile learning. However, there was slight interaction between facilitation conditions and behavioural intention. The research was found to be of importance as it provided the university administrators and educators information on factors influencing students' acceptance and actual usage of mobile learning.

In a similar research conducted by Abu-Al-Aish & Love (2013) to explore the factors that influence the acceptance of m-learning in higher education and to investigate if prior experience of mobile devices affected the acceptance of m-learning based on the (UTAUT) Unified Theory of Acceptance and Use of Technology. The study results revealed several factors such as performance expectancy, effort expectancy, influence of lecturers, quality of service and personal innovativeness affected the behavioural intention of students to use m-learning. These results also extended the UTAUT in the context of m-learning acceptance by adding the quality of service and personal innovativeness to the structure of UTAUT thereby providing educators and practitioners with useful guidelines in designing a successful m-learning system.

In a study by Rossing et al., (2012), the use of mobile learning presented students and professionals with a unique opportunity to access information instantaneously regardless of location. This implies that, mobile learning facilitates learning to take place anywhere and at any time through the use of portable electronic devices such as smartphones and tablet computers. As mobile learning facilitates the use of mobile technologies mentioned earlier in this section, addressing the use of mobile technologies is highly imperative.

A study conducted by Naicker (2013) to assess the technology and operational

readiness of students at Durban University of Technology revealed a number of findings. A survey questionnaire and focus group interviews were conducted as data collection methods. The results of the study were presented using descriptive and inferential statistics and analysed using the lens of activity theory. In terms of technology readiness, despite students owning their mobile devices and reasonable compliance with application requirements among students, data cost remained a problem. Despite a positive attitude among students, in assessing operational readiness, the majority of students required awareness, on-going support and training. The study recommended that higher education institutions need to work around exorbitant connectivity costs to form meaningful m-learning approaches at a lower cost. Another finding revealed the lack of m-learning awareness, key stakeholders were recommended to encourage and support dialogue. It was suggested to conduct more mobile readiness surveys in this study.

As the use of modern and wireless technologies is growing rapidly, mobile technology is finding significant importance in education. Many higher education institutions are practicing mobile learning as a method to deliver course content. According to Abu-Al-Aish (2014), mobile learning provides mobile access to learning material and resources and facilitates collaborative learning and feedback exchange between instructors and students. Before implementing mobile learning a series of stages need to be taken into consideration. Researchers such as Ozata & Keskin (2014) identified three main phases that need to be considered when developing m-learning. These phases include a focus on the device, a focus on learning out of the classroom and a focus on the mobility of the learner.

Globally, access to mobile technologies for teaching and learning has been recognised as of beneficial for the young to enter the digital realm (UNICEF, 2012). This possibility was acknowledged by the department of higher education (DHET) in South Africa which actively encouraged universities to expand by offering online courses (DHET, 2013). However, given the persistent socio-economic factors and the digital-divide gap in South Africa, higher education needs to continue improving access to ICT particularly in the rural universities (UNICEF, 2012).

Several reports across the globe, such as one from EDUCAUSE revealed a remarkable increase in college-age students in developed countries using mobile technology such as smart phones from 1.2% in 2005 to 62.7% in 2010 (Smith and

Caruso, 2010). The Pew Internet and American Life Project reports similar trends particularly among students from 18 to 29 years Smith (2010) with further projections suggesting that mobile device use worldwide will grow from 6 318 in 2017 to over 6 918 by year 2020 (The Radicati Group, Inc, 2016).

In the past decade, a number of colleges and universities in South Africa have recognised the role of mobile technologies as devices that can facilitate teaching and learning (Bozalek et al., 2013; Czerniewicz & Brown, 2009). Though the integration of mobile learning is not new in higher education institutions, access to technology in a resource constrained economy cannot be anticipated (Kilfoil, 2015).

Today's "digital natives" are no longer confined to their desktops as the mobile revolution spreads across higher education (DeGraff, 2014). Evidence is shown by educational institutions in United States such as Seton Hill College and Illinois Institute of Technology which provided its first year undergraduate students with iPads for academic purposes in order to guarantee a truly modern college experience (Devine, 2013). In South Africa, Richfield Graduate Institute of Technology (RGIT) is one among other higher education institutions to introduce the Tablet PC for educational purposes to its students in 2011 (Mcilhone, 2012). This was followed by other public institutions such as University of Cape Town in 2013 and University of Johannesburg (UJ) in 2014 (Brown & Pallitt, 2015).

As from the 20th century, researchers began to investigate language learning using various mobile devices such as mobile phones, pocket PCs and Apple iPhones to see their relevance in education (Jong, Specht and Koper, 2010; Wong & Looi, 2010; Johnson, Li., Phan, Singer and Trinh, 2012). These researchers were more focussed on design features that capitalised on Wi-Fi access, internet browsers and text input and they found that embracing the mobility and connectivity of such devices led to innovation in language learning for students across different learning environments.

The availability and effectiveness of mobile devices among students in colleges and universities has transformed the educational landscape as it has brought a multitude of benefits (Adams, 2012). With the use of mobile devices, learner's access to information beyond the classroom walls has increased the possibilities of where and when to learn (Traxler, 2010). This has created opportunities where none existed as these mobile devices provide support and collaboration experiences that have not been possible previously. Merchant (2012) noted the key role of mobile technologies

as improving the social interactions of students because these mobile technologies act as a communication hub for contacts and sending messages. A study by Stockwell (2010) about the use of mobile phones for vocabulary activities examined 175 English students who had an option to complete vocabulary activities using either a mobile phone or a desktop to identify the effect of the mobile platform. The study found out that students increasingly used mobile phones to improve knowledge of vocabulary, grammar listening and speaking in both formal and informal settings.

Using mobile devices for educational purposes has become a common expectation for students. A study by Valk, Rashid and Elder (2010) demonstrated how mobile phones facilitated learning in rural and remote regions of developing countries. Mobile technologies such as tablets and smartphones have become popular worldwide and South Africa in particular with a broad range of students across various levels of education, however, their small screen size was noted to cause rational disadvantages such as diverting student's attention and visual problem (Kim & Kim, 2012).

2.5.1 Criticisms of mobile learning

Mobile learning has been criticised by a number of researchers such as Freyson (2005) who was of the belief that mobile learning using mobile devices in higher education in particular is mainly meant for administration rather than for educational purposes. This is because, much of the learning using mobile devices in educational institutions is usually done in a less structured format. Additionally, mobile devices are often used for just-in-time learning and not beyond that which is normally a result of poor or lack of m-learning strategic planning by institutions. An argument by Rajasingham (2011) confirmed that previous research on higher education and the new paradigms of teaching and learning in the past two decades suggests that universities which opted for mobile learning failed to fulfil all their expectations completely. This failure was noted as a result of poor implementation of mobile learning. For a successful implementation of mobile learning and better learning outcomes and to maximise the benefits of mobile learning, it can be suggested that higher education institutions need to pay attention to the right information, the right person, at the right time, in the right place, in the right way and on the right device.

2.5.2 Mobile learning devices

There are various mobile devices that can be used by students to support mobile learning namely; mobile phones, smart phones, laptops and tablet computers. These devices are described below.

- ***Mobile Phones***

Mobile phones have become very common in developing countries, South Africa in particular. This has led to an increased ownership in mobile phones in the past decade especially among the young generation. However, their use for educational purposes is low globally. In education, mobile phones can be used for various purposes such as text messaging, recording class sessions, taking pictures of notes and drawings on the white board among others.

- ***Smartphones***

Smartphones can serve the same purpose as mobile phones they have a touchscreen and can provide some additional features and possibilities. Students can use smartphones to connect to Wi-Fi, the internet, access course material, watch educational videos and connect to the student learning portal. In addition, most smartphones have a data plan which can facilitate internet connection easily at anytime and anywhere when there is no Wi-Fi connectivity (Mohseni, 2014:61). Students in colleges and universities can use smartphones to download educational apps that can speed up performance and enhance learning. Students can also access their e-mails, upload and share learning material, interact with peers and lecturers beyond class time and boundaries. With a smartphone, students are able to engage, collaborate and interact with course material at any time and place.

- ***Laptops***

Laptop computers also known as notebooks are portable computers that can be used in different environments with the same capabilities as desktop computers. A laptop includes a screen size equivalent to a desktop, keyboard and a track pad which serves as a mouse. Most of laptops have several USB and I/O ports that allow standard keyboards and mouse to be used with the laptop. Modern laptops allow users to virtually connect to the internet without any wires.

- **Tablet Computers**

Tablet computers also known as Tablet PCs are a combination of a smartphone and laptop. Most of what can be done by a tablet can also be done on a desktop computer or laptop, though the tablet has an advantage of mobility compared to desktop computer. Like smartphones, tablets can connect to the Wi-Fi, has a data network and are a great tool for interaction, just in time learning and collaboration (Mohseni, 2014:62- 63).

With the rise in mobile device use and ownership among the millennial generation, the majority of educational content has begun to be published digitally (Auer, 2016). The success and attractiveness of mobile devices in education has not been widely acknowledged, additional research is needed to design appropriate guidelines for new curricula and pedagogy that support and evaluate the use of mobile technology in higher education institutions. Hence, one cannot just use digital media but specific digital literacies are required to familiarise with the systems and processes of the devices. The following section will discuss the Tablet PC as a mobile learning device used for educational purposes in higher education. The history, different types, applications and criticism of Tablet PC will be discussed.

2.6 The Tablet Personal Computer (PC)

The Tablet PC has become popular among individuals of all ages and is used for a variety of purposes. Several people use the tablet computer for business, academic and entertainment purposes for example watching videos, browsing, playing games and connecting to social media among other uses. In many colleges and universities tablet computers are being used for educational purposes in particular. Russell (2013) in his study mentioned that “Tablet computers are no longer just a nice-to-have accessory but instead they are becoming a must-have”. Hence, the popularity of tablets for educational purposes is now increasing due to a number of features they possess. These features include many apps that facilitate teaching and learning, a good screen designed for perfect reading and many educational games. These features makes the tablet a great device that can be used by many students for academic purposes such as accessing the student portal or learning management system, emailing, playing games, podcasting, surfing, video streaming, take quizzes, conduct presentations, typing notes, social media among others

(Mohseni, 2014:70-72).

Picture 2. 1 : Tablet Personal Computer (PC)



Source: Adapted from (RGIT Prospectus, 2019: 22)

Picture 2.1 above shows a typical Tablet PC issued by the institution under study to its students. The history of the Tablet PC comes from a long way back when it was developed by Alan Kay in 1972, who named it the “Dynabook” and was mainly used by children of all ages (O’Neill, 2012). The Dynabook was further developed and remodelled in the early 1990s due to the fact that it was not user friendly, bulky, had a short battery life and an incompatible user interface (Fischman & Keller, 2011). The term Tablet PC came into existence in 2001 when Microsoft engineered a device known as the Microsoft Tablet PC which was mainly meant for business company employees. Its main features were a flat touch touchscreen, virtual keyboard, and a small in size that allowed it to be easily carried around (Siemieniecki & Majeskwa,

2015).

In 2009, a new generation of tablet device was introduced with the release of Apple iPad which had an effective operating system, larger in size and easily manageable touchscreen and a long battery life (Hamon, 2012). Since then, due to the interactive and engaging nature of the Tablet PC, it has been adopted by many colleges and universities and has become one of the common mobile devices to be used for educational purposes (Clark & Luckin, 2013). The Tablet PC can be defined as "... a thin, flat and light weight mobile computer that is portable with a long battery life, a touch screen and circuitry that is contained in a single panel" (Vermaat, Sebok, Freund, Campbell and Frydenberg, 2015:3).

There are various operating systems of tablet computers, with the common ones being Android, iOS, Microsoft windows, Linux, Blackberry Tablet OS, and Firefox OS (Fischman & Keller, 2011). The most distinguishable feature of the Tablet PC is the touchscreen which allows for direct movement of fingers on the screen though some tablets allow the use of a stylus pen (Fischman & Keller, 2011). Among other hand held and mobile devices, the Tablet PC has been described by researchers as a "game changer" as it offers similar features to those of smartphones and laptops (Eccelsfield & Garnett, 2010).

The Tablet PC has the ability to wirelessly connect to the internet through local area network (WLAN) known as Wi-Fi hotspots using 3G or 4G telecommunication networks. Other common features of the Tablet PC includes a Bluetooth which allows for easy sharing and exchange of information between paired devices, front and back cameras, USB port(s), microphone, built-in speakers and a multimedia function that allows a student to record and watch videos, view images and listen to audio recordings (Thompson, 2015; Muir, 2011). The Tablet PC is very compatible with various methods of instruction such as mobile learning, e-learning, online learning and distance learning as mentioned in Chapter 1.3.2. This compatibility furnishes the users of Tablet PC with an opportunity to study and discover information anywhere and anytime (Algoufi, 2016). Tablet computers are commonly produced and sold by several manufacturers namely; Apple (iPad), Microsoft (Tablet PC), Samsung (Galaxy Tab) and Amazon (Kindle Fire) (Mohseni, 2014:66). In order to justify the suitability of tablet computers as mobile learning devices for educational purpose, a comparison between laptops and smartphones is essential.

2.6.1 Comparison between Tablet PCs and laptops

Tablets PCs and laptops are both computers and they both run and support similar applications and software but they are different in the advantages that each offers. According to Mohseni (2014: 78) tablet computers have the following advantages:

Portability and mobility: Tablets are portable and mobile devices compared to laptops due their smaller sizes and light weight making them very convenient to move around with and to be popular in education especially in facilitating mobile learning.

Battery life: Tablets have a longer battery life compared to laptops averaging from 8 – 10 hours as opposed to laptops whose battery can run for 4 hours at most. This facility makes tablets to be more convenient and easy to use in remote situations where there is lack of power to charge. This can be beneficial to students as they are outside of the classroom or their homes.

Touchscreen and interactivity: The touch screen is the most distinguishable feature that makes learning with them much more interactive and engaging. The touch screen helps the users to excitingly engage with the learning material. Although there are laptops with touch screens, it is not as comfortable and interesting to interact due to the manner in which the screen is positioned. Also due to the tablet' touch screen, the distance between the user and the screen which exist in laptop computer is eliminated. Compared to laptops, tablet computers are handheld devices that can facilitate direct interaction with content using the finger tips.

Applications: Tablet computers have countless number of amazing applications that one can use for learning purposes. The majority of the applications have a variety of interactive features which add to the pleasure of learning for example there are many educational games applications designed for tablets and are available for free download at no extra cost.

Camera: Most tablet computers have a camera which can be used for recording class lectures, create presentations or taking pictures on the white board. The fact that tablets are handheld devices, it is easy to use their camera for such purposes compared to laptops.

Better reading: Since tablet computers are more mobile and are hand held, they are

more appropriate for reading as one can just easily move them around and hold them in different directions or read any content while standing and at any position. Also the front screen of most tablet computers are designed using electronic paper and ink that gives a better reading experience similar to that of ordinary paper in terms of light reflection making reading easier in different angles of natural or artificial light.

2.6.2 Comparison between Tablet PCs, laptops and smartphones

Several researchers believe that tablet computers are an extension of smartphones as they share a number of common factors (Fender & Wolfley, 2014). The similarity between tablet computers and smartphones lie in the fact that tablet computers and smartphones are all mobile and portable, have a touchscreen, are interactive and connect to Wi-Fi. Tablet computers and smartphones support several applications and can be used to access the internet, emails, online course material, social media sites, create videos and audio conferencing. Due to the larger screens as opposed to smartphones, tablets are much more useful in education than smartphones (Fender & Wolfley, 2014). Tablets are advantageous to use over smartphones due to their large screens which allows for better reading and surfing. It is also much more convenient to use a tablet computer for educational apps, writing emails and taking quizzes compared to a smartphone. Also tablets have a larger virtual keyboard which makes typing more easier compared to smartphones.

A comparison between laptops and tablet computers reveal key differences between them. Laptop interface mimic a typical desktop set up with a complete keyboard and mouse whereas tablet computes have a special touch screen display that can be operated with a stylus pen or fingertips. Both tablet computers and laptops are portable except that tablet computers are light weight than laptops. In terms of battery life, laptops have a lower battery lifespan compared to tablet computers however, some tablet computers can be upgraded with smart batteries that can improve charge duration. In terms of functionality, tablet computers allows for an increased functionality with certain digital imaging programs such as Adobe Photoshop.

From the above discussion, it can therefore be concluded that tablet computers are

the most useful and convenient mobile technological devices that can be used for educational purposes compared to laptops and smartphones. This has led to many higher education institutions in South Africa and across the globe to implement mobile learning by introducing the Tablet PC as a device to facilitate learning and access to information anywhere at any time. With the explosion of digital technologies Richfield Graduate Institute of Technology (RGIT) previously known as PC Training and Business College (PCTBC) and a portfolio company of Investec Asset Management became one of the top private higher education institutions in South Africa to take the initiative of introducing the Tablet Personal Computer (PC) to its students in 2012 (RGIT Prospectus, 2019:6-8). RGIT in partnership with Vodacom cell-phone company which offers 10inch Vodafone Tablets to all first year undergraduate students who registers to study with the institution. RGIT has evolved and became a leading institution of higher learning that has been operating successfully for the past 29 years with 34 higher education campuses in South Africa (The Star Newspaper, 2019).

RGIT provides a 10 inch Vodafone Tablet PC to all BEMS undergraduate student who registers for a new qualification with the institution to use for the entire study period. The Tablet PC comes in a sealed box and is accompanied by a headset, cover case, charger and Vodacom sim card that needs to be registered and activated using the student's personal details. Study material such as study guides and assignments are uploaded in the Tablet once handed over to the student. However, students are also able to download the study guides, assignments, previous question papers and power-point presentations from the student portal "Moodle". The Tablet PC's compact, convertible design allows students to comfortably use it in small spaces even to hold it in the palm of their hands while standing up (Staff writer, 2012).

Unlike other forms of tablet computers, the Vodafone Tablet PC uses a common operating system known as Android, has a built in wireless internet support and a long battery life that runs from 6 to 8 hours depending on student usage. With the Tablet PC, students have access to real time interactive learning experience with their lecturers and fellow students, free learning programmes, e-skills, e-libraries regardless of location and a wider range of research material is available from various research sites. Furthermore, the Tablet PC allows students to quickly jot down notes from mathematical formulae to flow charts, re-organise their notes, save

and search them later for future use. The availability of free unlimited Wi-Fi at the campus allows students to get free internet connectivity all the time. Charging bays for students are also available on the campus should there be a need to recharge the Tablet PC.

2.6.3 Criticisms regarding tablet computers in education

Though tablet computers are a great technological tool in teaching and learning, there are some criticisms associated with them. Researchers such as Nguyen et al., (2014) have argued that although tablet computers facilitate teaching and learning and increase student engagement, they do not positively impact on the outcomes of students and their effects are not known. Tablet computers have also been argued that they can distract learning due to the fact that some students use them for personal interests who are not educationally related. However, this can be controversial as many academics have a belief that students can use the tablets only to browse or check social media rather than paying attention to class activities and lectures (Nguyen et al., 2014). The current research aims to explore some of these criticisms which make it difficult to make claims or support them.

Tablet PCs have become common as they are relatively being introduced by many colleges and universities across the globe including South Africa in particular. Many researchers have suggested the use of Tablet PCs as a learning supportive tool in the classroom. Previous researchers have focussed on the usability and impact of tablet computers (Deng., Li., Wang and Song, 2014; Amelink., Scales and Tront, 2012; Dundar & Akcayir, 2012; Chen & Sager, 2011; Yoon & Sneddon, 2011; Galligan, Loch, McDonald and Taylor, 2010; Loch & Donovan, 2006). To date there have been few to no empirical studies focussing on the perceptions of students regarding the Tablet PC as a mobile learning device at graduate institutes in Tshwane. This forms the research gap that this study attempt to fulfil.

2.6 Literature review regarding the use of Tablet PC in higher education institutions

Tablet PCs are one of the newest developments and innovations in the world of computing and technology. The face of higher education institutions is gradually

changing as students commonly use the Tablet PC for learning purposes. Various researches have been conducted about the Tablet PC use in universities and colleges. Most of the Tablet PC research projects in higher education environments are driven by the incredible popularity of the Tablet PC though its integration in post-secondary setting is not guaranteed to be a success (Percival & Claydon, 2015). In a study conducted by Semerci (2018) with the aim of exploring student views on the use of Tablet PCs in education revealed that all the participating students had a positive attitude towards the use of tablet computers for educational purposes. However, it was found that the tablet computers affected student-to-teacher and student-to-student interaction. Students also argued that the uploaded educational content on the learning portal was inadequate and inappropriate to their level of education.

Similarly, Duran & Aytac (2016) conducted a study through the FAITH project with the purpose of determining students' views on the use of tablet computers in teaching and learning processes indicated that students mostly used the tablet computer to access the internet and the content presented on the tablet computer were aligned to the topics in the textbooks. The results of the study indicated that students agreed to the fact that the tablet computer weakened communication between themselves and their lecturers. Also, some students noted that learning by attending classes only without the tablet computer reduced their success and level of understanding of the covered topics. The study also found that most of the students suffered from headaches and eyestrain due to high radiation waves as they studied with the tablet computer.

According to Chikurunhe (2017) in a research study to investigate the use of digital mobile devices such as tablet personal computers and smartphones for enhancing teaching and learning at among 370 students at the University of Venda. The study specifically aimed to investigate the student current use of mobile devices, how they could be effectively used for teaching and learning and the perceptions of students and lecturers about mobile devices as tools for teaching and learning. Based on demographic factors, of the 300 surveyed students, 51 % were female while 49% were male respondents, 84% of the total respondents fell between the age range of 15- 25 years followed by 16% ranging from 26 – 35 years. A high response rate came from 3rd year students with 47%, followed by 2nd year students with 30.7% and 4th year level of study with 16.3%.

The results of the study indicated that the majority of the respondents were active

and spent more of their time on the internet surfing information. Respondents reported to use their tablet pcs and smartphones to download learning material, download apps, type notes, send e-mails and access social sites. However, some students reported that their tablet computers were no longer working which was a limitation to mobile learning, some were not able to download study material, connect to Wi-Fi due to low limited bandwidth. Findings also revealed that many students and lecturers were not using the Learning Management System and the Blackboard due to lack of knowledge and training.

In another research by Phillips (2017) which examined college students' mobile device usage on the basis of demographic factors namely; gender, age, ethnicity, class standing, mode of delivery and socio-economic status and the factors that affect students' likelihood to use mobile devices for academic purposes. The results of the study revealed that of the total number of 10 000 undergraduate respondents, 56% were female and 44% were male, 70% fell between the age range of 18-24. These results indicated that traditional aged students reportedly used smartphones more frequently compared to non-traditional aged students who reportedly used tablets more. Students reported to most frequently use their devices in class to connect to learning material. However, lack of institutional technology infrastructure and support were the strong factors that impact on students' use of tablets. The results of the study therefore recommend that higher education faculty and administrators devise comprehensive training and technology plans that support and encourage students to use mobile devices for educational purposes.

Shambare and Shambare (2016) conducted a study in South Africa to analyse the adoption of tablets by students at a local higher education college in South Africa. The study found that the level of knowledge among students about tablets was not as high as expected. The study revealed that 69% of the 344 students surveyed had no previous experience of using the devices and were only exposed to the device at the time of registration when given the tablets in the beginning of their studies. In terms of gender 41% male students participated in the study and 59% female students participated in the study. In terms of educational level distribution 1st years were 52%, 2nd years 39% and 3rd years 9%. Students reported to mainly use the tablet for typing homework, browsing the internet and researching. During the study, many students found it difficult to navigate through the portable electronic devices and made only

artificial use of the wide collection of functionalities that were familiar to them. This finding indicates a clear need for higher education institutions to offer basic training on tablet pc use right from the beginning of students' academic study and not to assume that students have enough knowledge (Trollip, 2016).

Mang & Wardley (2016) conducted research study to determine students' views about the introduction of tablet computer technologies in university classrooms. The majority of students reported on the positive aspects of the tablet provided greater practicality, better communication, provided a way to overcome limited in-class interactions and promoted the broadening of course content through student' independent research. However, the tablet was reported to have conflicting views as students were tempted to use it on off-topic issues.

In a similar research conducted by Percival & Claydon (2015) focussing on user perceptions and usability of tablets in the classroom by both Canadian university students and faculty was determined and examined. In terms of demography, 68% male and 32% females participated in the survey. The study results showed that respondents reported the smaller size of the tablet, long battery life, note taking facilitation, lightweight, mobility and convenience as advantages offered by the tablet. The majority of respondents reported to mostly use the tablet for general web-browsing, social media, listening to music, watching videos, completing coursework, access the Learning Management System (LMS). A small number of respondents reported to use the tablet pc to access e-books, note taking, completing assignments, checking the blackboard for class announcements, messaging lecturers and managing e-mails. Top disadvantages reported by respondents were distractions, keyboard deficiency, small screen size, software incompatibility, small icons which made navigation difficult and absence of a physical keyboard. Overall, the participants found the general capabilities and portability of tablets impressive especially for note taking and class room engagement. However, responses demonstrate the need for a significant training and support to help students understand how to leverage tablets as educational tools.

Siemieniecki & Majeskwa (2015) conducted a study regarding the use of tablet computers by 396 humanities students. The observations showed that students used the tablets to search the web and share one's experience, download educational materials published by faculty, take traditional notes, prepare notes containing

hyperlinks, read books, prepare written assignments, prepare multi-media presentations, run blogs, solve online tests, communicate with other network users such as sending e-mails, record sound during lectures, take photos, participate in on-line courses, use mobile applications for learning foreign languages in particular. The students owning a tablet reported to frequently using the tablet while studying at home, at university, when travelling as well as during their free time spent outside home. The study also revealed that there was no statistical relationship between gender and frequency and form of using tablets in the learning process. Both male and female students used the tablet to search, view, analyse, play back and assimilate the materials available for them. Less often the tablet was used to create long essays or complex presentations.

Findings from the study further revealed that the majority of respondents were increasingly motivated and active to learn when using the tablet, hence they were able to solve tasks and promote motivation. Among the limitations of tablets, students reported lack of possibility of doing effective multi-tasking work, limited nature of mobile computing applications counterparts, difficulties with the touch interface when writing long-text assignments and problems with the technical shortcomings related to tablet operation. These cited limitations identified by students using the tablets showed the imperfections of the tool and are an important indicator of where and how best to use them for learning purposes.

The Tablet PC was reported to offer advantages such as mobility, small weight and size, ease of use and a large number of free applications. Unlimited access to the internet allowed the retrieval of information and contact with other on the web at any time was of more importance to the respondents. This led to the enhancement in participation in the classroom. Moreover, the tablets was found to offer pedagogical opportunities to the majority of students such as increase in the ability to independently work, ability to solve tasks on their own, communication and collaboration among students increased.

Research conducted by Chen (2013) investigated the use of tablet computers by university students to learn English in informal settings outside of classroom and how to foster more effective use of the tablet for independent language learning. The study demonstrated that tablet computers were ideal tools for creating an interactive,

collaborative and ubiquitous environment for language learning provided that the technological affordances of the device had been fully explored with the students. The investigation also revealed that students had a generally favourable attitude towards the usability, effectiveness and satisfaction of tablet computers for Mobile Assisted Language Learning (MALL).

Stewart (2013) in his study found that students used the tablet to access the blackboard, communication through e-mail interact with others, do assignments, team projects and study for exams. The students indicated portability, convenience, ease of use, good software applications, flexibility, simplicity, transferring documents synchronisation, hardware features such as long battery life and size of tablet and faster internet connectivity as advantages of using the tablet. Challenges were that e-books were difficult to read when using tablets, lack of physical keyboard, no USB ports, storage space, tablet computers were a distraction if using them for non-school related activities. The study found that there were a number of key indicators that needed to be improved before a Tablet PC program could become successful. These included: increased Professional Development for teachers around the use of the Tablet PC in the classroom; increased time allocation for teachers to investigate and create learning activities; improvements in the school's infrastructure and quality of the students' Tablet PCs. The study also recommended that once the key indicators have been met, another study into the use of the Tablet PC in a school setting should be conducted. This should be able to give a far greater indication of the role the Tablet PC has in education.

Research by Pamuk, Cakir, Ergun, Yilmaz and Ayas (2013) focussing on teachers' and students' perceptions towards the use of tablet devices showed that learning appeared to be more attractive and interesting when using the Tablet PC. A total of 88% student response indicated that they used the Tablet PC to access e-books. During the classroom observations, it was observed that some students did not use the Tablet PC appropriately in line with the class lessons. The Tablet PC was perceived as a tool that distracted some students during class lecture, hence some lecturers did not allow students to use the Tablets during their lesson time.

Lewis (2013) conducted research among college students at the University of Phoenix and the results of the study revealed that tablet computers were portable, easier to use and convenient compared to laptops.

Research conducted Alyahya & Gall (2012), from the University of Northern Colorado measured 12 student's perceptions of using the Tablet PC. The study relied on student's feedback of the benefits they had experienced as well as observations in lectures. Students described the main benefits of tablets as having everything in one device which made it easier for students to organise their learning, had access to educational material and note taking software and were able to communicate on the go thereby staying connected all the way.

According to Rossing et al., (2012) who conducted a study among 209 Indiana university students in America to explore perceptions of Tablet use by students. The study highlighted individual differences in terms of gender and age between students in using the device. Response by gender revealed that 51.2% male, 43.5% females responded to the study while 5.3% did not identify themselves. In terms of age range, age range of 18-28 had a total of 82.8% responses, 29-44 that is 12.4% responses and 4.8% did not identify their age ranges. The advantages in using the tablet, students mainly reported of the tablet being able to support collaborative learning environment where students were able to discuss concepts, debate questions and build knowledge together. The tablet promoted greater interaction and sharing of knowledge during in class discussions and activities, more involvement in class and group discussions, connect concepts and ideas quickly and efficiently with peers, active participation from groups, fun exciting and easy to use, allows one to study at own pace, convenient such as speed, portability, intuitive functions and navigation, comfortable design and small size and ease of use. While some found the device to be helpful others found it to be a distraction and difficult to take notes on.

Limitations of using the tablet computer included trouble with the touchscreen sensitivity and accuracy and absence of a physical keyboard, distraction, lack of training, connectivity problems, undeveloped information literacy and rapidly outdated technology. The study emphasised the important role of the class instructor in carefully orchestrating and managing in-class activities. However, the researchers argued that educators and instructors need to provide direction and carefully integrate reliable digital resources as students look forward to them as experts therefore, they must be prepared to answer any questions students might have so that they can be confident and rest assured that the adoption of a tablet is a worthwhile venture. However, the students were very positive concerning the use of tablets in higher education as they reported to have immediate access to information and an improved learning

experience.

In another study by Van Oostveen, Muirhead and Goodman (2011) which was meant to examine the experience of 31 university students who were issued Tablet PCs to use during an academic year. The findings from the study revealed little evidence to support that effective learning took place in spite of the students being familiar and comfortable with the Tablet PC.

According to Nortcliffe & Middleton (2013) results from surveyed university students supported the idea that tablet computers fostered autonomous, pervasiveness and student engagement. The tablet computers were used to capture learning conversations from formal and informal situations in order to personalise and enhance student learning. In a similar study by Loch, Galligan, Hobohm and McDonald (2011), volunteered students' utilised tablet computers in a college Mathematics course. Their results cautioned that although the tablets promoted learner-centred pedagogy, the reduced cost of tablets would not be worth the limited computing power that they provided.

In a report presented by Clark & Luckin (2013: 2), the Tablet PC was found to support seamless learning by allowing students to take control of their own learning, motivate and engage students through the finger driven interface, allow group interaction that is not facilitated by other devices such as laptops and desktops and the ability of the Tablet PC to effectively in combination with other technologies such as cloud storage and efficient network connectivity. The Tablet PC environment was found to facilitate a change in the major activities of students from passive recorders to active participants as well as promoting interactive problem solving and peer critiquing during lectures (Brown-Martin, 2010). Tablet based mathematics instruction also provides a powerful means to change student behaviour during classroom learning. When students participate in class in which their work may be presented either anonymously or self-identified, the prompted pressure of presenting their work to the class can motivate students who might otherwise not invest themselves in the classroom experience (Cochrane & Rhodes, 2011).

Mang & Wardley (2012) identified the main advantages of using tablet technology as use software applications to enhance creativity and critical thinking, using digital texts and readings which lead to substantial cost savings for students and encouraging

greater interaction among students and faculty. However, some studies had conflicting themes that tablets in general does not support learning and educational goals or conversely considered as time wasting, causes distractions during classes, have connectivity problems and are an entertainment tool which does not play any role in learning (Churchil, Fox and King, 2012).

A study by Franklin (2011) recommended that for an institution to successfully adopt tablets it has to ensure that the device is integrated into both the academic and the social aspects of student life. This recommendation was also supported by a study conducted by Wardley & Mang (2016) who stressed that most students cannot adopt a tablet device voluntarily but however they would have seen a need for a sustained interaction with the device. Therefore, these researchers further suggested the following options to educational institutions that need to introduce tablet computers in their universities and colleges:

- Know everything about the tablet operating system prior to distributing tablets to students
- Decide early on how you would like to use the tablet in your classes
- Ensure that you work closely with your institution's Information Technology department.
- Make the tablet an integral component of the classes
- Describe the tablet features and benefits on the first day of class use
- Carefully consider how to distribute the tablets to students

However, in spite of the popularity of the Tablet PC among students and institutions, research studies concerning their use in higher education environment is still lacking. This calls for more research to be conducted in order to understand student's perceptions concerning the use of tablet devices in higher education settings (El-Gayar, Moran and Hawkes, 2011).

In terms of pedagogical opportunities offered by the Tablet PC, few studies were identified. In a recent study that was conducted by Bai (2019) which was meant to explore the pedagogical practices of mobile learning in H-12 and higher education settings, the main pedagogical practices of mobile learning were categorised into nine types namely, situated learning, communication and collaboration learning, game-based learning, inquiry-based learning, informal learning, personalised learning,

behaviourist learning activities, learning content access and review, student engagement and motivation.

A study conducted by Rikala, Vesisenaho and Myllari (2013) which focussed on perceived pedagogical opportunities and the actualised pedagogical potential of tablets in educational institutions demonstrated the positive impact that tablets had on teaching and learning as well as making changes in pedagogical perspectives. Respondents noted that tablets can diversify and enhance teaching and learning by promoting learners' motivation and independent learning and supporting engaging teaching methods.

Tront (2015) conducted a research study on facilitation of pedagogical practices through large-scale deployment of Tablet PC. The purpose of the program was to better facilitate pedagogical practices that were expected to improve learning but were not readily accomplished in the previous environment. Practices that were projected to be improved included highly interactive classroom presentations, student to student and instructor to student collaboration, comprehensive note-taking and review, movement of learning with emphasis to more process-oriented lectures and away from simple information broadcasting. The study results found that decisions on hardware and software choices required input from across the university. Training of faculty and support personnel was central to the success of the initiative. Improvements to infrastructure including network connectivity, additional classroom projection systems and increased availability of power connections were some of the physical challenges that required attention. Sound and frequent assessment of the successes and failures of the program, and identification of potentially fruitful avenues to pursue in the future was part of the dominant deployment strategy from the beginning. In addition to these infrastructure challenges, the success of this type of program was found to be dependent on the willingness of the faculty to make changes in the way in which they taught.

In a study by Radosevich & Kahn (2006), it was established that Tablet PCs and recording/playback software offer a way to meet students' needs while also making a significant difference in learning outcomes. The researchers evaluated the hardware/software combination by comparing student performance over two semesters; during the first semester students in three courses did not receive the technology, and during the second semester students taking the same three courses

did receive the technology. Both quantitative and qualitative evidence suggested that tablet technology and recording/playback software had a beneficial effect on learning outcomes, particularly in highly technical classes. Moreover, students and the instructor himself noted increased engagement with the use of the technology. In sharing their results, Kahn & Radosevich (2006) advocated further research of the Tablet PC as well as other emergent technologies to support constructivist pedagogy and enhanced student learning.

2.8 CONCLUSION

In summation, this chapter explicated the evolution of technology followed by that of the technological changes in the education sector, in South Africa specifically and the world at large. The uses of technology in higher education were discussed, followed by an examination of mobile learning and finally a discussion on the Tablet PC and related literature regarding the Tablet PC use in higher education has been done. The next chapter focuses on customer perception. The factors influencing perception and the stages of customer perception will be discussed. Perception as a concept is central to the present study.

CHAPTER 3: CUSTOMER PERCEPTION PROCESS

3.1 INTRODUCTION

This chapter addresses the concept of perception that is central to the present study. Ordinarily, to perceive is to make an opinion of and or shape an understanding of an object. In the life of businesses, customer impressions and perceptions may decide the success or failure of those who trade in goods or services. Customer perception is very important for the survival of any business as it plays a pivotal role in the ability of an organisation to attract new customers and retain the existing ones. It is through customer perception that an organisation can understand what the target market thinks about its product offering and the reasons for using or not using a particular product. In today's digital age, information is found with just a click of a button, hence it can be quick and easier for organisations to track happy and satisfied customers through many online platforms by using the internet. With the increased use of technology in higher education institutions, it is important for universities and colleges to understand students' perceptions regarding the use of electronic devices for educational purposes (Kazmi, 2012). The major purpose of this study is to explore students' perceptions regarding the Tablet Personal Computer (PC) as a mobile learning device at a graduate institute in Tshwane. This research recognises students as customers. In this chapter perception and perceptual theories are discussed. This is followed by the factors that influence perception. The chapter ends with a detailed discussion on major steps in the customer perception process.

3.2 PERCEPTION

The term perception originated from the Latin word 'perception' meaning "receiving, collecting, taking possession and apprehension with the mind or senses" (Shergill, 2012:81). Perception involves seeing hearing, feeling, tasting and smelling of stimuli that will be relayed to the brain for interpretation (Du Plessis, Strydom and Jooste, 2012). Through perception, people are able to perceive objects and the environment differently due to the differences in culture, experience, purpose and interpretation of the subject in question (Heffner, 2014). Perception is mainly characterised by memory and thought and is accompanied by feelings and action where the brain organises information and translate it into something meaningful (Shergill, 2012). Perception

is influenced by people's knowledge of a product making it very difficult to change once it is registered in the mind of the consumer (Cant, 2014). Many institutions and organisations use perception as a marketing tool due to the fact that they have realised that customers differently interpret and organise information thereby judging a product differently (Mathews, 2015)

Perception can be defined in a number of ways. According to Cant and Van Heerden (2018: 62), perception is how an individual sees a product, brand or organisation based on his or her sense of sight, hearing, smell, taste and feel. Roberts-Lombard & Parumasur (2017), defined perception as a process by which people select, organise and interpret stimuli to form a meaningful picture of the world through the senses of sight, sound, smell, touch and taste. In another definition by Gbadamosi (2016) perception is defined as the way people select, organise and interpret stimuli to make sense of the world around them. Cant (2014:47) defined perception as "...how individuals see (select, organise and interpret information) a product, brand or organisation based on their senses of sight, hearing, smell, taste and feel". According to Joubert (2013:56) perception is defined as a "...process by which an individual selects, organises and interpret various stimuli to the five senses of sight, sound, smell, touch and taste in order to create a meaningful and coherent picture of the world around them. Lastly, perception is defined as "...the process of receiving, organising and assigning meaning to information or sensory stimuli detected by the five senses" Du Plessis et al., (2012: 101). In simple terms, perception refers to the way in which users of a product or service give meaning to the world surrounding them by absorbing the information they are exposed to through their senses thereby able to interpret and comprehend that information in a manner they understand.

From the above definitions, a number of assumptions about perception can be reached. Firstly, perception is "selective" due to the fact that customers are exposed to a large quantity of information every time which they are not able to attend to. Hence, they decide on which message they can pay attention to and how they will react to it (Roberts-Lombard & Parumasur, 2017). Secondly, perception is "subjective" meaning that customers only pay particular attention to what they are interested in due to their beliefs, cultures, values and lifestyles (Roberts-Lombard & Parumasur, 2017). Such areas of interest play a bigger role in influencing how the customer behave and act towards the product (Joubert, 2013). Lastly, perception is

based on the individual's "frame of reference" (Roberts-Lombard & Parumasur, 2017:150). A frame of reference refers to a set of values or criteria base in which measurements or judgements can be made. This means individuals are unique and different as their perceptions can be based on their personal experiences and knowledge of a particular product (Joubert, 2013). Based on the above discussion, it is through perception that marketers are able to know how customers perceive their products and services, how they select and attend to various sources of information and how they interpret and give meaning to those products and services. An understanding of how perceptions arise and how consumers reach and make decisions is displayed in the perceptual process shown below.

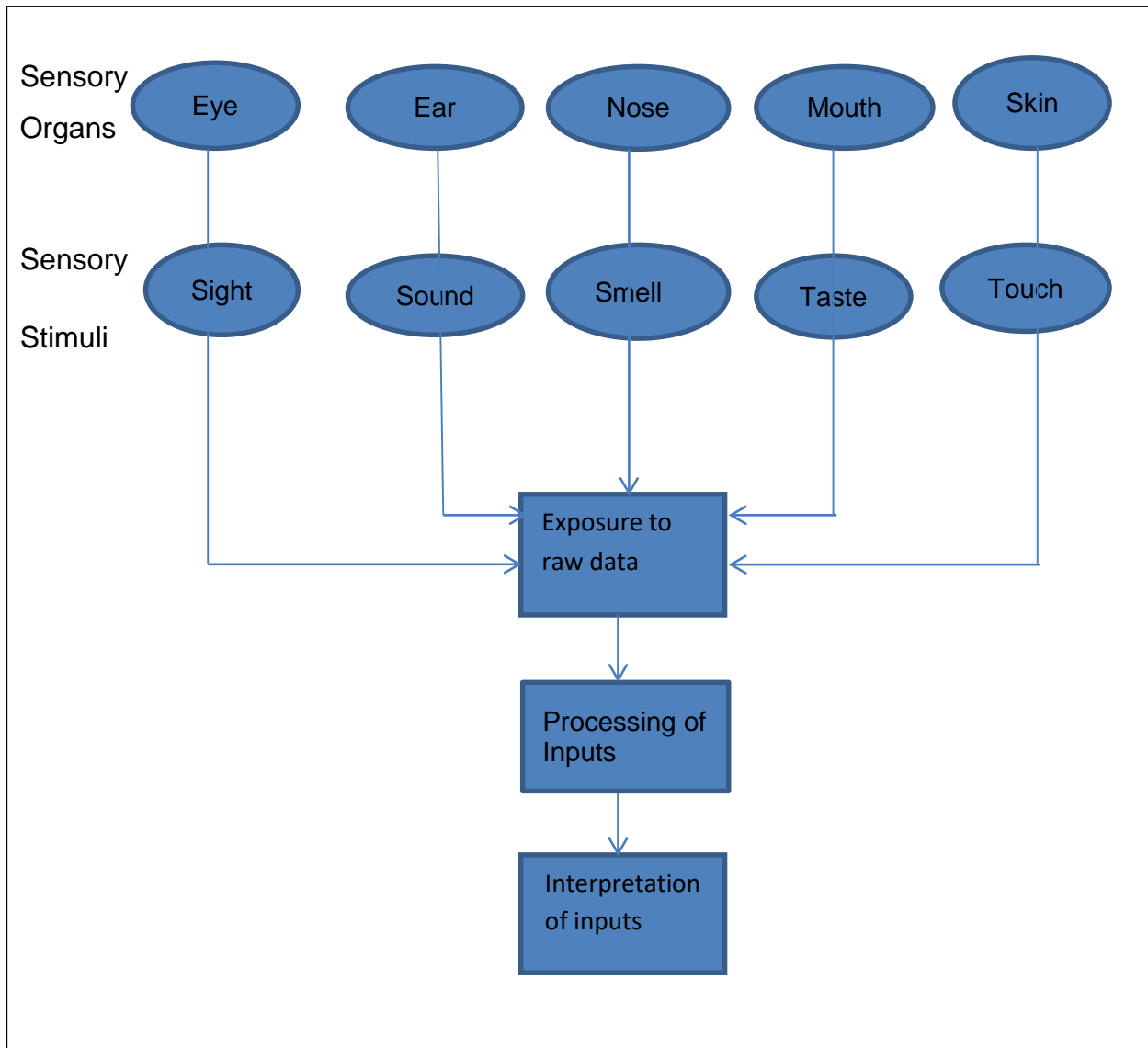


Figure 3. 1: An Overview of the Perceptual Process

Source: Adapted from (Hanna, Wozniak and Hanna, 2017:83)

As shown in Figure 3.1 above, customers receive sensory stimuli such as sound, smell or taste through their sensory organs known as the five senses namely eyes, ears, nose, mouth and skin. Stimuli are a plural for the word stimulus which refers to anything that inspires and arouse interest in an individual (Ngambi, Van Heerden and Cant, 2013:63). The customer's sensory organs are then exposed to a marketing message in the form of an advertisement. The advertisement comes to the mind of the customer as an input which the customer has to process by giving more thought. Lastly, the customer is able to give meaning of the advertisement through interpretation so that he/she can make a final decision. However, not all stimuli get noticed by customers therefore, for effective results the stimulus in the form of an advertisement need to be above a certain threshold level to constitute exposure.

Thresholds tend to be different due to the fact that every individual's senses namely: sight, hearing, smell, taste and touch have an upper and lower limit of responsiveness to stimuli. A threshold also known as "limen" refers to the point of intensity or sensitivity at which people can detect the presence of or difference in a stimulus (Bergh, 2012: 113). This means that stimuli with intensities below the threshold are considered undetectable or subliminal whereas stimuli at values close enough to the threshold will often be detectable. Hence, all senses have some limit to responsiveness to stimulation known as thresholds. The various threshold levels are briefly discussed below.

3.2.1 Absolute threshold

Absolute threshold refers to the smallest unit or minimum amount of stimulation that an individual can detect in about 50 percent of the time that the stimulus is represented. In other words it is the point below which a physical stimulus can no longer be detected (Bergh, 2012:113). Absolute threshold can differ from person to person, among senses and even for the same person among different situations (Bergh & Geldenhuys, 2014). For example, a customer buying a product or service whose benefits are well known or placing a bill-board/poster with invisible letters and images that even passers-by or motorists are not able to recognise at a reasonable distance cannot activate customer's sensory receptors and the stimulus will not be perceived. This implies that marketers need to consider absolute threshold in designing their marketing stimuli as consumers pay particular attention to messages and information which are visible to them and which attract and arouse their interest.

3.2.2 Differential threshold or Just Noticeable Difference (JND)

The Just Noticeable Difference (JND) is also known as Differential Threshold (Mathews, 2015:1-5). It is normally used to determine the amount of change that can be made to an institution's products in order to avoid losing the general recognisable features of the product. The JND can be defined as "... the minimum quantity by which stimulus intensity must be modified in order to acquire a distinguishable variation" (Bergh & Geldenhuys, 2014:118). According to Vastani (2015) the JND is used by businesses and companies to improve their products either by just above or just below the noticeable differences. Many marketers, organisations and institutions apply the

JND so that they are able to constantly improve their products. Just below the JND can be negative changes such as price increases, product size or quality changes that will be least noticeable by the customer whereas just above JND can be positive changes such as product promotions that are set above the noticeable threshold. An example a positive JND can be an institution that promote its products by giving a price discount to students who register early “early bird registration” in advance for a qualification to be studied in future. An example of a negative JND can be an advertisement of an institution’s products on one form of media which the target market is not exposed to or does not use. Therefore, it is advisable for an institution to use the best media in sending its marketing message to attract its target market.

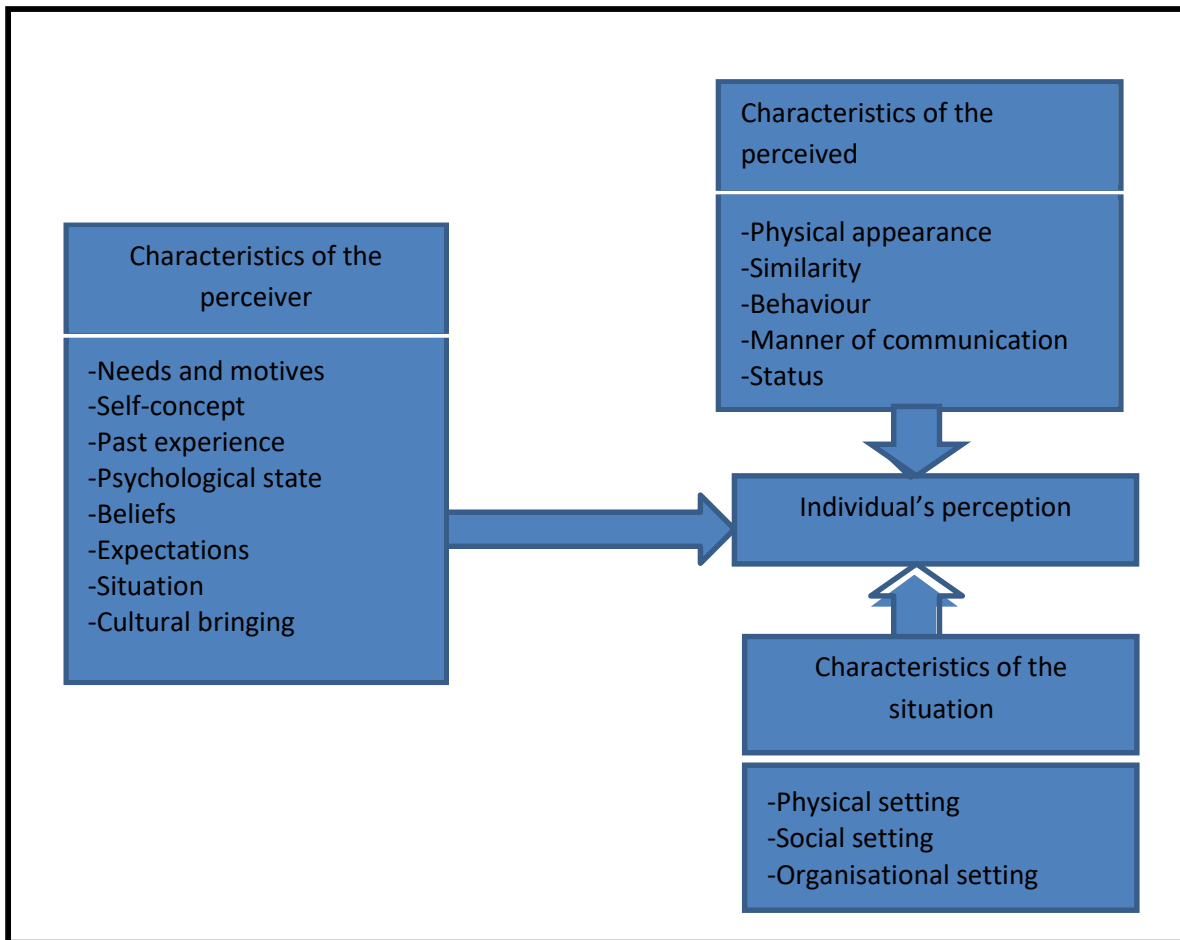
3.2.3 Subliminal perception

Subliminal perception occurs whenever stimuli are presented below the threshold (limen) for awareness (Bergh & Geldenhuys, 2014). The term subliminal perception means “...perceiving without being aware” (Bergh, 2012:114). For example some customers subconsciously make buying decisions of certain products which they do not really want without giving much thought due to the manner in which the product is advertised or appeal to them. For example some products are placed at the nearest convenience of the customer in order to lure the customer to impulsively buy the product. The next section discusses several factors that influence perception.

3.3 FACTORS INFLUENCING CONSUMER PERCEPTION OF A PRODUCT

Perception not only influence consumer behaviour but also affect the performance, profitability, success and failure of an institution (iResearch Services, 2017). This is due to the fact that a customers’ perception of a product or service is based on the actual experience of using that particular product or service. For example, if a student is impressed by a particular institution’s product or service offering during his/her academic studies, he is likely to have a positive perception towards the institution and will be able to refer others. There are a number of factors that shape or distort perception. There are various factors that influence perception namely: (1) characteristics of the perceiver (2) characteristics of the perceived and (3) characteristics of the situation (Parhizgar, 2013:156). The following figure illustrates these factors and explanation follows thereafter.

Figure 3. 2 : Factors influencing perception



Source: Adapted from (Kashyap, 2017; Bergh & Geldenhuys, 2014: 130; Parhizgar, 2013: 156)

3.3.1 Characteristics of the perceiver

The perceiver refers to the individual who envision or focusses on the stimulus (Sincero, 2013). When perceivers look at a target and attempt to interpret what they see, their interpretation is greatly influenced by their personal characteristics. This study recognises the students as perceivers. As shown in Figure 3.2 above, the characteristics of the perceiver are discussed below.

- **Needs and Motives:** Individuals' needs and motives can play a huge role in how they perceive things. A need refers to the gap that exists between the actual state the consumer is in and the state he or she would like to be in

(Cant, 2014:45). Motives are a psychological drive or urge that compels individuals towards actions that satisfy their needs (Cant, 2014:45). A combination of needs and motives can drive an individual to seek for a satisfactory product that matches with his/her desires. For example, a student who is technologically savvy is likely to look for an educational institution that offers education through technology use.

- **Self-Concept:** Self-concept is another factor that affects perception. Self-concept refers to the total thoughts and feelings that an individual has about himself (Joubert, 2013:93). An individual with a positive self-concept tend to notice positive attributes in another person. In contrast, having a negative self-concept can lead the perceiver to pick out negative traits in another person. For instance in this study, students with a positive mind set about the performance of the Tablet PC, are likely to seek benefits, have confidence and trust in the device unlike other students with a negative mind set.
- **Past Experience:** Individuals' past experience of a particular product shapes the manner in which they perceive the current situation. People's perceptions are often guided by their past experiences and what they expect to see. If individuals are betrayed by a particular institution or product they lose trust in conducting further transactions with that particular institution and will refrain from purchasing the product. For example, if students encounter problems and challenges in using a particular product such as the Tablet PC in the past, that experience is likely to shape and influence their perception of similar products in future.
- **Psychological Status:** Perception is likely to be much influenced by an individual's psychological and emotional state. For example, students who are mentally and emotionally stable can use and make meaningful perceptions when exposed to a product such as the Tablet PC.
- **Beliefs:** An individual's beliefs can influence his/her perception greatly. Thus people conceive facts based on what they believe in rather than what they exactly are (Kashyap, 2017). For example, if students believe in a product such as the Tablet PC due to good performance record, it is likely difficult for competitors to change their perception towards it.
- **Expectations:** Expectations refers to strong beliefs that something will happen or be the case (Oxford Dictionary, 2019). Customer expectations refer

to the perceived value or benefits that a customer looks forward to when purchasing or using a product. Expectations can distort perceptions in that people see or hear what they anticipate. For instance, students can expect the Tablet PC to perform in a certain manner hoping to get certain benefits, but they will be disappointed if their expectations are not met.

- **Situation:** Certain factors in the environment such as the location, status and conditions or environment surrounding an individual can influence perception. For example students can decide to study with a particular institution only because it is conveniently located to them and the infrastructure is good therefore anything negative associated with that institution or brand will positively affect his/her perception.
- **Cultural Upbringing:** An individual's ethics, values and cultural upbringing can also play an important role in perception. For example, ethical background, tradition, tribe or educational level can influence the ability of a student to perceive a product such as the Tablet PC for educational purposes.

3.3.2 Characteristics of the perceived

The perceived refers to the individual, target or object being observed. In this study, the perceived refers to the Tablet PC. The following characteristics of the perceived can influence perception. These characteristics are discussed below:

- **Physical Appearance:** Certain characteristics or features of the product being observed can affect what is perceived. It is believed that people's perceptions about others are influenced by their physical appearances namely; age, gender, personality traits and other forms of behaviour (Parhizgar, 2013:156). For example, the physical appearance such as size and colour of the Tablet PC can play a major role in influencing students' perceptions towards it. Students can feel attracted to the Tablet PC due to its colour and size. In this study, students are offered a black 10 inch Tablet PC to which they can feel attracted to as they register with the institution under study.
- **Similarity:** Similarity is another characteristic of the perceived where products or services that look the same as the others are grouped together. This organising mechanism helps institutions to segment its target market by grouping customers of similar characteristics together. For example, students'

perceptions are likely to be influenced by the Tablet PC as it shares similar characteristics with other mobile devices such as smartphones and laptops.

- **Behaviour:** Behaviour refers to the manner in which the product performs or responds to given instructions or commands. In this study, the manner in which the Tablet PC performs technically can play a role in influencing students' perception towards it. The ability of the Tablet PC to perform various different functions and responding to students' commands and instructions effectively and efficiently can make it a favourable device which can be trusted by students.
- **Manner of Communication:** Communication is described as the exchange of information from one person to the other. The Tablet PC plays a huge role in facilitating communication between students and their peers and lecturers. Communication can take place through e-mailing, messaging, texting and phone calling. Therefore, the manner in which the Tablet PC facilitates communication among students and lecturers is crucial as it influences the students' perception. If the Tablet PC promotes communication and interaction among students and their lecturers then students can have a positive perception towards the Tablet PC.
- **Status:** Status refers to a position held in the society or in the market. Due to the common ownership of mobile devices among adults and the young as mentioned in Chapter 2, the Tablet PC has become as common as microwaves in the market particularly in higher education institutions across the globe. Hence, the status or position in the market of the Tablet PC is likely to influence students' perceptions.

3.3.3 Characteristics of the situation

The situation in which interaction takes place between the perceiver and the perceived has an influence on the perceiver's impression of the target. This means that the context in which people perceive objects or events is very important. The characteristics of the situation include physical setting, social setting and organisational setting as shown in Figure 3.2. In this study, the characteristics of the situation refer to the institution (RGIT) in which the Tablet PC is being offered and in which the study was conducted. These characteristics are discussed below:

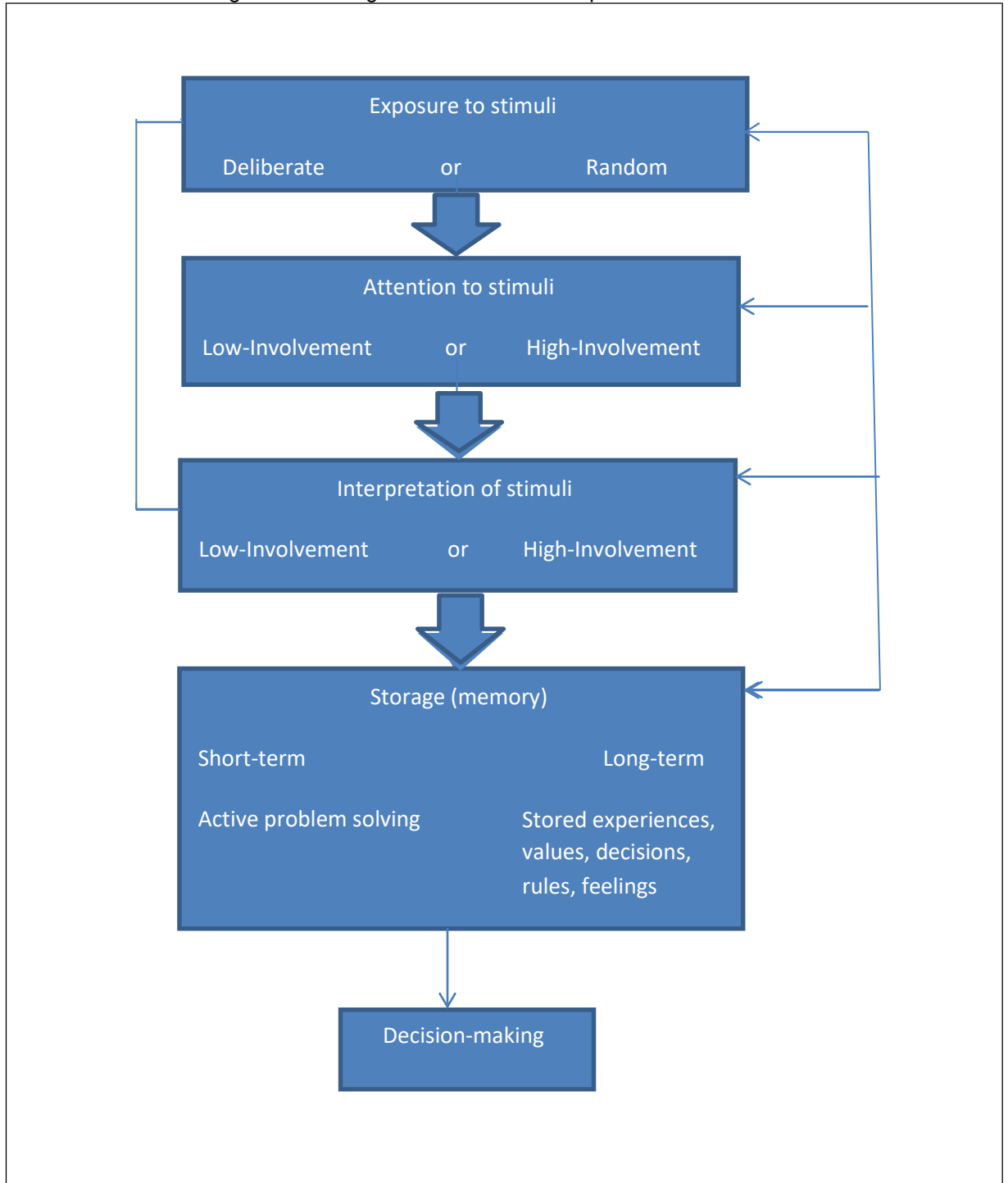
- **Physical Setting:** The atmosphere or surrounding environment in which an institution or individual is located can influence people's perception. The physical setting of an institution can include things such as the building's shape, colour, size, and many others. These features have greater influence on the consumer's perception of an institution as they form the basis of judgement and choice. For example in this study, the size, shape, colour, layout such as positioning of internet or Wi-Fi hotspots for easy access to internet network can create positive or negative students' perceptions of the product under study.
- **Social Setting:** The social setting in this study refers to the immediate area or environment in which the institution is located to offer its service to the students. This can include the culture of neighbouring businesses and other stakeholders that the institution exist and associate with. The social setting can also be related to the ability of the institutions' product (Tablet PC) to promote mobile learning by providing access to the internet and learning content anywhere at any time as students will need to stay connected while on the go. For example the social setting of an institution such as the ability of the Tablet PC to connect to free Wi-Fi from other surrounding organisations give students an impression or picture of what they will be dealing with and how learning is promoted and facilitated out of the classroom.
- **Organisational Setting:** Organisational setting influence behaviour of people as it has an impact on the internal aspects such as the ability to communicate with management, decision makers, leaders, lecturers, support staff and faculty in an institution. If the organisational setting permits a friendly, workable and sociable environment, students' behaviour and perceptions towards the product and service offering will be positively influenced. The organisational setting such as providing an open door policy for students to feel free to communicate and share their grievances and experiences with the institution can play a tremendous role in influencing students' perceptions of a product. The next section discusses the customer perception process in detail.

3.4 CUSTOMER PERCEPTION PROCESS

The customer perception process is based on the fact that consumers are bombarded with marketing messages, information and product campaigns every day in the form of advertisements, special offers, in-store displays and many others all fighting for

their attention (Roberts-Lombard & Parumasur, 2015:161). However, due to customer's limited cognitive capacity, processing these marketing messages imposes a huge load on their capacity and they therefore end up selecting products or marketing messages that only conform to their needs and ignore others (Gunther, Muller and Geyer, 2017). Customer perception is defined as "... a marketing concept that encompasses customers' impression, awareness and consciousness about an institution and its offering using their five senses thereby creating a meaningful picture of the product" (Yadav & Jain, 2016: 2). Customers can form different perceptions of the same stimulus because of four basic perceptual processes namely exposure, attention, interpretation and memory or recall. These stages are shown in Figure 3.3 below.

Figure 3. 3 : Stages of Customer Perception Process



Source: Adapted from (Joubert, 2013:57; Batra & Kazmi, 2009:108)

The customer perception process shown in Figure 3.3 above will be discussed in the context of students as they are regarded as customers. In the beginning of every year prospective high school students seek for information from many colleges or universities and then register for their studies with the institution of their choice, in this current study Richfield Graduate Institute of Technology (RGIT) in particular. Upon

completion of the registration process, the student is given a Tablet PC to use for academic purposes for the entire study period at the institution. It is during this time that the perception process begins.

3.4.1 Stage 1: Exposure to stimuli

As shown in Figure 3.3, the first stage of the perception process is exposure to stimuli. Exposure refers to the extent to which a person takes cognisance of stimuli via his or her senses (Roberts-Lombard & Parumasur, 2017). Exposure to stimuli can either be deliberate or random as illustrated in Figure 3.3. Stimuli are a plural for “stimulus” which refers to anything that inspires or arouses interest in an individual (Ngambi et al., 2013: 63). In this study the stimulus is the “Tablet PC”. Deliberate exposure occurs when the customer is intentionally exposed to a marketing campaign because of his or her own choice, intentions and goals (Joubert, 2013) while random exposure occurs when a customer accidentally or unexpectedly is exposed to a marketing campaign such as an advertisement in a magazine, television, radio commercial or passing through a billboard or poster (Greathouse of Marketing, 2011).

During exposure, the sensory receptors of a customer are engaged by product cues through sight, sound, smell, taste and texture (Cant, 2014:47). However, exposure to stimuli does not guarantee that the individual will pay attention to the information or marketing message though he or she may have seen or heard it (Roberts-Lombard and Parumasur, 2015:163). The perception that comes from these stimuli often triggers and influences the buying behaviour of the individual (Ngambi, Van Heerden and Cant, 2013: 60). If the customer does not notice the message there is no guarantee that the marketing message was communicated as was intended by the marketer (Stuart, 2014; 155). In other words, this means that customers are able to perceive a marketing message with regards to what they have learnt in the past and their experiences.

However, most of the stimuli an individual is exposed to are deliberately selected through a process called ‘selective exposure’ where some stimuli are screened out, others avoided and some distorted (Ngambi et al., 2013:61). This means consumers can selectively choose to expose themselves to certain stimuli that are relevant and pleasant to them and ignore unpleasant or irrelevant ones which they have no interest in (Du Plessis et al., 2012:102). Due to the fact that customers do not all do the same

things at the same time or get exposed to the same product at the same time, it is the responsibility of the marketer to place marketing messages where there is maximum exposure of the target market (Cant, 2014:47).

In this study, the majority of students are deliberately exposed to the Tablet PC because of their choice to study with the institution under study knowing that they will be provided with the Tablet PC to use for academic purposes. The Tablet PC appears to the five senses of the student namely: sight, sound, smell, taste and touch. The student is able to feel, touch and see the Tablet PC before getting to know how to use it for academic purposes.

3.4.2 Stage 2: Attention to stimuli

As shown in Figure 3.3, the second stage of the perception process is attention to stimuli. Attention occurs when an individual voluntarily attend to the stimuli that is consistent with his or her current needs (Stuart, 2014). Attention can be defined as "... the extent to which the processing activity is devoted to a particular stimulus" (Roberts-Lombard & Parumasur, 2017:151). Solomon et al., (2012: 155) defined attention as "... the extent to which a person devotes mental processing to a particular stimulus". As shown in Figure 3.3 attention can either be low-involvement or high-involvement. With low involvement, the customer does not spend time in attending to the stimulus whereas with high involvement, the customer uses much time and effort to attend to the stimulus.

Given the fact that customers are exposed to a number of stimuli every time as mentioned in Stage 1, these customers are not able to process all the information at the same time, but they tend to be selective in attending to the marketing messages using 'selective attention' (Cant, 2014:48). Selective attention refers to the act of focussing on a particular object for a period of time by an individual while concurrently ignoring irrelevant information that is also occurring at the same time (Du Plessis, et al., 2012:102). This means customers have a tendency to screen or filter out irrelevant information to which they are exposed to and focus only to information or stimuli that address their current needs or the one that they are in need of or interested in (Bergh & Geldenhuys, 2014:121; Solomon et al., 2012: 156). Hence, marketers need to work extra hard in order to stand out from the crowd and attract customers by either making their advertisements more creative, vivid or appealing

(Stuart, 2014: 156).

In this study, after being exposed to the Tablet PC, students become highly involved by selectively paying attention to the Tablet PC uses. The Tablet PC usage information can be obtained through the written manual, electronic given instructions or during orientation time. It is through exposure that information regarding the Tablet PC accessed by students. The students will therefore choose to pay attention to information or instructions that help them in using the Tablet PC for academic purposes. During the attention stage, students pay more attention to the functionalities of the Tablet PC and try to understand some of the activities important for academic success. These activities include accessing study guides, conducting research, logging in to the internet, downloading of e-books, logging in to social networks, logging in to Moodle student portal, recording lecture videos and many other things that enhance academic performance.

According to Joubert (2013:58) attention is determined by two major factors namely; the individual, the stimulus and the situation. These factors will be discussed below.

- **The individual**

The individual or the customer is more likely to be affected by primary individual characteristics such as interests, needs, expectations, personality, lifestyle, social and cultural environment to gain attention (Roberts-Lombard & Parumasur, 2015:164). These interests serve as a reflection of the consumer's overall lifestyle, long-term goals and plans (Joubert, 2013:58). For example students' personality, expectations, needs and interests increases the attention to learn more about the Tablet PC in order to achieve the learning outcomes.

- **The stimulus**

The characteristics and nature of the stimulus itself play a crucial role in determining what the customer can notice and ignore (Roberts-Lombard, 2017:152). A stimulus can be described as anything that inspires or arouses interest in an individual (Ngambi et al., 2013: 63). In this study the stimulus is the "Tablet PC". By coming up with a unique stimulus, marketers are able to differentiate themselves from other stimuli thereby getting easily noticed by customers. In order to achieve uniqueness of stimuli, marketers can consider the following:

- **Size and intensity:** Size deals with how big or small an article or marketing message is and it really matters (Roberts-Lombard & Parumasur, 2017:152). The larger the stimulus the higher chances of it to be noticed (Joubert, 2013: 59). For example, the institution under study offers a 10 inch Tablet PC to students for easy handling.
- **Colour:** Colour is a powerful way of drawing attention to a product and can differentiate it from other products (Roberts-Lombard & Parumasur, 2017:152). However, if colour is used incorrectly it can be distracting and can cause a product not to be noticed by customers thereby negating the positive effects of the message and leading to the message not being effectively conveyed (Joubert, 2013: 159). For example the Tablet PC is black in colour which draws attention to students and is also easy to clean and maintain.
- **Position:** Position is based on the fact that products that appears in places where customers are more likely to be found stand a better chance of being noticed (Roberts-Lombard & Parumasur, 2017: 152). Objects or messages that are placed near the centre of a visual field are more likely to be noticed than those near the edge of the field (Joubert, 2013). This means that marketing messages or advertisements that are placed in busy areas or where a number of people meet are likely to get attention than others (Roberts-Lombard & Parumasur, 2015:164). For example, the institution under study has many campuses located in the CBD where the majority of customers do shopping therefore it is easier and quicker for potential students to find the campus in any town or city.
- **Isolation:** Isolation refers to a process of separating a stimulus object from other objects (Roberts-Lombard & Parumasur, 2017:153). For example, the introduction of the Tablet PC as a mobile learning device has been treated as a USP (Unique Selling Proposition) by the institution under study as it has been treated as a unique product that facilitate learning among other electronic devices.

3.4.3 Stage 3: Interpretation of stimuli

As illustrated in Figure 3.3, interpretation of stimuli is the third stage of the perception process. Interpretation refers to the meaning that a person assigns to sensory stimuli (Cant & Van Heerden, 2018:63). During this stage, the customer comprehends,

decodes and assigns meaning to the marketing message (Stuart, 2014:156). In interpreting the stimuli, the customer can be lowly or highly involved as shown in Figure 3.3. With low-involvement, customers take a shorter time to decode or assign meaning to the marketing message or stimuli whereas with high-involvement customers takes a longer time to interpret the stimuli. During interpretation, customers also scan their memory to retrieve previous experiences if any that they encountered in using a similar product or dealing with the same product and try to make sense of it.

Consumers usually interpret information on the basis of their own attitudes, beliefs, motives and experiences, which is known as 'selective interpretation' (Cant, 2014: 48). Selective interpretation occurs when stimuli are perceived but the message will not be interpreted as it was intended to be (Roberts-Lombard & Parumasur, 2015:166). This means not all consumers perceive and interpret stimuli in the same way and assign the same meaning to the same stimuli. However, the *subjective qualities and frame of reference* dominates the perception (Roberts-Lombard & Parumasur, 2015:166). Customers can interpret the marketing message incorrectly by distorting the meaning or by misunderstanding it either purposefully or subconsciously to fit in with their dislikes, likes, prejudices and attitudes (Roberts-Lombard & Parumasur 2015:166). During interpretation, the consumer try to modify the stimulus in one way or another in order to make it more coherent with their own point of view, beliefs or experience (Pride, Ferrell, Lukas, Schembri and Niininen, 2015:132).

By using schema, customers try to filter and distort any new information about a product and try to match it with what they already know in their memory. This creates a link between the past and present thereby influencing customer perception towards the product (Bagraim, Cunningham, Pieterse-Landman, Potgieter and Viedge, 2011: 63). However, perceptual distortions such as cognitive bias can result in poor judgement and irrational decisions. A cognitive bias refers to "... a systematic error in thinking that affects the decisions and judgements that people make" (Cherry, 2017). In the current study, interpretation is the third stage that comes after attention to stimuli. During interpretation students can either be lowly or highly involved in finding meaning of the Tablet PC. Students are lowly involved in if they choose to ignore all information about the Tablet PC. When students are highly involved they are motivated to know more about the Tablet PC for learning purposes. If students did

not encounter any problems before in using a similar device to the Tablet PC they are likely to quickly adapt. If there are no previous experiences with a similar device as the Tablet PC then it will definitely take time for them to quickly understand using it.

According to Roberts-Lombard & Parumasur (2017:154), during interpretation the marketing message can be distorted by two main factors namely; 'levelling' or 'sharpening'. These two methods are discussed below.

- **Levelling** means that an individual can ignore or simplify an important piece of information by removing dissonant elements so that it becomes more acceptable (Roberts-Lombard & Parumasur, 2015:166). For example students can choose to use the Tablet PC for certain specific academic purposes and ignore ones that do not contribute to their academic achievement.
- **Sharpening** means that an individual can put additional information into a message by adding new elements or words to make it fit in with his or her predispositions and value systems (Roberts-Lombard & Parumasur 2015: 167). In this regard, customers tend to add new dimensions to some of this information to support their beliefs and practices (Roberts-Lombard & Parumasur, 2017:154). For example, through sharpening, students can download additional material and applications using the Tablet PC for them to be able to perform other tasks that help in accomplishing academic tasks.

In order to avoid distortion, institutions need to ensure that devices such as the Tablet PC is designed in a manner that reduces and eliminate the possibility of students to incorrectly assign meaning and understand the functioning of the Tablet PC by giving proper training and guidance in using it.

3.4.4 Stage 4: Storage (memory)

As shown in Figure 3.3, storage or memory is the last stage of the customer perception process where information is retained in the customer's memory so that it will be available when the customer is considering buying the product (Roberts-Lombard & Parumasur, 2017:154). During this stage very few people, if any, will remember everything they experienced even after attaching meaning and interpreting it. This is based on the fact that customers tend to forget the marketing message when they are

making a product purchase through *selective retention* even if they had perceived the message correctly. Selective retention refers to the process whereby customers more accurately remember messages that are closer to their interests, values and beliefs than those that are in contrast with them, selecting what to keep in their memory and remembering only what they want to remember (Pride et al., 2015:132). This is based on the belief that customers are likely to remember good points made about a brand they favour or they like and forget good points made about competing brands or products. Hence, they tend to retain information that supports their attitudes and beliefs. This means that customers have a tendency of forgetting what they learn but however remembers what agrees with their beliefs and their own point of view (Dumaz & Diarbakirlioglu, 2011:18).

Storage (Memory) is marked by the keeping of marketing message in short-term and long-term memory Algie (2014) as shown in Figure 3.3. Short-term memory means the customer temporarily retains and tends to forget the marketing message even after having attended or correctly interpreted it (Cant, 2014: 48). Whereas, with long term memory customers are able to keep the message in their mind for a long time after interpreting it (Cherry, 2017). The marketer's goal in the interpretation stage is to provide future positive stimuli (motivations) in the proceeding stages that translate consumer's storage of the message into long-term memory. Therefore, in order to make sure that the marketing message is retained in the customer's memory or increase the chances of the marketing message to be memorised by customers, marketers often use a number of strategies. Firstly, they can use point-of-purchase promotions to remind their customers of their messages and products (Roberts-Lombard & Parumasur, 2017:154). Secondly, marketers can use so much drama and repetition of key messages in their advertisements, place advertisement commercials in different time slots and in different media sources (Kotler & Armstrong, 2011:160). If the customer accepts the stimulus then the information is stored in long-term memory for future use.

In this study, the storage or memory stage is the last stage of the customer perception process. Storage or memory stage is marked by the ability of the student to store the interpreted information about the Tablet PC in either short-term or long-term memory. If the student keeps the Tablet PC information in short-term memory, it means that the student will never remember any of the information regarding the

Tablet PC in future. Whereas, if students keep the information in long-term memory then they will remember information regarding the Tablet PC and use it in future for decision making purpose or to share with others.

In an academic context, normally students repeatedly and frequently use the Tablet PC to perform various academic activities as most of the academic content will be accessed digitally using the Tablet PC thereby influencing the storage of information into long-term memory. But if a student does not frequently use the Tablet PC due to her choices and preferences, there is a possibility that they are likely to forget how some of the activities are done leading to short-term memory storage and thereby influencing future decision making as the student fail to recall any information regarding the Tablet PC.

As shown in Figure 3,3 the storage or memory stage leads to decision-making where students have to decide to accept or decline using the Tablet PC for academic purposes if beneficial to their academic success. There is a close relationship between storage/memory and decision-making in particular. According to Roberts-Lombard & Parumasur (2012:251) consumer perception is an important factor that usually occurs in the early stages of decision making process. Decision-making can be defined as the process of selecting an action (Redish & Mizumori, 2015). Roberts-Lombard & Parumasur (2015:264) defined consumer decision-making as "... a sequential and repetitive set of psychological and physical activities ranging from problem recognition to post-buying behaviour". This implies that a customer is only able to make a decision or take action if there is information that has been relayed and stored in his/her mind first through perception.

3.5 IMPORTANCE OF PERCEPTION

An understanding of perception is important to an institution as it helps to comprehend how perceptions arise and how consumers reach and make purchase decisions (Recklies, 2015). In this study, understanding students' perceptions can assist the institution to understand the psychological processes that students go through when making judgements and opinions regarding the Tablet PC as they use it for academic purposes. It must not be generalised or assumed that all the students perceive the Tablet PC in the same way, but by exploring their perceptions, it gives a

clear picture of how students, use, benefit, face challenges and gain learning opportunities from using it. This will assist the institution in deciding on the best way to satisfy students' needs and to take corrective action. With perception, an institution is able to avoid mistakes and errors in a product that can lead to customer dissatisfaction. Understanding students' perceptions has the ability to build a good reputation and guarantees a bright future for an institution as students' needs are known and addressed accordingly.

3.6 CONCLUSION

This chapter has highlighted the concept of perception that is central to the present study. The factors that shape and influences human perception of objects and subjects have been discussed as they lay a foundation for this study. As noted earlier this study focusses on the perceptions that degree students make of the Tablet PC in a higher education institution in Tshwane. The four basic stages of perception were also discussed and the Chapter concluded with the importance of studying perception. It can therefore be concluded that studying customer perception is of importance as it provides knowledge about customers' views and judgement of an institution's products. This enables an institution to identify opportunities for improvement and effective decision making. The following chapter presents the research methodology followed in this study.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter delineates the methodology of the present study. Methodology, just like theoretical frameworks, is part of the science of research. Research can originate from a specific problem, concern or issue that needs to be clarified through the application of scientific procedures in order to discover the truth that is unknown and hidden. Information gathered from a research can assist an institution to understand where it stands and to make corrective action where possible. The main objective of the current research is to explore students' perceptions of the Tablet PC as a mobile learning device in higher education.

In previous chapters (Chapter 1, 2 and 3) a theoretical discussion of the literature that supports the research question was reviewed. Chapter 1 discussed the background history of South African higher education, the educational challenges facing higher education, diversity in higher education institutions, learning methods used by universities and the various digital media and their use in education. This was followed by the problem statement, research objectives, a brief description of the perception process, research methodology and the study limitations. In Chapter 2, the evolution of technology and literature that support the use of technology in education, mobile learning and students' perceptions regarding the Tablet Personal Computer in higher education was examined. It was noted in this chapter that technology is a powerful tool that has managed to support and transform education in various ways though it is not a silver bullet for solving all the academic problems. Chapter 3 gave an account of the customer perception process and the factors that influence customer perception.

The current chapter focuses on the specific research design and the research steps followed in order to address the research question and objectives of the study.

4.1.2 Defining research

Research comprises of creative and systematic methods undertaken for several reasons such as to broaden the scope of knowledge, to devise new applications, to develop new theories, solve new or existing problems or to reaffirm the results of previous work done by others (OECD, 2015). A number of authors have defined

research differently. Saunders, Lewis and Thornhill (2015:11) defined research as ‘... a process that people undertake in a systematic way in order to find out information thereby increasing their knowledge’. According to Habib, Maryam and Pathik (2014: 3) research is defined as ‘... a scholarly, scientific and systematic investigation to establish facts and principles or to collect information on a subject to be presented in a detailed and accurate manner’. Another definition by Salkind (2013: 65) defined research as ‘... a process through which new knowledge is discovered’. These definitions assist in understanding the pillars and meaning of research.

The purpose of conducting research can be a complicated issue and varies across various fields and disciplines (Wiid & Diggines, 2015:2) and plays a paramount role in providing answers and solutions to various problems encountered by an institution (Godwill, 2015:6). However, the major purpose of research is to generate new ideas, revise existing theories for concept testing and expand knowledge on the specific area under study (Habib et al., 2014: 11). Practically, this means marketing research creates knowledge that can lead to new technologies, products and development of industries that can have a significant impact to the economy (Wiid & Diggines, 2015:2). The specific research design and methodology of this study will be described below.

4.2 THE RESEARCH PROCESS

In order to conduct research, a structured process needs to be followed as mentioned earlier on in the previous section. Poor planning of the research can result in a waste of time and resources therefore it is important that a structured approach is followed in order to get the desired results. The type of research methodology used in a research study is determined by the main focus of the research for example this study aims to “explore students’ perceptions regarding the Tablet Personal Computer PC as a mobile learning device at a graduate institute”. The majority of research processes follow some standard steps which may vary differently as some researchers combine or split the steps due to the uniqueness of the research problem (Cant & Van Heerden, 2018:126-127). Various authors have suggested a number of steps in conducting research due to the uniqueness of a research problem (Ngambi et al., 2013:127). These research steps are discussed below.

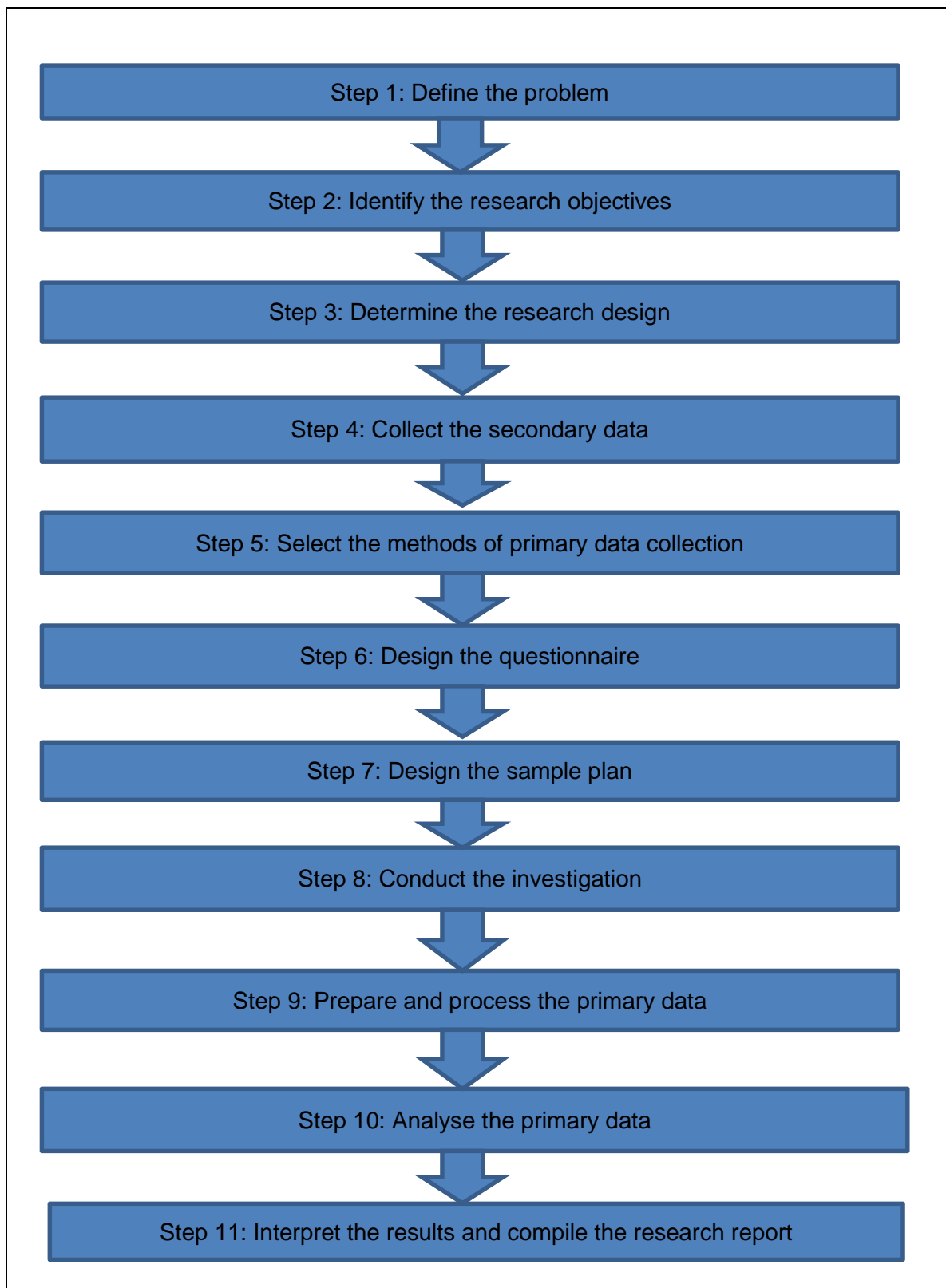
Gray & Malins (2016: 2) identified seven steps to the research process. The first step comprise of planning and preparation of the research, this is followed by surveying the

research context, locating research questions in relation to the context, generating and gathering data through the use of research methods, evaluating, analysing and interpreting research outcomes and finally communicating research findings. Saunders et al., (2015:11) highlighted that the number of research stages varies but they usually include formulating and clarifying a research topic, reviewing the literature, designing the research, collecting data, analysis of data and finally writing the report. According to Wiid & Diggines (2015:41) the research process is divided into 11 distinctive steps. The first step is defining the problem followed by identifying the research problem, determining the research design, collection of secondary data, selection of the primary data collection method, questionnaire design, sample plan design, conduct the investigation, preparation and processing of primary data, analysis of primary data and finally interpretation and compilation of the research report.

Hyman & Sierra (2015) divided the research process into six steps. The first step is the identification of the problem followed by research design, sample selection, gathering the data, analyse the results and lastly communication of findings and their implications. Habib et al., (2014:15) identified five sequential steps in conducting research. The first step begins with formulating the problem followed by research design, data collection, data processing and finally the research report. According to Ngambi et al., (2013:128) the marketing research process is composed of six steps where the first step is to describe the research problem, followed by selection of the research design, preparation of the research design, fieldwork processing tabulation and analysis and lastly step 6 reporting of research results.

Taking the above research steps into consideration, the structured research process as set out by (Wiid & Diggines, 2015: 41) was followed due to the fact that it is comprehensive, well detailed and provides easy and clear steps to follow from one step to another. A brief discussion of these research steps follows below.

Figure 4. 1 : Steps in the marketing research process



Source: Adapted from (Wiid & Diggines, 2015:41)

4.2.1 Step 1: Define the problem

As illustrated in Figure 4.1, the first step of the research process is to define the problem. Before this research was conducted, a research problem was initially identified by the researcher. However, it is also possible that opportunities can be discovered when conducting research (McDaniel & Gates, 2010: 4). The difference between a problem and an opportunity is that; a problem refers to those independent variables that prevent conformity between the performance standards and planned objectives of an organisation (Wiid & Diggines, 2015: 52) whilst an opportunity refers to a favourable or unexploited situation which gives an institution a break through opportunity to progress or succeed in the market (Ngambi et al., 2013:129). Without the identification of a research problem or opportunity, it is not possible for the research to be conducted. Institutions and organisations usually become aware of a problem or opportunity when there are conflicting fragments of information, reports, opinions and symptoms brought to its attention (Wiid & Diggines, 2015: 51).

The current study emanated from the fact that students are given the Tablet Personal Computer (PC) as a mobile learning device to use for learning purposes immediately after registering to study with the institution, however, it is not known how the students perceive the Tablet PC as a tool that enhances learning as they use it in their academic journey. Therefore, to address this issue, research needed to be conducted in order to explore this initiative.

In previous chapters, the literature that supports the research problem was discussed. From the literature reviewed on databases such as EBSCOhost, Emerald, JSTOR, SAGE and ProQuest, it was identified that technology in the form of mobile devices lays an important role in the education life of a student. However, considering previous researches in South Africa, no research has been done on students' perceptions regarding the Tablet PC as a mobile learning device in higher education to date. Therefore, this was identified as a gap in the existing body of knowledge for this study.

In pursuing with the research problem, the following research question was asked:

What is the perception that students make of the Tablet PC as a tool to enhance learning in higher education institutions?

In an attempt to answer this research question, the research objectives for this study were formulated and are outlined below.

4.2.2 Step 2: Identify the research objectives

As shown in Figure 4.1, the second step in the research process is to identify the research objectives. A research objective refers to the specific information that is needed to solve a marketing research problem (Cant & Van Heerden, 2018: 130). A research objective can be described as a clear and concise declarative statement which states what is to be achieved by a study. In order to identify the research objectives, the researcher indicated broadly what needed to be accomplished and attained by the research. Research objectives are basically divided into primary and secondary objectives. The primary objective is an overall statement of the thrust of the study and gives an indication of what is expected to be achieved by the study whereas the secondary research objectives refers to the aspects of the research topic that the researcher needs to investigate.

- **Primary research objective**

To explore students' perceptions regarding the efficiency and contribution to learning of the Tablet PC as a mobile learning device in order to justify the adaptation of study material by students.

- **Secondary research objectives**

It is from the above outlined primary research objective that several research objectives were derived. These secondary objectives are as follows:

- To explore the uses of the Tablet PC as a mobile learning device used by students to enhance learning at a graduate institute.
- To empirically identify the advantages of using the Tablet PC as a mobile learning device used by students to access learning material.

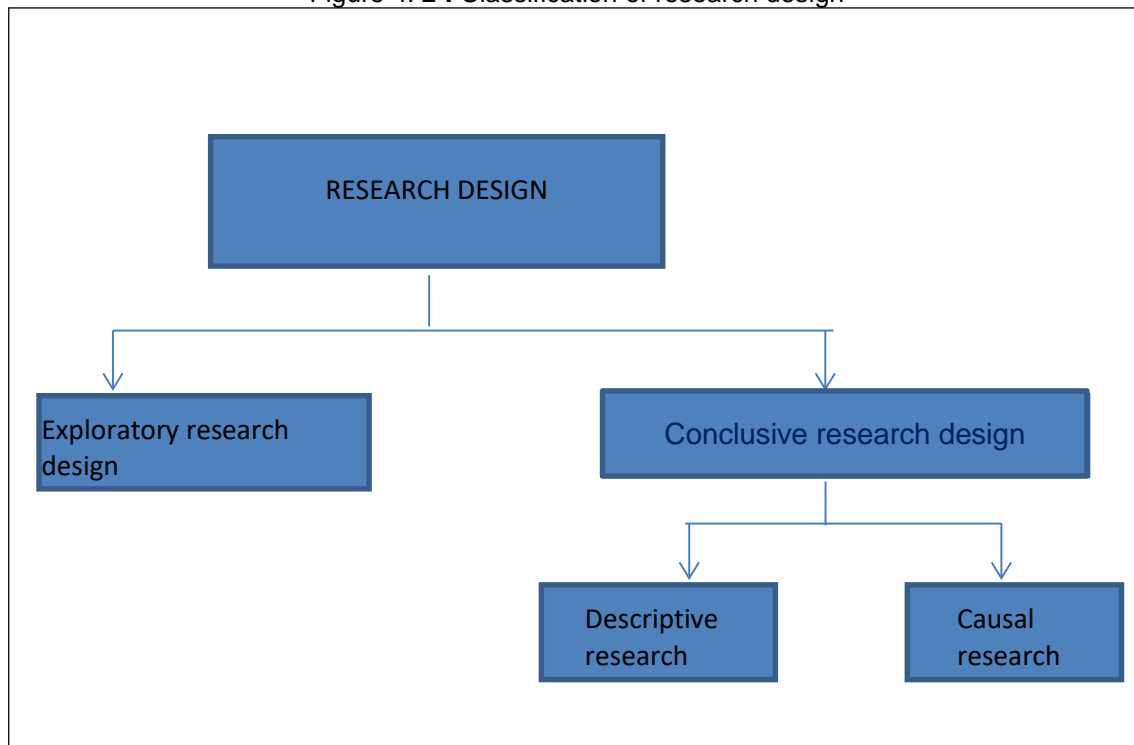
- To discover challenges facing students when using the Tablet PC as a mobile learning device at a graduate institute in Tshwane.
- To determine the performance of the Tablet PC in terms of service quality as it is used by students for academic purposes.
- To determine the pedagogical opportunities offered by the Tablet PC as a mobile learning device.
- To determine if students' perception of the Tablet PC varies with age, gender and years of instruction.

The above mentioned secondary research objectives were used to formulate questions on the questionnaire in order to get the desired responses as shown in Table 4.4. The next step after identifying the research objectives is to determine the research design to be used in the study.

4.2.3 Step 3: Determine the research design

As shown in Figure 4.1, the third step in the research process is to determine the research design. Cant & Van Heerden (2018:131) described research design as a plan or format that is used to answer the research question specifying the methods and procedures to be used when collecting data. In other words, it is a plan that indicates the required data, the sampling plan and the methods of data collection and analysis to be used in a study. The purpose of a research design is to serve as a guideline to the research process and includes clear details on how data will be collected (Clowe & James, 2014: 34). There is, however, no research design that can be said to be perfect due to the fact that every research study is unique and is conducted differently. A researcher can choose from two basic types of research designs namely: exploratory and conclusive research design depending on the research process (Clowe and James, 2014). These research designs are illustrated in Figure 4.2 below.

Figure 4. 2 : Classification of research design



Source: Adapted from (Wiid & Diggines, 2015:66)

The research designs shown in Figure 4.2 are discussed below.

4.2.3.1 Exploratory research design

As illustrated in Figure 4.2, exploratory research design is the first classification of the research design and can be used in various circumstances namely; to address a phenomenon where there are high levels of uncertainty and ignorance about a particular subject, when the research problem is not very well understood and when very little research has been done on the subject matter (Godwill, 2015: 16). Most exploratory designs are in the form of literature reviews, experience surveys and focus groups (Cant & Van Heerden, 2018:134). The current research is exploratory in nature as it aims to gather more information about students' perceptions regarding the Tablet PC as a mobile learning device. The next section describes conclusive research design.

4.2.3.2 Conclusive research design

As shown in Figure 4.2 above, conclusive research is a second classification of the

research design. It is a form of research design that helps the researcher to study the research problem in a decisive manner and then choose a possible course of action from various alternatives (Wiid & Diggines, 2015:67). Conclusive research design is categorised into two, namely descriptive and causal research. These are discussed below.

4.2.3.3 Descriptive research

As depicted in Figure 4.2, descriptive research design falls under the first category of conclusive research design. Descriptive research can be used to identify and obtain information about the characteristics of a particular problem or issue (Habib et al, 2014: 8). It provides answers to questions such as who, what, when, where, why and how of the research (Wild & Diggines, 2015: 67). The main objective of descriptive research is to provide a comprehensive and accurate description of the current research situation (Cant, 2014:71). The various techniques used for collecting data in descriptive research include personal interviews, postal questionnaires, telephone interviews and observations (Cant & Van Heerden, 2018:134).

4.2.3.4 Causal research

As shown in Figure 4.2, causal research is the second category of conclusive research design. Causal research is a type of research design that explores the effect of one variable on another (Habib et al., 2014:8). Causal research is very structured in nature and aims to identify any causal link between the factors or variables that pertain to the research problem (Godwill, 2015:17).

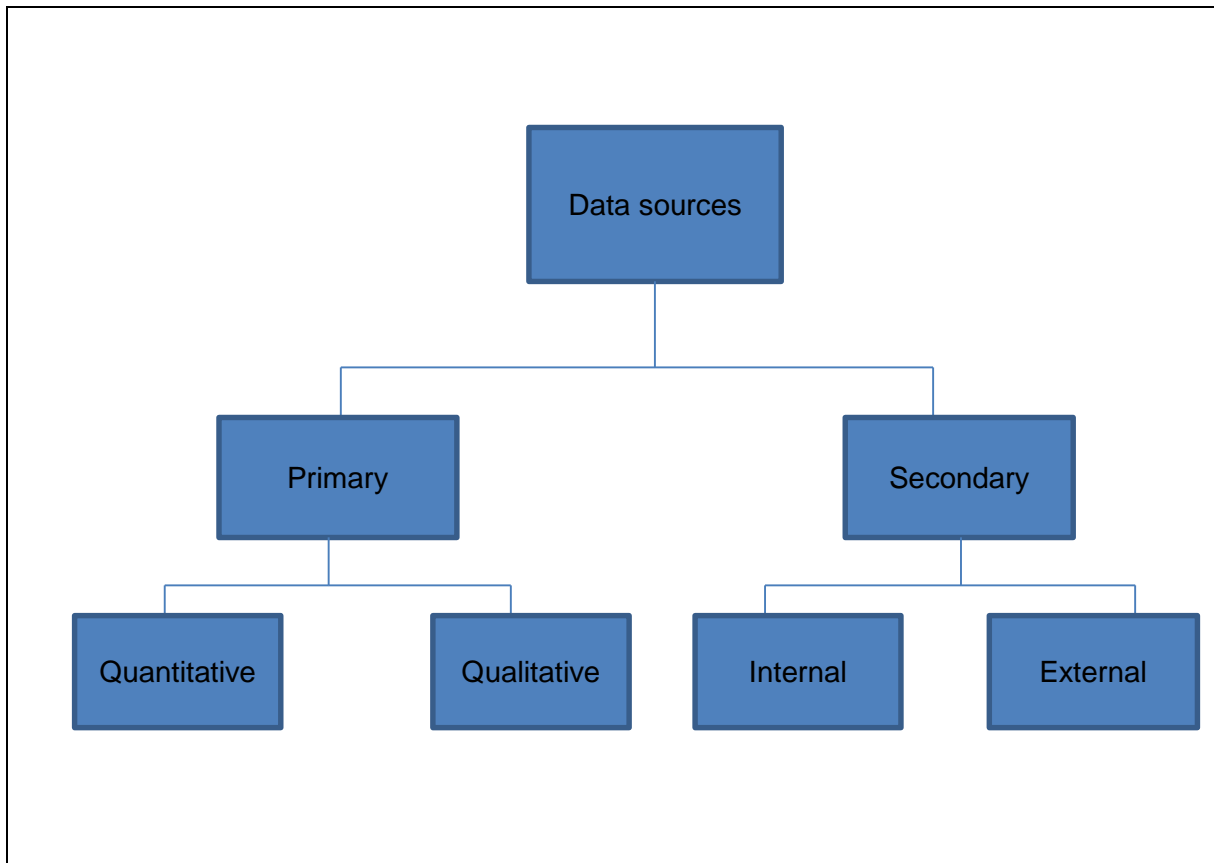
Taking the above research designs into consideration, this study can be regarded as exploratory in nature as it attempts to explore students' perceptions regarding the use of the Tablet PC as a mobile learning device at a graduate institute to enhance learning. After determining the research design, the researcher focuses on the methods that will be used to collect data.

4.2.4 Step 4: Collect the secondary data

As shown in Figure 4.1, the fourth step in the research process is to collect the secondary data. Secondary data refers to data that has already been gathered for

other purposes other than the current research (Wiid & Diggines, 2015:43). There are a wide range of methods that can be used to collect data. Therefore, it is very important to identify the correct method of data collection depending on the research study being undertaken. Data collection methods can be classified as either primary or secondary based on various dimensions. The following diagram shows the classification of data sources.

Figure 4. 3 : Data Sources



Source: Adapted from (Wiid & Diggines, 2015:94)

Primary and secondary data sources will be discussed below.

4.2.4.1 Secondary data

As shown in Figure 4.3, data sources are categorised into two, namely; primary data and secondary data. Secondary data is historical data that has already been gathered either by an organisation or external providers for a particular research (Wiid & Diggines, 2015: 43). Secondary data can be obtained from various sources including websites, published journals, conference papers, books, research reports among others (Habib et al., 2014:4). Secondary data has the following advantages and disadvantages as shown on Table 4.1 below:

Table 4. 1: Advantages and disadvantages of secondary data

Advantages	Disadvantages
Data is immediately available	No secondary data is available for the specific problem
It is very cost effective to collect	It may not be relevant to the problem at Hand
Research can be collected confidentially	Data can be inaccurate and may contain sources of error
The answer to the research problem can be provided	It may not be sufficient to make a decision or solve a problem
Alternative primary research methods and potential problems can be identified	Secondary data can expire (date) quickly in a fast-paced environment
Background information can be Provided	It can use a different measure
Sample frame can be provided	Different sources can be used to define and classify definitions differently

Source: Adapted from (Wiid & Diggines, 2015:84; Hair et al., 2015: 119)

Table 4.1 above show the advantages and disadvantages of using secondary data as a source of gathering information. Secondary data sources can be classified as internal or external. Internal secondary data is collected by an organisation in the course of its normal business transactions. Examples of internal data sources include; sales invoices, sales reports, internal research surveys and many others (Wiid & Diggines, 2015:85). External data is found in sources outside the organisation and it comprises of reports and bulletins published by government departments, semi government bodies, syndicated services and other published sources (Wiid & Diggines, 2015:85). It is important and highly advisable that the researcher considers the advantages and disadvantages of both primary and secondary data as illustrated in Table 4.1 before deciding on the type of data to use for the research.

Cant (2014:72) suggested that all research should start by doing an in-depth analysis of secondary data as it is cheaper and faster to obtain than primary data. This suggestion was also supported by Wiid & Diggines (2015:84) who reiterated that the

first step in data collection is to determine whether secondary data already exists in order to solve the problem at hand and if the researcher's needs are not fully satisfied by the available secondary data sources then further research will need to be conducted. Thus, the current study began with an in-depth review of available relevant literature in the form of secondary data. Various external secondary sources such as the internet, academic journals and textbooks were consulted in this current research study. These sources helped in understanding results of previous researches, developed theories and patterns in order to develop relevant constructs appropriate for the current study. A literature review was then completed using the researched secondary data (See Chapter1, 2 & 3) from academic journals, articles, previous dissertations and text books. However, the review of literature could not fully address and satisfy the research objectives of this study hence primary data needed to be collected.

4.2.4.2 Primary data

As shown in Figure 4.3 primary data is one of the method used to collect data. Primary data refers to data that is collected and used exclusively in order to solve the research query at hand (Cant & Van Heerden, 2018: 136). In other words it is the type of data obtained directly from the target population through fieldwork in order to solve a specific problem at hand (Habib et al., 2014:4). As mentioned earlier, primary data need to be collected if secondary data does not provide sufficient information to solve the research problem. Primary data is also known as "raw data" and can be in the form of numbers, figures, ranks, weights, text and other similar response forms. Qualitative and quantitative researches are the main research approaches that can be used in the collection of data.

- **Qualitative research**

Qualitative research is defined as "... the collection, analysis and interpretation of data that cannot be meaningfully quantified and summarised in the form of numbers" (Wiid & Diggins, 2015:95). Qualitative research seeks in-depth open-ended responses with a major objective of getting respondents to speak freely about a chosen subject and to obtain information as much as possible (Cant, 2014:71). It relies on detailed description by respondents to gain insight into a particular problem and is concerned

with the individual's personal experiences of the problem under study (Habib et al., 2014:9). Qualitative research typically investigates phenomena in an in-depth and holistic fashion, through the collection of rich narrative materials using a flexible research design (Polit & Beck, 2014:389). Qualitative research is useful when examining people's attitudes, perceptions, motivation and understanding of a problem (Wiid & Diggines, 2015:95). One of the common characteristics of qualitative research is that data is in the form of words and images (Kuada 2012:118). Qualitative data can be collected through focus groups, in-depth interviews, projective techniques and many others. These are briefly discussed below.

Focus groups: Focus group discussions also known as "group interviews" or "group discussions" refers to a form of qualitative research in which a group of people are asked about their perceptions, opinions, beliefs and attitudes towards either a product, service, concept, idea or packaging among others (Roller & Lavrakas, 2015:104). Focus group discussions are normally moderated and led by a trained facilitator who sets the agenda and poses an initial set of questions to participants, making sure that ideas and experiences of all participants are represented and attempts to build a holistic understanding of the problem based on participants' comments and experiences (Bhattacharjee, 2012:40). Focus group discussions can be conducted through online, telephone or face-to-face (Roller & Lavrakas, 2015: 114).

In-depth Interviews: In-depth interviews are relatively unstructured extensive interviews in which the interviewer asks many questions and probes for in-depth answers (Wiid & Diggines, 2015:103). Questions for discussion develop spontaneously as part of the natural interaction between the interviewer and the respondent. The interviewer guides and motivates the respondent to participate and stimulate discussion by giving hints of the subject in question. The main advantage of using in-depth interviews is that it gives an opportunity to probing where greater detail and insight can be obtained from the respondent especially when addressing more complex issues (Wiid & Diggines, 2015:104). However, proper planning is needed for the interviews to be effective.

Projective techniques: Projective techniques refers to an indirect method of questioning that enables a respondent to project beliefs and feelings onto another person, object or situation (Wiid & Diggines, 2015:105). Projective techniques are used to explore respondent's feelings, attitudes and motivations in more detail than

can be achieved through face-to-face questioning or discussion. Projective techniques are designed to uncover the respondent's hidden feelings, opinions or beliefs that cannot be expressed verbally. The most commonly used projective techniques are association techniques, completion techniques, construction techniques and expressive techniques.

In order to collect data using the above discussed qualitative research methods, there is need for face to face contact with responses which might be time consuming and expensive to implement. Due to the geographic dispersion of the target audience and limited budget, qualitative research was not chosen for this study. The next section discusses quantitative research.

- **Quantitative research**

Quantitative research methods primarily rely on the collection and analysis of numerical data in the study of social phenomena (Frey, 2018). It pursues structured and quantifiable responses which highly rely on numbers, measurement and calculations (Ngambi et al., 2013:134). The purpose of quantitative research methods is to determine whether the predictive generalisations of a theory holds true (Habib et al., 2014:8). The current research is quantitative in nature as it aims to collect individual students' perceptions of the Tablet PC and analyse them in figures and numbers. Observations, surveys and experiments are the common data collection methods in quantitative research. These methods are explained below:

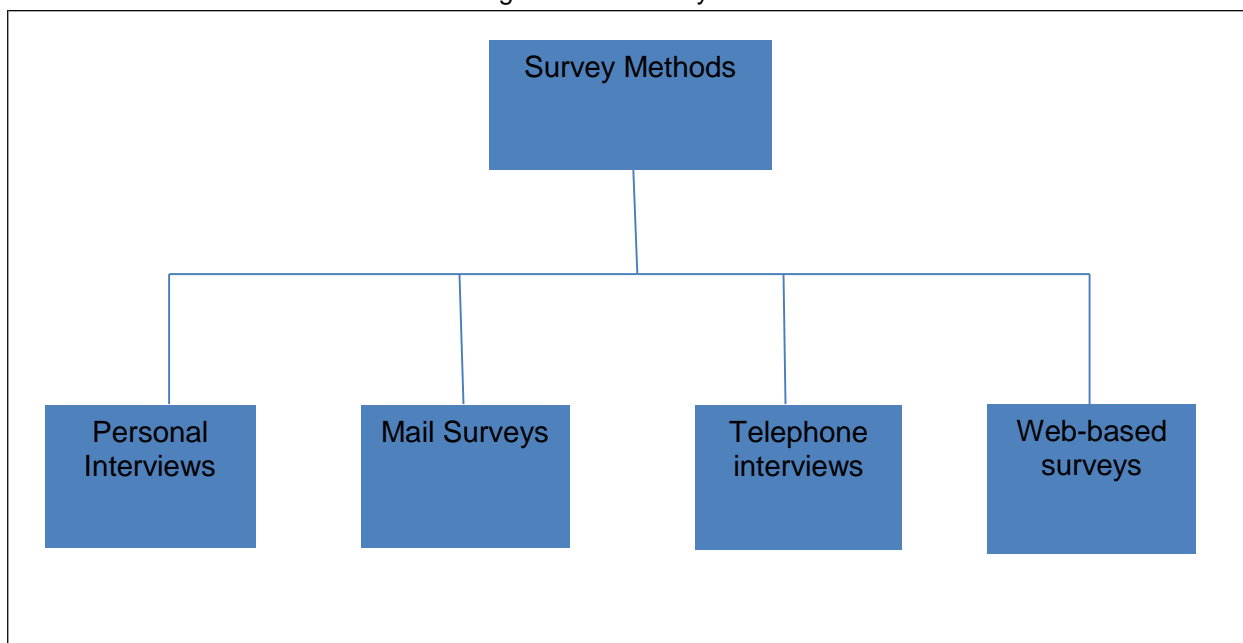
Observations: Observation occurs when people and situations are observed by means of human or mechanical methods. For example a researcher can observe or monitor the behaviour of customers as they visit a particular shop at a certain period of time and record the data.

Experiments: An experiment can be defined as "... a research investigation in which conditions are controlled so that an independent variable can be manipulated to test a hypothesis about a dependent variable" (Wiid & Diggines, 2015:142). In an experiment, data is collected in a natural setting or artificial one such as the laboratory by means of surveys or observations. In the natural setting or field the independent variables are manipulated under as many conditions as the practical ones. Whilst in laboratory experiments human beings are the test units who participate in the activity

under certain conditions and are aware that they are being observed.

Surveys: Surveys are the most common methods used in gathering primary marketing information. A survey can be defined as a research strategy that involves the structured collection of data from a sizable population (Wiid & Diggines, 2015:116). Surveys involve collection of data from selected individuals or respondents by use of a questionnaire which can be administered through either telephone, personal, mail or web-based/Internet method (Wiid & Diggines, 2015:116). The major aim of using a survey is to obtain valid data that accurately represent a predetermined population (Frey, 2018).

Figure 4. 4 : Survey methods



Source: Adapted from (Wiid & Diggines 2015:117; Cant, 2010:87)

Personal Interviews: Personal interviews or surveys takes place face-to-face and the interviewer asks the respondent/s certain questions on a specific subject (Wiid & Diggines, 2015:21). Personal surveys can either be conducted through door-to-door, mall intercepts or executive interviewing (Wiid & Diggines, 2009:112). Extensive communication between the interviewer and the respondent is normally encouraged. Personal interviews are usually conducted in the respondent's office or home, in a shopping centre or in a centre with central research facilities. The interviewer can use structured or semi-structured questionnaire or the interview can be unstructured.

Electronic instruments such as tape recorders can be used to record the interview between the interviewer and the respondent. According to Wiid & Diggines (2015:123-124) the advantages and disadvantages of personal surveys are discussed below:

- Personal contact
- Use of visual material
- Opportunity to explain
- Low literacy levels required
- Sample is more representative
- More lenient than other methods

The disadvantages of personal surveys are that they are very expensive as travel, accommodation, remuneration of interviewers among others need to be met. When using personal interviews there is need to train interviewers, some respondents can be widely dispersed geographically and not all respondents will be accessible or available during the interview period and also intensive control is highly essential as the interviewer has to make sure that he/she follows instructions and to ensure that the questionnaire is completed by the targeted individual (Wiid & Diggines, 2015:124).

Mail surveys: Mail surveys are used to post or send a questionnaire to the respondent by posting the questionnaire to the respondent's physical address. The respondent completes the questionnaire by answering the asked questions and returns the questionnaire to the researcher within a specific time period and relevant method as suggested by the researcher. Mail surveys are the cheapest method of collecting survey data and a large geographic area can be covered at a low cost. However, mail surveys are normally associated with low respondent rates which may be caused by low literacy levels or ignorance of respondents since the researcher has no control over whether the correct person completes the questionnaire and an accurate mailing list is required to ensure that the questionnaire reaches the correct respondent (Wiid & Diggines, 2015:128).

Telephone interviews: Telephone interviews are surveys conducted using a land line telephone, a cell phone or computer-aided telephone known as CATI where the interview can be recorded manually or electronically using the computer to capture responses (Wiid & Diggines, 2015:124). Telephone survey tend to be the best

method to use if data is immediately required. It is relatively cheaper than personal interviews, has high response rate and respondent's literate levels are not important when conducting telephone surveys. However, telephone interviewing has its own drawbacks which include asking a limited number of questions to avoid costs and irritation of the interviewees, only people with phones can be reached and also needs the respondent to be highly committed in answering interview questions (Wiid & Diggines, 2015: 127).

Web-based surveys: Can also be referred to as online surveys. Web-based surveys use either the e-mail or the internet to administer the questionnaire. Web-based surveys are normally used when respondents are online for example on Facebook, Google mail, Twitter or LinkedIn. Respondents in this study were sent an e-mail with the link to the survey over a period of four weeks from 30 May to 30 June 2019. Since the survey was based on a voluntary basis, no incentives were provided to respondents. Using web-based or online surveys has advantages and limitations.

According to Wiid & Diggines (2013: 126) the advantages of using web-based surveys are as follows:

- **Convenient for respondents:** With an online survey, respondents are able to access the questionnaire at their convenience. In this study, students were able to access the questionnaire at any time of the day as it was available 24/7.
- **Quick delivery of responses:** Online survey permitted the questionnaire to be delivered and redelivered when necessary and could be completed in a short period of time with the click of a button. Also responses and feedback from respondents were immediately recorded and captured.
- **Cost effectiveness:** When using the online survey, there was no need to train and remunerate fieldworkers, print out questionnaires and distribute them, this definitely ended up cutting as the available budget was limited. Hence, the reason why an online survey was selected in this study.
- **No interviewer bias:** Due to the fact that there are no interviewers or fieldworkers in collecting data, interviewer bias is limited with online surveys as students would just read the question and follow instructions without the command of any one.

However, web-based surveys have some disadvantages that have to be considered (Wiid & Diggins, 2013: 126).

- **Potential for sampling errors:** Respondents can choose whether they want to complete the questionnaire or not. This can attract room for sampling errors.
- **Anonymity not guaranteed:** Normally the e-mail address of a student is linked to his/her personal details and student number which if used anonymity of the respondent will not be guaranteed. However, in this study, the e-mail address of respondents and student numbers was only used to identify number of registered students. Respondents were requested to provide their personal e-mail addresses which were used to send the questionnaire and had nothing to do with their personal identifying information. Therefore it can be difficult to trace the questionnaire with the specific person who completed it.
- Online surveys can raise respondents **concerns about sending private and confidential information** via e-mail or the internet due to the high risks of internet fraud and hacking activities.
- The survey can go to junk files or spam therefore the **respondent might not be able to see it.**

The use of technology particularly the internet and mobile learning is growing every day. Many young generation and adults can spend most of their time online using mobile devices to access the internet at any time of the day. This gives a strong reason as to why web-based or online survey was chosen and used in this study.

Based on the various needs and objectives of the research, the researcher should select the most appropriate research method for the study. A researcher can either use a qualitative or quantitative research approach. The differences between qualitative and quantitative research approaches are outlined in Table 4.2 below.

Table 4. 2 Comparison between qualitative and quantitative research

COMPARISON DIMENSION	QUALITATIVE RESEARCH	QUANTITATIVE RESEARCH
Types of questions	Probing	Non-probing
Sample size	Small	Large
Information per Respondent	More	Varies
Administration	Interviewers with special skills are required	Fewer special skills required of interviewers
Types of analysis	Subjective and Interpretive	Statistical, summarisation
Hardware required	Tape recorders, projection devices, video, pictures, discussion Guides	Questionnaires, computers, printouts
Ease of replication	Difficult	Easy
Researcher training necessary	Psychology, sociology, social psychology, consumer behaviour, marketing, marketing Research	Statistics, decision models, decision support systems, computer programming, marketing, marketing research
Type of research	Exploratory	Descriptive or causal
Validity	High	Low
Data presentation	Words	Numbers
Researcher involvement	Researcher learns more by participating and/or being immersed in a research situation	Researcher is ideally an objective observer who neither participates in nor influences what is being Studied

Source: Adapted from (Wiid & Diggins, 2015: 96)

Taking the above summary into consideration, a quantitative research approach

was deemed the most appropriate as it is inexpensive and does not consume a lot of time to collect information from respondents.

4.2.5 Step 5: Select the primary data collection method

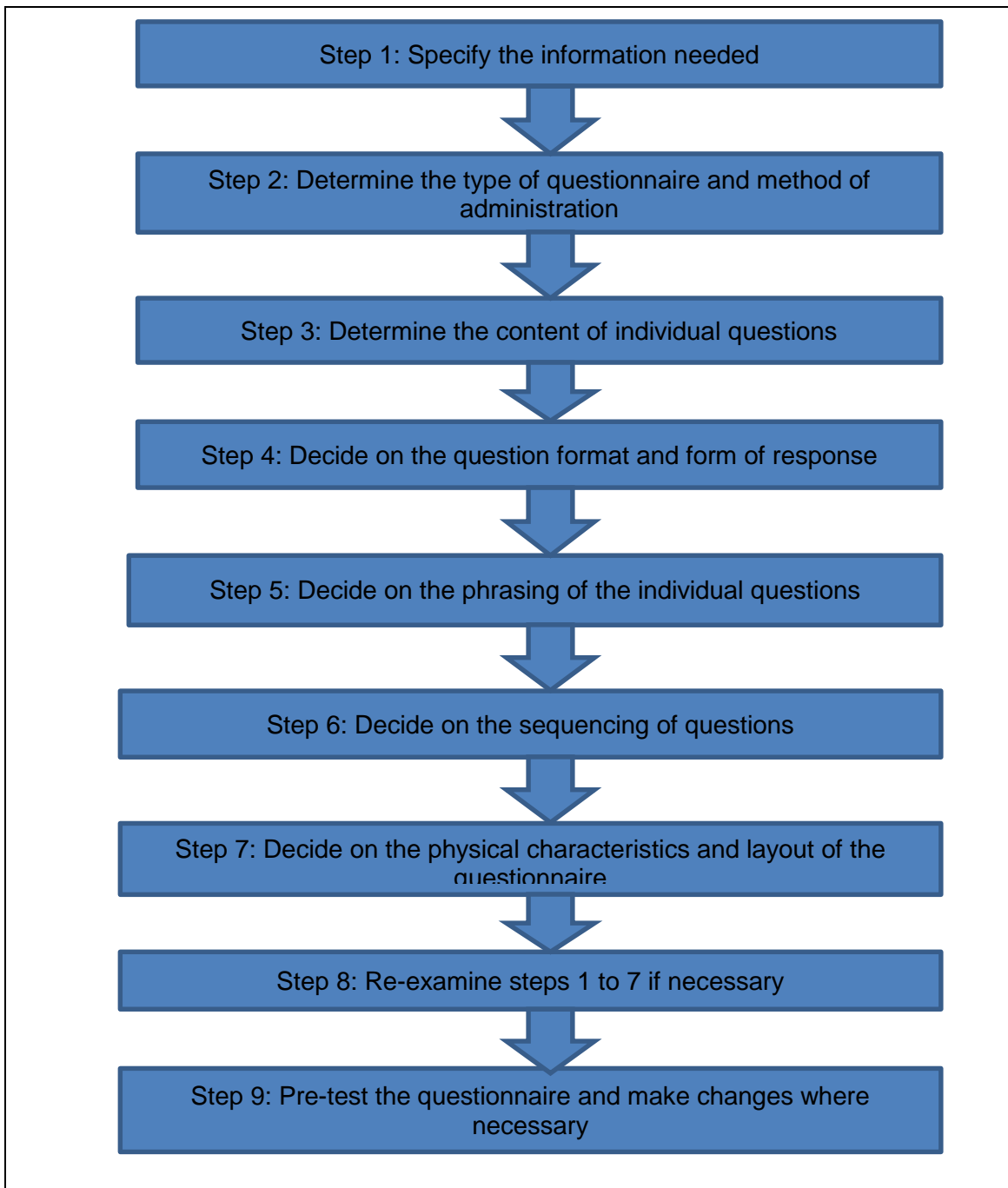
As shown in Figure 4.1, the fifth step in the research process is selection of the primary data collection method. Primary data refers to data that has not been collected beforehand and is collected to address a specific problem (Wiid & Diggines, 2015:93). As mentioned in the previous section, primary data can be collected through either qualitative or quantitative research methods. For the purpose of the current study, data needed to be collected in order to explore students' perceptions regarding the Tablet Personal Computer as a mobile learning device used for learning purposes. Therefore, quantitative data in the form of web-based/online survey was used. The next section describes the questionnaire as a data collection method chosen in this current study.

4.2.6 Step 6: Design the questionnaire

As shown in Figure 4.1, the sixth step of the research process is the design of the questionnaire. There are different types of research instruments used to collect primary data as mentioned previously in this chapter, the questionnaire being the common one. The questionnaire in this study was composed of open and closed-ended questions. The design of a questionnaire is an important step in the research process. In the current study, the purpose of the questionnaire was to explore students' perceptions regarding the Tablet Personal Computer as a mobile learning device at a graduate institute. The questionnaire used in this study was formulated in line with the research objectives mentioned in Chapter 1 and Section 4.2.2 of this Chapter.

Authors such as Wiid & Diggines (2009:172) suggested some guidelines that need to be taken into consideration when designing a questionnaire. These guidelines are illustrated in Figure 4.5. It is important to note that a review of the questionnaire takes place and changes can be made as deemed necessary.

Figure 4. 5 : Guidelines for designing a questionnaire



Source: Adapted from (Wiid & Diggines, 2009:172)

In designing the questionnaire for this study, the above summarised steps were followed. These steps are briefly explained below.

As illustrated in Figure 4.5, the first step in designing a questionnaire is to specify the information that is needed to be collected from the respondents.

The research objectives that were formulated in Step 2 of the research process

were used to identify and specify the type of questions to be included in the questionnaire. Table 4.3 below shows the secondary research objectives as outlined in Figure 4.2.2 and the questions formulated to match each objective in designing the questionnaire as they appear on the questionnaire.

Table 4. 3 Research objectives and questionnaire matrix questions

Research Objective	Question (s) asked to obtain desired Response
To explore the uses of the Tablet Personal Computer as a mobile learning device used by students to enhance learning at a graduate institute.	1. How often do you use the Tablet PC for your studies? 2. Please indicate the level of occurrence in using the Tablet PC in the given statements. Other uses: ...
To empirically identify the advantages of using the Tablet Personal Computer as a mobile learning device used by students to access learning material.	3. Please indicate the advantages that you have identified in using the Tablet PC? Other advantages: ...
To discover challenges facing students when using the Tablet Personal Computer as a mobile learning device at a graduate institute in Tshwane.	4. Please indicate the extent to which you face challenges when using the Tablet PC? Other challenges: ...
To determine the performance of the Tablet Personal Computer in terms of service quality as it is used by students for academic purposes.	5. Please indicate the extent to which you agree on the performance of the Tablet PC? Other performance: ...
To determine the pedagogical opportunities offered by the Tablet	6. Please indicate the extent to which the following issues regarding the Tablet PC can give opportunities in future.

Personal Computer as a mobile learning device.	Other opportunities: ...
To determine if students' perception of the Tablet Personal Computer varies with age, gender and years of instruction.	<p>7. What is your gender?</p> <p>8. Please indicate your current age range.</p> <p>9. Please indicate your year of study.</p>

The structure of the questionnaire was determined after establishing the information requirements shown on Table 4.3 of this chapter.

As shown in Figure 4.5, the second step of questionnaire design is to determine the type of questionnaire and method of administration. The type of questionnaire used in this study was determined by the primary data required and the selected data collection method. As mentioned earlier, there are four main methods that can be used to administer a questionnaire namely: mail, telephone, personal interview and online/web/electronic. Thus, the questionnaire for this study was administered using the web-based/ online method.

As shown in Figure 4.5 the third step in designing a questionnaire it to determine the content of individual questions. Question content refers to the general nature of the question and the information it will provide excluding its phrasing and format. Normally individual questions are formulated after deciding on the type of information needed and the data collection method mentioned in Step 1 and 2 above. Before determining the content of each individual question, answers to the following questions were sourced:

- Is the question necessary?
- Are several questions needed or only one question is enough?
- Do the respondents have the information that is needed?
- Does the question fall within the respondent's boundary of knowledge?
- Will the respondent find it difficult to answer the question?
- Will the respondent be prepared to provide the required information?

As illustrated in Figure 4.5, the fourth step in designing the questionnaire is to decide on the question format and form of response. During this step there is need to determine the structure of the questionnaire to be used. There are different types of question formats that can be used to design a questionnaire namely: structured questions (close-ended), unstructured questions (open-ended) and semi-structured questions (both open and close- ended questions). These types of questions are discussed below.

Structured questions: Also known as close-ended questions and they consist of a number of alternatives which the respondent has to choose from (Wiid & Diggines, 2009:176). Structured questions give respondents limited options and specify how the question should be answered (Zimkund & Babin 2013:272). There are different types of structured questions namely: dichotomous, multiple-choice, single response, multiple-choice, multiple response and rating questions.

Unstructured questions: These are known as open-ended questions as they allow the respondent to answer a question in his or her own words (Zimkund & Babin, 2013:272). According to Struwig & Stead (2011:92), unstructured questions allow the respondent to express his/her opinion and views using own words and such questions are useful when the researcher needs further clarification.

Semi-structured questions: These refer to a mixture of structured (close-ended) and unstructured questions (open-ended) (Masterson & Pickton, 2013:190). A combination of such questions in a questionnaire allows the respondent to display his or her responses in a favourable manner and provide a balanced set of answers to the research question.

In the current study, a semi-structured questionnaire was used. Respondents were given an opportunity to select answers from given statements as well as to add their own opinions if not presented in the given statements. The semi-structured questionnaire was composed of multiple-choice questions, single response questions,

rating questions and open-ended or unstructured questions. These type of questions are shown below.

- Likert scale:** Likert scale also known as multiple choice or single response questions provide three or more alternative responses are which the respondent is supposed to select only one answer among the given alternatives. In the questionnaire, Likert scale questions were found in **Section A** (Question 1) of the questionnaire where respondents were requested to indicate how often they used the Tablet PC for studies and **Section E**, which required demographic information such as: gender (Question 7), age (Question 8) and year of study (Question 9). These questions are seen in Annexure A of this research.

An example of these questions as they appear from the online survey is as follows:

How often do you use the Tablet PC for your studies? Please click the appropriate box?

Never	1	
Rarely	2	
Sometimes	3	
Often	4	
Always	5	

- Rating questions:** These types of questions asks the respondent to rank or position each given item on a scale or sequence in terms of preference, dislikes, importance and size (Wiid and Diggines, 2009: 178). Ranking questions were used in various sections of the questionnaire. **Section A** (Question 2) indicated the level of occurrence in using the Tablet PC, **Section B** (Question 3) required respondents to indicate the advantages they get from using the Tablet PC, **Section B** (Question 4) requested students to indicate the challenges they face when using the Tablet PC, **Section C** (Question 5) required respondents to indicate the overall performance of the Tablet PC and lastly **Section D**

(Question 6) required students to indicate the extent to which pedagogical opportunities are offered by the Tablet PC in future See (Annexure A).

Examples of rating questions from the research questionnaire used are as follows:

... please indicate the advantages that you have identified in using the Tablet PC in the given statements below.

Item	Statement	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
3.1	The Tablet PC allows me to easily access study material on and off campus	1	2	3	4	5

Item	Statement	1 (Not to any extent at all)	2 (To a little extent)	3 (To some extent)	4 (To a large extent)	5 (To a very large extent)
6.1	The Tablet PC strengthens my learning Experience	1	2	3	4	5

With reference to the attached questionnaire on Annexure A, *unstructured questions* were found on Section A (Question 2.19), Section B (Questions 3.19 and 4.16), Section C (Question 5.20) and Section D (Question 6.15). These open-ended questions required respondents to provide their own perceptions, opinions and insights that were not presented in the close-ended questions.

Examples of unstructured questions from the questionnaire on Annexure A are as follows:

2.19	Other uses: Please click the relevant button and specify below
------	--

3.19	Other advantages: Please click the relevant button and specify below
------	--

4.16	Other challenges: Please click the relevant button and specify below
------	--

As shown in Figure 4.5, the fifth step of questionnaire design is the phrasing of the individual question. This step comes after deciding on the content and the final structure of the questions. Wiid & Diggins (2009:179) emphasised on the following guidelines to use in phrasing the questions:

- Use of simple words familiar to everybody
- Avoid ambiguous words and questions
- Avoid leading questions that indicate the answer
- Avoid presumptive questions and assumptions
- Avoid generalisation and pose the question in specific terms
- Avoid two-fold questions

These guidelines were taken into consideration and the questionnaire was adapted accordingly.

As shown in Figure 4.5, the sixth step in designing the questionnaire is to decide on the sequencing of questions. Sequencing of questions comes after deciding which questions to include in the questionnaire and how the questions will be phrased. The sequence of questions in a questionnaire affects the quality of responses given by respondents especially when sensitive issues are being dealt with. The sequencing or placement of questions such as demographic questions remains a debatable topic among researchers. Some researchers believe that placing demographic questions at the end of the questionnaire reduces the fatigue of respondents since they are easy to answer. Some researchers claim that placing demographic questions in the

beginning of the questionnaire arouses interest in the respondent to answer the questions since they are easy and non-threatening to answer. In the attached questionnaire (Annexure A), a *funnel method* of arranging questions was used. The funnel method permits the questionnaire to begin with asking more specific and important questions that contributed in exploring students' perceptions and ended by placing non-threatening demographic questions at the end of the questionnaire (See Annexure A).

As shown in Figure 4.5, the seventh step in designing a questionnaire is to decide on its physical characteristics and layout. The physical characteristics and layout of the questionnaire is very important as it may confuse respondents and result to unanswered questions. As shown on Appendix A, the research questionnaire has been attached in the exact manner in which it appeared on Lime Survey. The first page of the questionnaire was written on the UNISA letterhead. The survey began by a brief introductory statement of the researcher followed by basic guidelines and general information regarding the study. This page informed the respondent about the benefits of the research, expected time to complete the questionnaire, that participation was voluntary and no incentives were given upon completing the questionnaire, that the questionnaire was anonymous, that the responses will only be used for academic purposes and the contact details of research supervisors were provided in case the respondent had questions or queries regarding the research. The introduction screen also acted as an informed consent form from which the respondent would follow the instruction of clicking the next button placed on the bottom right of the screen to begin answering the questionnaire and to move on to the next page. In an attempt to make the questionnaire appear shorter, questions in the same section were configured and structured to appear on one screen.

Respondents were always able to see how they were progressing with the questionnaire as Lime Survey showed a progress percentage bar on top of the screen of every page. Clear instructions to respondents were also given to guide the respondent in selecting the desired response, how to add additional information and on how to save and proceed with the questionnaire at another time. The last page of the questionnaire showed a submit button which the student would click in order to submit the completed questionnaire. The questionnaire concluded by thanking the respondent in completing the survey. The concluding remarks gave the respondent

an idea of being a very important and valuable individual.

As illustrated in Figure 4.5, the eighth step in designing a questionnaire is to re-examines the rough draft done. During this step, the questionnaire is reviewed paying particular attention to the question content, phrasing, instructions, format and the sequence of the questions. This means the questionnaire is assessed to check its compliance with the design guidelines. The rough draft of this questionnaire was revised by the academic supervisor and the statistician before it was pre-tested. Upon reconsideration, the questionnaire was then pre-tested.

As shown in Figure 4.5, the last step in designing the questionnaire is pretesting and making necessary changes. Pre-testing refers to the rehearsal or testing of the research instrument before it is fully put into practice in order to detect and solve problems before a standardised set of procedures are finalised (Willis, 2016:359). During pre-testing, all the aspects of the questionnaire was tested including wording, sequence and layout. In the current study, pre-testing of the questionnaire was done to a similar characteristic group with a reasonable number of students as discussed with the statistician and the supervisor. Respondents were asked to highlight unclear questions and the ones they had problems in understanding. This allowed the researcher to eliminate and correct ambiguous, confusing or difficult statements, questions and words that would have led to misinterpretation and misunderstanding of questions by respondents. The questionnaire was revised and adapted accordingly.

The final questionnaire was sent for ethical clearance and was approved by UNISA's CEMS ethics committee after which it was prepared and activated on Lime survey on 30 May to 30 June 2019. The full questionnaire, as it appeared on Lime Survey, is attached in **Annexure A**. The next step in the research process is discussed below.

4.2.7 Step 7: Design the sample plan

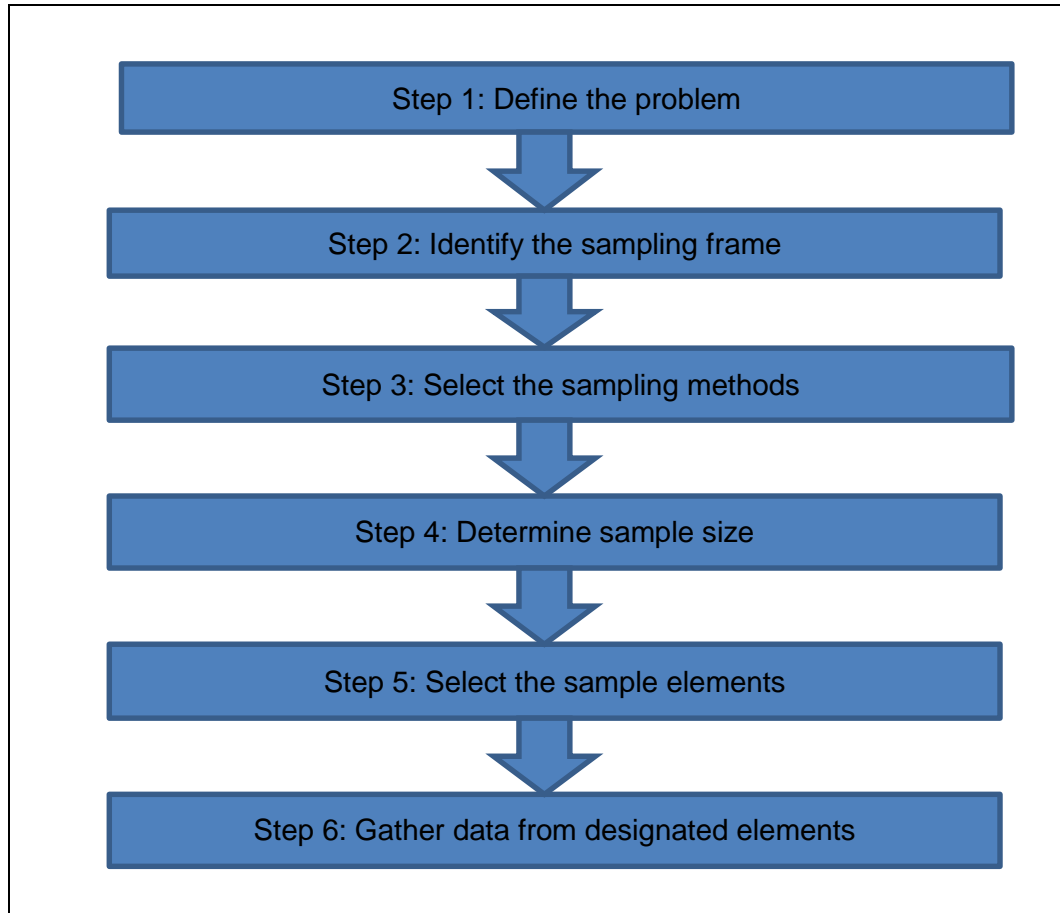
As depicted in Figure 4.1, the next step after designing the questionnaire is to design the sample plan. Sampling is the statistical process of selecting a subset called a "sample" from a population of interest for purposes of making observations and statistical inferences about the population (Bhattacharjee, 2012: 65). In other words it

is the process of selecting a portion of the population to represent the entire population (Polit & Beck, 2012:742). It is extremely important to choose a sample that is truly representative of the population so that the inferences derived from the sample can be generalised back to the population of interest. During the sampling process, the researcher identifies the individuals or respondents who will participate in the research known as the 'target population'. Normally, the requirement is that the sample must be as representative of the population as possible (Wiid & Diggines, 2015:44).

There are a number of sampling processes suggested by various authors. Wiid & Diggines (2015:206) identified six basic steps in the sampling process. The first step is to define the population followed by identification of a sampling frame, selection of the sampling method/s, determination of the sample size, selection of the sample elements and lastly gathering of data from designated elements. Daniel (2015: 512) suggested a number of steps to follow when conducting sampling. In the first step the researcher has to prepare to make selection of study elements. This is followed by the second step where the researcher has to choose between selecting the entire target population and selecting a subset of the target population. The third step is to choose a major type of sample design to use probability, non-probability or mixed methods. In the fourth step the researcher chooses a sub-type of the non-probability, probability or mixed methods sample design that was selected in the third step. This will be followed by the fifth step of determining the sample size. Lastly, the researcher will need to select and recruit the sample.

According to Nishishiba, Jones and Kraner (2014) there are three critical steps which a researcher need to follow in sampling. The first step is to identify the sampling frame followed by identification of the correct sample size and finally identification of appropriate sampling technique. However, for the purpose of the current study, the sampling process will be discussed as set out by Wiid & Diggines (2015:185) as it gives the researcher clear, quick and easy steps to follow when conducting the sampling process. The sampling steps are illustrated below:

Figure 4. 6: Sampling process



Source: Adapted from (Wiid & Diggines, 2015:185)

The sampling steps illustrated in Figure 4.6 above are briefly discussed below.

As depicted in Figure 4.6, the first step of the sampling process is defining the population. A population refers to the entire group of people or objects that is of interest to the researcher and which meet the criteria they are interested in studying (Van der Walt, Rensburg and Hildegard, 2018:116). It is from the study population that the target population is extracted. The target population consist of a comprehensive number of individuals, units or items that can become objects for observation (Wiid & Diggines, 2015:188). In other words, the target population is the total number of people in which the researcher would like to gather information and make conclusions from. The target population for the current study was undergraduate students

registered with Richfield Graduate Institute of Technology (RGIT) at a BEMS campus in the city of Tshwane. Richfield Graduate Institute of Technology is one among other private higher education institutions in South Africa which took the initiative to introduce the Tablet Personal Computer (PC) as a mobile learning device to its students in 2012 to date.

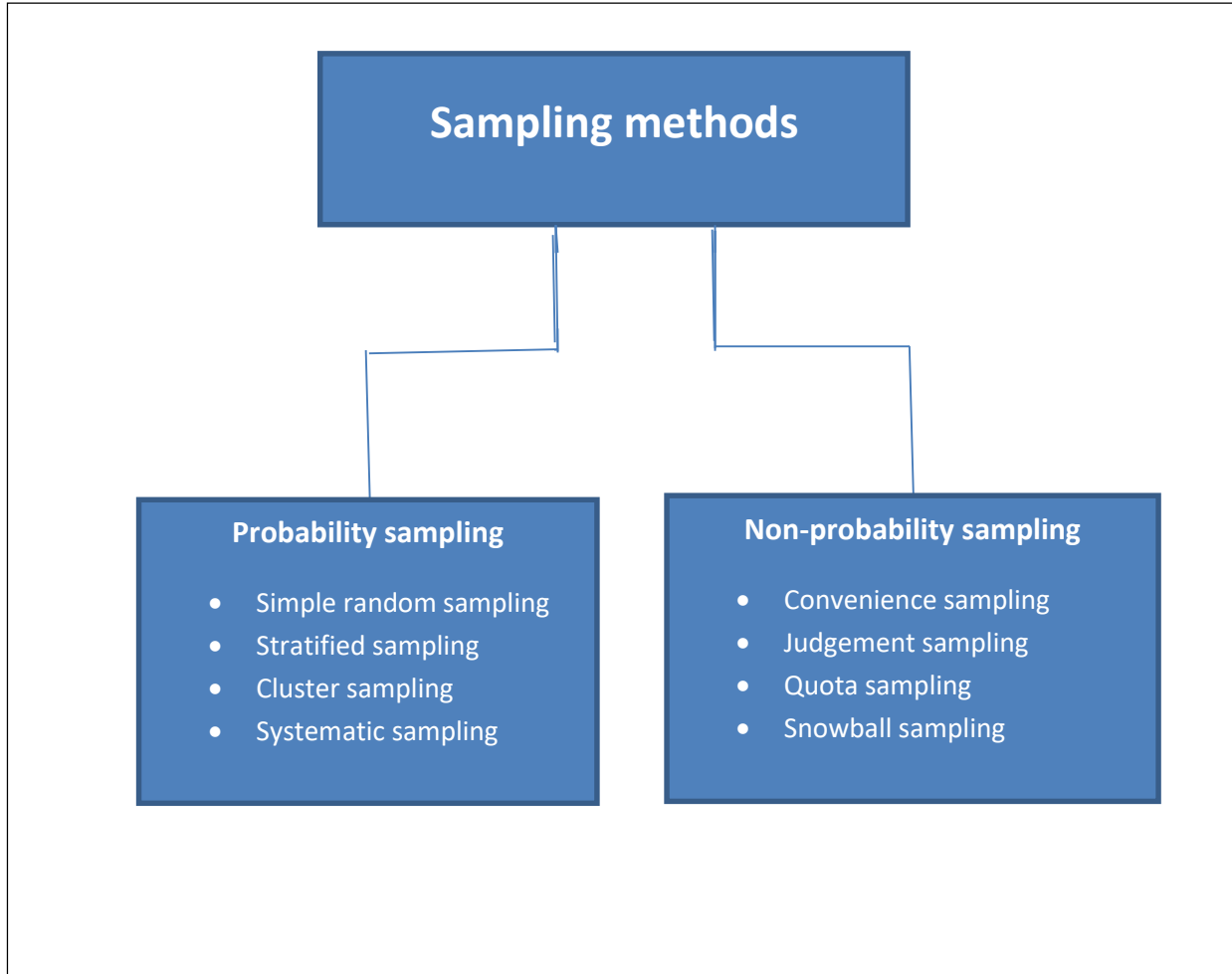
As illustrated in Figure 4.6, the second step of the sampling process is identifying the sampling frame. A sampling frame refers to a comprehensive list of the sampling elements in a target population (Van der Walt et al., 2018:117). The sampling frame may be in the form of a list, an index or any population record (Wiid & Diggines, 2015: 188). The sampling frame must be accessible and the information must be arranged in such a way that the sample can easily be drawn from it. It is from the sample frame that the actual research population is drawn. Sample frames are divided into various categories which are;

- 1) Computerised registers of names and addresses for example the registers of the Bureau for Marketing Research
- 2) Address directories, buyer's guides and yearbooks that are published by trading concerns
- 3) Membership lists of organisations

In the current study, a computerised register of all full-time undergraduate students registered at the BEMS campus in Tshwane was used. Students willing to participate in the survey were requested to provide their updated personal e-mail addresses for the administration of the questionnaire.

As shown in Figure 4.6, the third step of the sampling process is selecting the sampling methods. Sampling refers to the process of selecting the sample from a population in order to obtain information regarding a phenomenon in a way that represents the study population (Van der Walt et al., 2018: 115). Sampling methods can be divided into two major categories namely; probability and non-probability sampling. These two sampling methods are shown on the diagram below.

Figure 4. 7 : Classification of sampling methods



Source: Adapted from (Cant, 2014: 80)

As shown in Figure 4.7 above, sampling methods are classified into probability and non- probability methods. Probability sampling or non-probability sampling methods can be used in selecting participants or respondents of a study. Probability and non-probability sampling methods are briefly discussed below.

Probability sampling refers to a sampling process in which units of the population are selected individually and directly by means of a random process (Wiid & Diggines, 2015:194). There are four major types of probability sampling as shown in Figure 4.7 namely; simple random sampling, cluster sampling, stratified sampling and systematic sampling. These types of probability sampling are briefly explained below.

Simple random sampling: Simple random sampling is a probability sampling procedure which allows participants to be drawn and listed separately in a random way from the sampling frame giving each participant an equal chance of being included in the sample (Van der Walt et al., 2018:119).

Systematic sampling: Systematic sampling is a type of probability sampling which involves the selection of participants at equal intervals such as every fifth, eighth or twentieth participant (Van der Walt et al, 2018:121). In systematic sampling the first element has a known chance of being selected but the remaining elements are dependent on which element was selected first (Cant et al., 2013:171). Systematic sampling is easier and convenient to use especially if a list of participants (sampling frame) is available. The next section discusses non-probability sampling as a sampling method.

Stratified random sampling: In Stratified sampling the population is divided into subgroups or strata according to a variable/s of importance to the study so that each element of the population belongs to one stratum (Van der Walt et al., 2018:122). Random sampling will further be performed within each stratum using either simple or systematic sampling technique. Population characteristics such as age, gender, educational level and income are some of the examples that may require the use of stratified sampling.

Cluster sampling: Cluster sampling involves the grouping of large scale studies where the population is geographically widespread, sampling procedures are difficult to conduct and where it may be impossible or difficult for the researcher to obtain the total listing of some populations (Van der Walt et al., 2018:124). The major advantage of cluster sampling is the ability to save time and costs especially when the population is large and geographically dispersed compared to other probability sampling techniques. However, cluster sampling is associated with more sampling errors especially in the first stage and handling of statistical data from cluster samples tends to be complex.

In non-probability sampling, the probability that a specific unit of the population will be selected is unknown and cannot be guaranteed (Wiid & Diggines, 2015:191). This means, non-probability sampling may or may not accurately represent the study population. Non-probability sampling, relies on personal judgement of the researcher

to select the sample (Cant et al., 2013:165). However it is more convenient and economical and allows for the study of populations where probability sampling does not qualify (Van der Walt et al., 2018:124).

As depicted in Figure 4.7, there are four major types of non-probability sampling methods namely; convenience, judgement snowball and quota sampling. These methods are briefly discussed below.

Convenience Sampling: Also referred to as accidental or availability sampling and involves the selection of readily available participants for the study (Van der Walt et al., 2018:125). Participants to the study are normally considered in the sample because they happen to be at the right place and right time of data collection. Only those people who are at the same place at the same time as the researcher stand a chance of being selected for an interview. Convenience sampling method is particularly useful in exploratory research in which ideas and insight are more important than scientific objectivity (Wiid & Diggines, 2015:192).

Judgemental Sampling: Judgemental sampling also known as purposive sampling is a type of non-probability sampling which is based on the researcher's judgement regarding participants that are knowledgeable and representative of the study phenomenon (Van der Walt et al., 2018:126). Judgemental sampling is commonly used in qualitative research studies where the researcher might not be aware of the total number of participants needed in advance for the research, hence sampling continues until data saturation is reached.

Snowball Sampling: Snowball sampling is a type of non-probability sampling that involves the assistance of study participants in obtaining other participants especially where it is difficult for the researcher's access to the population is restricted (Van der Walt et al., 2018:127). When conducting snowball sampling, the researcher deliberately selects a number of respondents with the specific required characteristics and these respondents are then used as informants to identify other individuals with the same characteristics.

Quota Sampling: Quota sampling is a combination of convenience and judgement sampling. Its purpose is to draw a sample with the same proportions or characteristics as the entire population (Van der Walt et al., 2018: 125). With quota sampling method, no sample frame is necessary for selecting respondents. If a respondent

who meets the criteria is not available, the interviewer simply interviews the next available respondent.

Based on the above discussion, the sample for this study was drawn from the target population using non-probability sampling method in the form of convenience sampling. The questionnaire was sent to respondents using their personal email addresses with an invitation to participate in the survey. Respondents who gave their consent to participate in the survey were sent the online survey for them to access and complete it at their convenience.

As illustrated in Figure 4. 5, the fourth step in the sampling process is determination of the sample size. The sample size of a study population can be determined by blind guessing or statistical formulae (Wiid & Diggines, 2015:203). With blind guessing, judgement and intuition are applied whilst statistical formulae is based on three factors namely, the required level of confidence, the required precision and the standard deviation. In determining the sample size, Raosoft sample size calculator was used (www.raosoft.com/samplesize.html). Confidence level of 95%, with 5% margin of error and a total population size of 277 was used to get a sample size of 162. Of the 277 undergraduate students invited to participate in the survey, 174 respondents accessed the questionnaire. When checked for outliers and missing data, a total of 169 responses qualified for data analysis. The next section briefly describes the fifth step in the sampling process.

As shown in Figure 4.6, the fifth step of the sampling process is the selection of sample elements. This step of sampling involves the selection of respondents. As discussed earlier, the sample was drawn using probability sampling and respondents were selected using simple random sampling method. The sample elements were the individual undergraduate students. The sampling frame was the database of all full-time undergraduate students studying at the BEMS campus in Tshwane.

As shown in Figure 4.6, the sixth step of the sampling process is gathering of data from designated elements. This is the last step of the sampling process and also the 8th step of the research process where the researcher gathered data from the target population. The students were informed of when the questionnaire would be open online one week before the commencement of the survey. The online questionnaire

was available online from 30 May to 30 June meaning the respondents were able to complete the survey anywhere and at any time of the day during this period.

Before the questionnaire was administered online, every participant was sent a consent form stipulating the purpose of the study in brief, the period and anticipated length in time taken to answer the questionnaire, the reward if any to be given to participant and when it will be given, benefits of the research as well as the handling of information and the option to withdraw from the study.

4.2.8 Step 8: Conduct the investigation

As shown in Figure 4.1 of the research process, the next step after designing the sample plan is to conduct the investigation. The investigation or fieldwork therefore entails the actual collection of the primary data from the target population (Wiid & Diggins, 2015:44). Before any research is conducted, the researcher needs to apply for ethics approval by the ethics review committee. Proper guidelines have to be followed by the researcher in the application process before permission is granted. According to the University of South Africa Policy on Research Ethics (2013:5), researchers should not engage in discriminatory, harmful or exploitative practices or harassment of participants. Participants' identities should not be disclosed to anyone but will strictly be used for the purpose of the research. All data collected from respondents need to be handled with confidentiality.

- **Ethical considerations**

According to the University of South Africa Policy on Research Ethics (2016) the researcher has an obligation to refrain from violating the integrity of participants. Participants are not supposed to be harmed, embarrassed, ridiculed or subjected to discomfort. All data and participants personal identities will be confidentially handled and will not be disclosed to anyone except for the purpose of the research.

Before the research was conducted, the researcher sent an application to the institution under study (Richfield Graduate Institute of Technology) requesting for permission to conduct research. Permission to conduct research was granted by the Faculty dean head of research (See Annexure C). The second application was sent to the UNISA research ethics committee CEMS (College of Economics and

Management Sciences) for ethical clearance since this study deals with human participants there was a need for the researcher to ethically gather data and keep participants information confidential. The research ethics document explained the study in detail. The research was ethically cleared by UNISA CEMS ethics committee (See Annexure B).

After obtaining ethics approval, the developed questionnaire was converted into an electronic web-based survey using Lime survey and an invitation letter to participate in the online survey was sent to full-time undergraduate students registered at a local college in the city of Tshwane through their personal e-mails. The e-mail invitation briefly provided information such as; the purpose of the study, the name and affiliation of the researcher, contact details of the researcher and the academic supervisor should there be any queries or questions. During the data collection period, two e-mails were sent to respondents reminding them to undertake the survey if they had not done so.

4.2.9 Step 9: Prepare and process the primary data

As shown in Figure 4.1, the next step after conducting the investigation is to prepare and process the primary data. In order to prepare and process raw primary data into useful information, it has be coded, cleaned, captured and verified. The preparation and processing of raw primary data needs to be done immediately after collecting all the responses from the survey. Incomplete questionnaires were not considered for further analysis due to incomplete information. A total number of 174 questionnaires were captured and five of them were complete with “Missing values”. Therefore, they were not considered for further analysis (See Chapter 5). The preparation and processing of data for analysis included capturing, cleaning and storing before analysing it. Raw data was automatically recorded and captured into an excel sheet through Lime survey therefore there was no need for the coding process as it was automatically done.

The process of capturing, cleaning and storing of data differs when it comes to online surveys. According to Wiid & Diggins (2013:231), the first step in preparing data from web-based questionnaires is verifying and cleaning the data into SPSS. This is followed by the cleaning process which consists of removing values that fall out of the

scale code and data remaining. These steps were adapted accordingly. In order to identify errors in the data sheet, minimum and maximum values, frequencies and means were calculated on each variable. After detecting possible errors, missing values and checked for outliers and dealt with them, relevant data (completed questionnaires) was now ready for analysis.

4.2.10 Step 10: Analyse the primary data

As shown in Figure 4.1, after preparing and processing the data the researcher's task is to analyse the primary data. During this step, the processed data is analysed and converted to relevant information for decision making (Wiid & Diggines, 2015:45). Data analysis can be described as a systematic procedure where respondents' views are grouped together to establish significant findings within a group of data (Quinlan, Babin, Carr, Griffin and Zimkund, 2015). Once data is collected, it is validated, edited, cleaned, coded and tabulated in order to facilitate the processing of results into meaningful information (Wiid & Diggines (2013:36). In this study, data from a web- based survey was automatically captured through Lime survey and entered into Microsoft Excel 2016 spread sheet and then exported into SPSS 24 for analysis.

Collected data was first screened for outliers and missing data. Some quality checks were also conducted such as uncommon variations in the data. In order to achieve normality in the data, the central limit theorem was applied. The central limit theorem postulates that " as the sample size gets large enough, the sampling distribution of the mean is approximately normally distributed" (Levine, Szabat and Stephan, 2016: 255). This is true regardless of the shape of the distribution of individual values in the sample population. A total sample used for statistical analysis in this study was 169, thus normality was achieved.

In this study, various statistical methods and techniques were used to analyse the quantitative data collected from the questionnaires. These methods of analysis include reliability analysis, descriptive statistics, frequency distributions, measures of central tendency and dispersion, factor analysis, inferential statistics in the form of one way Analysis of Variance (ANOVA), independent t-tests and correlation analysis. These analysis methods are discussed in the following sections.

4.2.10.1 Reliability analysis and Validity

Reliability refers to "... the consistency of the measurement that is, the extent to which the measures are free from errors" (Frey, 2018). In other words it is the degree to which a measurement yields the same results if repeated (Leedy & Ormrod, 2015). It is important to note that sound research depends on reliable and valid measurements. Reliability is a measure of internal consistency for example in a questionnaire, reliability is measured by evaluating the data collection exercise to see if it collected data which is deemed dependable, consistent and adequate for statistical analysis. According to Hair et al., (2014), internal consistency is a measure of inter-relationship of scale items. If a number of scale items measure the same construct, it is expected that all those scale items should be correlated with each other. Hence, low measures of correlation indicate low internal consistency within the scale items. In such a case, the scale items may need to be investigated for errors.

In quantitative research, internal reliability is concerned with whether all research variables are measuring the same aspect (Salkind, 2018). The basic idea of reliability in quantitative research is ensuring that a measurement is consistent (Jordan & Hofer, 2001). Furthermore, in a quantitative research study, statistical instruments can be used to test the reliability of a measurement (Jordan & Hofer, 2001; Tashakkori & Teddlie, 2009). Cronbach's coefficient alpha (α) was used to measure the reliability of the questionnaire in this study. According to the guidelines by Manerikar & Manerikar (2015) Cronbach's alpha values of 0.8 or higher are considered as high reliability (excellent), those between 0.70 and 0.80 are regarded as having good reliability (low-stakes testing), values between 0.60 and 0.70 are fair and acceptable and coefficients lower than 0.60 are questionable, poor and unacceptable. Table 4.4 illustrates that the Cronbach's alpha for all the five constructs of the questionnaire ranged from .6 to .9 indicating good reliability. Therefore, the questionnaire was relevant for the study. Table 4.4 indicate the guidelines followed in testing the reliability of the questionnaire.

Table 4. 4 Reliability testing

Cronbach's alpha (α)	Internal Consistency
0.9	Excellent (High-stakes testing)
0.7 < 0.8	Good (Low-stakes testing)
0.6 < 0.7	Acceptable
0.5 < 0.6	Poor
<0.5	Unacceptable

Source: Adapted from (Manerikar & Manerikar, 2015:118)

In an attempt to ensure reliability of the research, peers' reviews were done through colloquiums, by colleagues, peers and academics before the research was finalised. These reviews gave fresh perspectives and in some instances challenged the assumptions made by the researcher originally. Furthermore, the researcher sought the assistance of an experienced academic statistician for guidance in the development of the research instrument, statistical analysis of collected data as well as the reviewing of the final thesis in order to ascertain correct alignment of data analysis, study findings, interpretation and presentation of results. In ensuring reliability, pre-testing was done on respondents who were not part of the target population and the questionnaire was amended accordingly based on the received comments.

Furthermore, validity refers to the extent to which the instrument adequately reflects what it is designed to measure (Frey, 2018). In other words, validity is the extent to which an instrument measures what it purports to measure. According to Leedy & Omrod (2015) validity of a measurement instrument can take several different forms namely; face validity, content validity, criterion validity, construct validity. Face validity is concerned with whether or not an indicator appears to reflect the content of the concept in question (Bryman & Bell, 2015). Content validity refers to the degree at which a measure covers the full dimension of a particular concept (Allen, 2017). According to Salkind (2018: 106), criterion validity is concerned with how well a test estimate present performance or how well it predicts future performance. Construct validity can be defined as the extent to which the results of a test are related to the underlying set of related variable (Salkind, 2018:106).

Validity can be categorised into internal or external. Internal validity refers to the degree to which causal inferences are warranted on the basis of a study (Frey, 2018). Internal validity is thus largely a function of how well a study's design and execution allows researchers to make conclusive claims about the causal relationships between one or more independent variables and one or more dependent variables and rule out alternative explanations for observed associations. Internal validity is concerned with the correctness of a study based on the selection of a study sample, recording and analysis of data (Neuman, 2014). External validity involves ascertaining whether the results of a study can be transferable to other groups Handley (2012); that is, whether the results of a study can be generalised to the other population groups.

In order to ensure internal validity, a number of steps were considered in this study. Firstly, anonymity was guaranteed to respondents and these encouraged respondents to truthfully and honestly answer the questionnaire. Content validity was also ensured in the questionnaire based on the selected measurement constructs. These constructs were to a greater extent guided by previous literature regarding the study and was adapted in order to address the study requirements. For the quantitative phase of this study, external validity was ensured by pre-testing the questionnaire and by using a sample of 277 students which resulted to a usable sample of 169 completed questionnaires that permitted the use of several statistical techniques leading to the generalisation of research findings of the study population. Moreover, this study used a semi-structured questionnaire which enhanced external validity as respondents were able to express their views independently.

4.2.10.2 Descriptive statistics

Descriptive statistics refer to statistical procedures that are used to summarise, organise and simplify data (Gravetter & Wallnau, 2017). It involves taking a large group of data in a sample and reducing it to a small sample in order to visualise and present it into meaningful information through graphs, tables and figures in order to make Descriptive statistics present data in two forms namely: numerical and graphical techniques. Numerical techniques make use of summary statistics while graphical techniques present data in a manner that allows the reader to extract information (Keller, 2018). According to Frey (2018), there are several measures of descriptive statistics namely: frequency distribution, measures of central tendency namely:

mean,

mode and median, measures of variability that present the dispersion and spread of scores such as ranges, standard deviation, variance and correlation coefficient. In this study, descriptive statistics were computed for the demographic factors and all the scale items in the questionnaire and presented in the form of frequencies, means, standard deviations, distribution and coefficients of variation for numerical data.

4.2.10.3 Factor analysis

Factor analysis was used to determine construct validity of the current study. Factor analysis refers to a common multivariate analysis technique that is used to identify underlying variables from a group of observed variables (Lamb, Wolfinger, Money, Samuel and Page, 2015: 322). Factor analysis explains any patterns that may occur between the variables. There are basically two types of factor analysis namely: Confirmatory and Exploratory Factor Analysis. Confirmatory Factor Analysis (CFA) is used to test the relationship between variables that can be observed and is used to confirm a hypothesis (Easterby-Smith, Thorpe and Jackson, 2015: 300). Exploratory Factor Analysis (EFA) is used to determine the underlying constructs by reducing a large number of variables into a smaller set of variables which are then analysed to identify the underlying constructs (Lamb et al., 2015:423). In this study, an Exploratory Factor Analysis (EFA) was conducted to determine the underlying constructs of the research variables.

There are two models that can be used in EFA namely; Principle component analysis and Common factor analysis. Principle component analysis reduces the original set of variables to a smaller set of variables in order to identify the primary factors (Sarstedt & Mooi, 2011: 241). Common factor analysis makes use of only the common factors found in a scale to identify the underlying constructs (Lamb et al., 2015: 414). Both these models produce estimates for factor loadings of each of the common factors as well as a summary of the indices of the importance of each factor. These are the Eigenvalues, scree plot and factor loadings (Easterby-Smith et al., 2015: 302). The estimates that are found from each factor loading will be used to select the subset of common factors. An Eigenvalue indicates the ratio between the variance of the specific factor compared to that of the average factor (Feinberg et al., 2013:4).

A factor with an Eigenvalue that is above 1 is usually retained (Feinberg et al., 2013:

488). Reliability is determined by the size of the factor loadings. (Sarstedt & Mooi, 2011: 245). A scree plot is then used to select the optimal number of factors by providing a simple visual representation of how quickly the Eigenvalue or the quality of the factors degrades (Feinberg et al, 2013:490). The factor loadings represent the correlation between the original variables and the factors that are derived from them (Feinberg et al, 2013: 491). Factor loadings close to -1 or 1 indicate that the factor strongly influences the variable and factor loadings close to 0 indicate that the factor has a weak influence on the variable (Feinberg et al., 2013: 491).

According to Sarstedt & Mooi (2011: 241) principle component analysis reduces the original set of variables to a smaller set of variables in order to identify the primary factors. The adequacy of the factor analysis in this study was measured using the Bartlett's test of Sphericity and the Kaiser- Meyer-Olkin (KMO) which is a measure of sampling adequacy. According to Hair, Black, Babin & Anderson (2019), a sample is appropriate for factor analysis if the value of Kaiser Meyer Olkin (KMO) is greater than .5 and the Bartlett tests of sphericity is significant ($p < .05$). The number of factors were determined using the latent root criteria which is the most commonly used technique and only the factors having latent roots or Eigen values of more than 1 were considered significant (Pallant, 2013; Hair et al., 2019, Tabachnick and Fidell, 2014). Communality is the total amount of variation a variable shares with the other variables included in the factor loading. For communality to be achieved, firstly a factor solution should have most of the variables with commonality of more than .6 (Hair et al., 2019). Secondly items with factor loadings greater than .5 or more are considered practically significant (Hair et al., 2019; Tabachnick & Fidell, 2014). A factor solution is considered robust if it accounts for at least 50% of the total variation (Pallant, 2013).

4.2.10.4 Inferential statistics

According to Keller (2018), inferential statistics refers to a body of methods that is used to reach conclusions or inferences regarding characteristics of a population based on the sampled data. Inferential statistics can be performed using two procedures namely: hypothesis testing and parameter estimation such as confidence intervals and regression analysis (Frey, 2018). This study made use of two forms of inferential

statistics namely an independent t-test and an ANOVA (Analysis of Variance). These two forms are briefly discussed below:

- **Independent t-test:** An independent t-test refers to a two-sample test that compares means of the selected sample from two populations with the assumption that the random samples are independently selected and normally distributed (Levine et al., 2015). Thus two populations are regarded as independent if the measured values of the items observed in one population have no impact on the measured values of the items observed in the other population (Davis, Pecar, Santana and Burke, 2014). In the current research, an independent t-test was conducted to determine whether constructs differed by gender. For an independent t-test to be conducted, three assumptions should be satisfied. Firstly observations should be independent, secondly data should be normally distributed and lastly the groups should have equal variances.

According to Gravatter & Wallnau (2017), there are three assumptions in conducting an independent t-test. Firstly the observations with each sample must be independent secondly, the two populations from which the sample are selected must be normal and lastly, the two populations from which the samples are selected must have equal variances. In this study, the sample elements were selected using non probability sampling and thus the observations were independent. Normality was achieved by applying the central limit theorem and homogeneity of variance was tested using Levine's test of equality of variance. In cases where the variance was equal, statistics under equal variance assumed were discussed and in case where variance is unequal, statistics under equal variances not assumed were discussed. The significance of the test was measured using effect size which estimates the degree to which the phenomenon being studied namely: correlation or differences in mean scores) exist in the population (Hair et al., 2014). The effect size indicates the amount of influence changing the conditions of the independent variable has on independent scores (Heiman, 2015).

The independent t-test for this research was conducted at 5% level of significance and the test was significant if the p-value was less than .05. Composite variables were created by finding the average of the research constructs. A test was considered highly

significant if the p-value was less than .001.

- **ANOVA:** This is a statistical technique that is used to determine whether samples from two or more groups come from populations with equal means (Hair et al., 2014). The technique is derived from the way in which the calculations are performed as it analyses the variance of the data to determine whether one can infer that the population means differ (Keller, 2018). This implies that ANOVA reduces some of the random variability to enable significant differences to be found more easily as well as assisting in identifying interactions between factors. In this study, an ANOVA test was conducted to determine mean differences across constructs with more than two categories. Thus an ANOVA test was conducted to determine whether the constructs differed by year of study. The test was done at 5% significance level. In circumstances where the assumption of equality of variance across groups was violated, the Welch robust test of equality of means was conducted to determine whether the means truly differ and the Game-Howell test was used as a post-hoc test. In cases where the assumption was not violated, the F-test was used and the Tukey-HSD post-hoc analysis was used to determine where the differences existed. A p-value that is less than .05 is regarded as statistically significant indicating strong evidence on the rejection of the null hypothesis.
- **Correlation analysis:** Correlation is used to measure how strong a relationship is between two variables. Pearson correlation coefficient and Spearman correlation coefficient are the most commonly used in statistics among others. Pearson correlation coefficient was used to determine the degree of relationship between the research variables. A correlation of 1 means that for every positive increase in one variable there is a positive increase of a fixed proportion in the other. A correlation of -1 indicates that for every positive increase in one variable, there is a negative decrease of a fixed proportion in another. A correlation of zero implies that for every increase in one variable there is no positive or negative decrease in the other variable (Schumacker & Lomax, 2016).

- **Regression analysis:** Describes the relationship between a set of independent and dependent variables. It incorporates hypothesis tests that help determine whether the relationships observed in the sample data actually exist in the research population. Linear regression was used to analyse the relationships between the independent and dependent variables (Best & Wolf, 2014). The significance is based on the fact that if there is an increase in one independent variable there will be an increase in the dependent variable.

4.2.11 Step 11: Interpret the results and compile the research report

As shown in Figure 4.1, the last step of the research process is to interpret the results and compile the research report. During this step, the researcher interprets the results by finding meaning of the discussions and explains their significance for decision making purposes (Wiid & Diggines, 2015:45). The research objectives that were formulated in Step 2 of the research process will be clearly and directly linked to the results obtained. The research findings/results will be presented and communicated to the institution in question in the form of a research report. It is from these results and findings that recommendations and conclusions are derived and future research opportunities identified.

4.3 CONCLUSION

This chapter discussed the adopted methodology of the present study. Methodology explains and analyses the steps and procedures undertaken in order to achieve research objectives. A detailed overview of the research process was presented in this chapter. Non probability sampling method and convenience sampling was discussed in this chapter as methods used to collect data from respondents. Data for this study was collected using a web based/online survey in the form of a questionnaire that was self-administered to full-time undergraduate students at RGIT under the BEMS department. The chapter concluded with a discussion of the methods used to analyse the research data and the interpretation of results. The next chapter presents the research results and findings.

CHAPTER 5: DATA ANALYSIS AND PRESENTATION OF RESEARCH FINDINGS

5.1 INTRODUCTION

This chapter presents and also interprets the results of the present study. As stated before, this study focuses on students' perceptions of the Tablet Personal Computer (PC) as a mobile learning device at a graduate institute in Tshwane. In the preceding chapters, challenges facing higher education, the evolution of technology and the use of technology in higher education have been discussed. The methodology used in this research was presented in the previous chapter. An overview of the research design, population sample and sampling method used in the research are discussed in this chapter. This is followed by a presentation of the demographic profile and internal consistency of the measuring instrument. The research results for each question in the survey are presented using descriptive statistics, factor analysis, inferential statistics and correlation analysis. Data is presented using relevant tables, figures and graphs. The next section begins with a brief overview of the research design.

5.2 OVERVIEW OF THE RESEARCH DESIGN

The research methodology, population sample, response rate and sampling method are discussed in detail in Chapter 1 and 4, and are recapped in this section.

5.2.1 Methodology

The research of this study followed a quantitative approach in the form of exploratory research design as it made use of structured and unstructured questions to achieve the objectives of the study (See Chapter 4 section 4.2.6.4). A web-based self-administered questionnaire was used to collect data from the research population. Data from the online survey was automatically captured through Lime survey, recorded into Microsoft Excel spreadsheet and exported to IBM SPSS 25 for analysis. The collected data was subjected to quality checks such as uncommon variation, screened for outliers and missing data following the guidelines proposed by Hair et al., (2019).

5.2.2 Response rate

A sample of full-time undergraduate students participated in an online survey from 30

May to 30 June 2019. A total population of 491 full-time undergraduate students from the computerised register was invited to participate in the survey. Of the population invited, 277 accepted the invitation and an email containing a link to the survey was sent to those students who accepted the invitation to participate in the research. A total of 174 respondents accessed and returned the online survey with a return rate of 62.82% (174/277). Of these five were incomplete questionnaires. These five incomplete questionnaires were found to have more than 10% missing data when the responses were screened for outliers and missing values. Therefore, the five incomplete questionnaires were excluded from further analysis. A total of 169 complete questionnaires were considered for further statistical analysis with an effective response rate of 61%. The response rate was considered satisfactory and acceptable as the usable questionnaires represent a 6.11% margin of error at 95% confidence level and 50% distribution rate (Raosoft, 2020). The next section gives a brief discussion of the analysis performed on the online survey data.

5.2.3 Analysis performed

The purpose of analysing quantitative data is to create a visual understanding of the data in order to interpret its meaning. Data from the online survey was analysed using frequency distributions in the form of tables, figures, distribution, means and standard deviations for each survey question. This was followed by factor analysis, independent t-test and Analysis of Variance (ANOVA).

Distribution analysis was performed to indicate the distribution of the survey data responses from the online survey. Normal distribution is described by reporting the mean which shows the centre is located and the standard deviation which shows the spread of data from the mean. A small standard deviation compared to the mean produces a steep graph or a narrow bell curve. A large standard deviation produces a wider bell curve or a flat graph when the value is compared to the mean. In this chapter, normal distribution was used to show the distribution of data on all the research variables namely uses of the Tablet PC, advantages of the Tablet PC,

challenges of the Tablet PC, technical aspects of the Tablet PC and the pedagogical opportunities offered by the Tablet PC.

Exploratory Factor Analysis (EFA) was performed to determine the items that were highly correlated so that they will be able to form constructs that can be used in comparative analysis as indicated in Chapter 4 Section 4.2.10.3. EFA was conducted using principle component analysis with varimax rotation. Items with high factor loadings were grouped and labelled as one construct. A loading of -1 or 1 is considered to be high and the variable can be used to interpret the factor. In this chapter, EFA was conducted to determine the underlying constructs of each research variable namely: uses of the Tablet PC, advantages of the Tablet PC, challenges of the Tablet PC, technical aspects of the Tablet PC and pedagogical opportunities offered by the Tablet PC.

An Independent t-test was performed to determine whether there was a statistically significant difference between the means of two categories or groups which are independent of each other. The overall purpose of conducting an independent t-test in this research was to explore the respondents' perceptions of the Tablet PC between two independent groups such as male and female respondents. In this chapter, independent t-tests were performed to determine differences in mean scores by gender for the variables uses of Tablet PC, advantages of Tablet PC, challenges of Tablet PC, technical aspects of Tablet PC and pedagogical opportunities offered by the Tablet PC.

ANOVA (Analysis of Variance) was also performed in this research to determine the difference across constructs with more than two categories. The purpose of conducting ANOVA was to determine the respondents' perceptions of the Tablet PC by year of study. In this chapter ANOVA was used to determine differences in mean scores for uses, advantages, challenges, technical aspects and pedagogical opportunities offered by the Tablet PC by year of study.

As indicated in Chapter 4 Section 4.2.10.4 correlation measures the strength between two variables. In this chapter, correlation analysis was performed to measure the strength or direction of a relationship between two or more variables

namely the Tablet PC variables. Lastly, regression analysis was performed in order to determine the relationship between a set of independent variables and a dependent variable namely the relationship between the Tablet PC challenges and the other research variables.

5.3 DEMOGRAPHIC PROFILE

A profile of undergraduate students at a BEMS campus at Richfield was constructed using gender, age and year of study. The respondents were asked about their socio-demographic characteristics by indicating their gender, age and years of instruction. The demographic questions were placed at the end of the questionnaire as they deemed to contain sensitive information. The demographic profile of respondents is indicated in Table 5.1.

Table 5. 1 Characteristics of the respondents

Variable	Category	Count	%
Gender	Male	69	40.8%
	Female	100	59.2%
	Total	169	100 .0%
Age	18 – 30 years	164	97.0%
	31 – 40 years	5	3.0%
	Total	169	100 .0%
Year of study	1 st year	59	34.9%
	2 nd year	52	30.8%
	3 rd year	58	34.3%
	Total	169	100 .0%

As indicated in Table 5.1, in terms of gender, the majority (59.2%; n=100) of respondents were females and a total of 69 or 40,8% of respondents were males. These numbers are in line with the registration statistics of the institution where the majority of students are females compared to males.

In terms of age, the majority (97%; n=164) of respondents who answered the questionnaire ranged between 18 - 30 years of age while 3% or five (5) respondents were in the age group of 31- 40 years.

In terms of study level, it is clear from Table 5.1 that there was a fairly even distribution among 1st year (34.9%; n=59), 2nd year (30.8%;n=52) and 3rd year (34.3%;n=58) respondents. Thus, there was no significant difference between the three levels of study in terms of number of respondents meaning that respondents were evenly distributed among the year levels.

5.4 ANALYSIS OF INTERNAL CONSISTENCY OF THE MEASURING INSTRUMENT

Sound research depends on the reliability of the measurement instrument. Reliability measures the internal consistency of a research instrument. According to Leedy & Ormrod (2015), reliability refers to the degree to which a consistent measurement yields the same results if repeated. In this research, a self-administered questionnaire was used to collect data from respondents, therefore reliability was measured to confirm if the questionnaire content was dependable, consistent and adequate for statistical analysis. Reliability of an instrument is tested with a technique called internal analysis which produces measurements using Cronbachs' Alpha (α) (Wiid & Diggines, 2013:238).

Thus the internal consistency of measurement scales in this research was assessed by Cronbach's Alpha (α). As shown in Chapter 4.2.10.1, the guidelines by Manerikar & Manerikar (2015) were used to determine the level of reliability in this study. These guidelines provided a rule of thumb which says that if Cronbach's alpha is $\geq .9$ then its Excellent, if $\geq .7$ means Good, if $\geq .6$ is acceptable, if $\geq .5$ Poor and if $\alpha < .5$ its unacceptable. A high coefficient for Cronbach's alpha is always ideal as it indicate that the scale items are strongly related and therefore measuring the same construct. Initially, the variable "advantages of the Tablet PC" had a Cronbach's Alpha of .554 which is poor. Therefore, in order to increase the Cronbach's Alpha, a second analysis of the same variable was conducted with the deletion of 1 item "*Tablet PC comes with a physical keyboard which allows me to quickly type assignments and lecture notes*" (Question 3.13) from the initial total of 18 items. This exception led to the increase in

Cronbach's Alpha of Question 3 to .606 when analysis was done for the second time making the reliability to be acceptable. The reliability calculated for each variable and the overall instrument are shown in Table 5.2 below.

Table 5. 2 : Internal consistency-Cronbach's alpha

Variable	No. of items	Cronbach's alpha	Acceptable level
Uses of the Tablet PC	18	.636	Acceptable
Advantages of the Tablet PC	17	.606	Acceptable
Challenges of the Tablet PC	15	.794	Good
Tablet PC technical aspects	19	.863	Good
Pedagogical opportunities offered by the Tablet PC	14	.920	Excellent
Total	83	.833	Good

As indicated in Table 5.2, the variable "*pedagogical opportunities:*" had the highest reliability of .920 which is excellent. In total, the questionnaire had 83 measured items with an overall reliability of .833 which reveals good reliability. All the variables in Table 5.2 had reliabilities from .60 to .90 which are acceptable (Manerikar & Manerikar, 2015). This test confirms that the questionnaire was a reliable data collection instrument in this research and that the data were appropriate for further analysis

In the next sections, each of the identified variables in Table 5.2 will be analysed in terms of frequency, normal distribution, EFA, independent t-tests and ANOVA to determine the underlying constructs and impact of variance respectively.

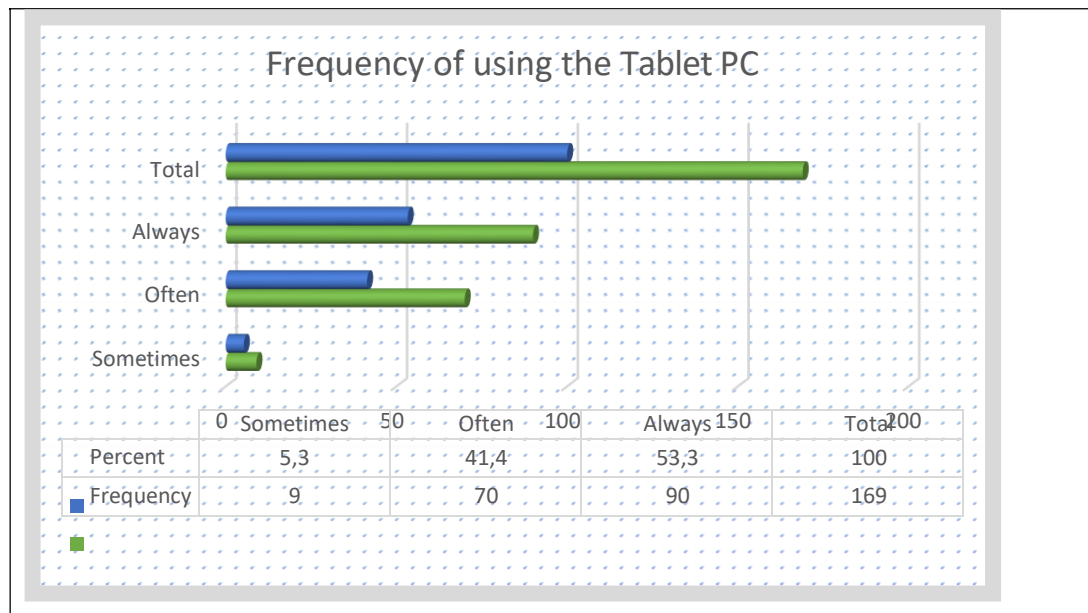
5.5 USES OF THE TABLET PC

The uses of the Tablet PC were divided into two categories in the questionnaire. Firstly, respondents were required to indicate how frequently they use the Tablet PC for study purposes. Secondly, respondents were required to identify what they use the Tablet PC for given optional statements and identifying additional uses not presented in the optional statements. These two categories are presented in the next sections.

5.5.1 Frequency of using the Tablet PC

In order to determine how frequently the Tablet PC is used, respondents were asked to indicate, on a 5-point Likert scale, how often they use the Tablet PC for their studies with (1) being never and (5) being always. Higher scores suggest that the respondent perceived a high frequency whereas low scores indicate a lower rate of Tablet PC usage. The results are illustrated in Figure 5.1 below.

Figure 5. 1 : Frequency of usage



As illustrated in Figure 5.1, more than half of the respondents (53.3%;n=90) always use the Tablet PC while 41.4% (n=70) of respondents often make use of the Tablet PC for their studies. A total of nine (9) respondents (53%) indicated that they sometimes use the Tablet PC for study purposes.

5.5.2 Uses of the Tablet PC as a mobile learning device

Question 2 of the online survey addressed uses of the Tablet PC and required respondents to indicate their responses on a 5 point Likert scale ranging from never (1) to always (5). A total of 18 optional statements were presented to respondents and they were required to indicate to what extent they agree with these statements. For reporting purposes, *always* or *often* and *never* or *rarely* percentages and frequencies will be combined.

As indicated in Table 5.3, respondents indicated various uses of the Tablet PC and these will be presented in descending order. Only the highest totals will be reported. An outstanding total of 95.24% or 160 respondents reported that they always (90.48%; n=152) or often (4.76%;n=8) use the Tablet PC to access study guides. This was followed by a total of 94.65% or 159 respondents who indicated that they always (66.08%; n=111) or often (28.57%;n=47) use the Tablet PC to study for online exams followed by 92.31% or 159 respondents who always (57.99%n=98) or often (34.32%;n=58) use the Tablet PC to conduct research on coursework.

It is clear from Table 5.3 that only a total of 40.24% or 68 respondents indicated that they sometimes use the Tablet PC to type class note. This was followed by equal proportions of 40.61% or 67 in number of respondents who indicated that they sometimes use the Tablet PC to download and read e-books and a total of 39.88% or 67 who sometimes perform backups of learning material, files and documents.. This was further followed by a total of 39.29% or 66 respondents who reported to use the Tablet PC to share academic information.

As shown in Table 5.3, the majority 92.82% or 155 of respondents indicated that they never (88.63%;n=148) or rarely (4.19%;n=7) use the Tablet PC to submit

assignments online. This was followed with a total of 60.7% or 102 respondents who indicated that they never 25.6% or rarely 35.1% use the Tablet PC to record class lectures. A further total of 52.07% or 88 respondents never (14.2%;n=24) or rarely (37.87%;n=64) type class notes using the Tablet PC. A total of 51.81% or 86 respondents reported that they never (22.9%;n=48) or rarely (28.92%;n=48) use the Tablet PC to receive and make calls.

Table 5. 3 : Uses of the Tablet PC

Statement	Always		Often		Sometimes		Rarely		Never		Total %	Total n	Mean	SD
	%	n	%	n	%	N	%	n	%	N				
2.1 I use my Tablet PC to study for online exams	66.08 %	11 1	28.57%	4 8	4.76%	8	-	-	.59%	1	100	168	4.60	.64
2.2 I use my Tablet PC to study for offline exams.	58.58 %	99	29.59%	5 0	10.65 %	18	-	-	1.18%	2	100	169	4.44	.78
2.3 I use my Tablet PC to prepare for class lectures in advance.	73.81 %	12 4	13.69%	2 3	10.12 %	17	1.19%	2	1.19%	2	100	168	4.58	.82
2.4 I use my Tablet PC to do research on course work.	57.99 %	98	34.32%	5 8	6.51%	11	.59%	1	.59%	1	100	169	4.49	.70
2.5 I use my Tablet PC to type assignments	14.79 %	25	18.34%	3 1	37.28 %	63	22.49 %	38	7.10%	12	100	169	3.11	1.13
2.6 I use my Tablet PC to submit assignments online.	1.2%	2	2.99%	5	2.99%	5	4.19%	7	88.63 %	148	100	169	1.24	.75

Statement	Always		Often		Sometimes		Rarely		Never		Total %	Total n	Mean	SD
	%	n	%	n	%	N	%	n	%	N				
2.7 I use my Tablet PC for recreation purposes (watching movies, playing games etc).	26.63 %	45	45.56%	77	19.53 %	33	4.73%	8	3.55%	6	100	169	3.87	.98
2.8 I use my Tablet PC to type class notes.	3.55%	6	4.14%	7	40.24 %	68	37.87 %	64	14.2%	24	100	169	2.45	.91
2.9 I use my Tablet PC to share academic information.	13.1%	22	44.64%	75	39.29 %	66	1.79%	3	1.18%	2	100	168	3.67	.77
2.10 I use my Tablet PC to download and read e- books.	7.88%	13	20.61%	34	40.61 %	67	26.66 %	44	4.24%	7	100	165	3.01	.98
2.11 I use my Tablet PC to log in to Moodle student portal.	52.08 %	88	31.95%	54	14.79 %	25	-	-	1.18%	2	100	169	4.34	.82

Statement	Always		Often		Sometimes		Rarely		Never		Total %	Total n	Mean	SD
	%	n	%	n	%	N	%	n	%	N				
2.12 I use my Tablet PC to communicate with my lecturers and other students.	20.12 %	34	44.38%	75	24.85 %	42	3.55%	6	7.1%	12	100	169	3.67	1.06
2.13 I use my Tablet PC to record class lectures.	4.2%	7	7.1%	12	28.0 %	47	35.1%	59	25.6%	43	100	168	2.29	1.06
2.14 I use my Tablet PC to watch video tutorials.	16.07 %	27	42.85%	72	32.74 %	55	2.98%	5	5.36%	9	100	168	3.61	.97
2.15 I use my Tablet PC to interact on social networks about academic matters.	29.94 %	50	40.13%	67	23.95 %	40	2.99%	5	2.99%	5	100	167	3.91	.96
2.16 I use my Tablet PC to access study guides.	90.48 %	152	4.76%	8	2.38 %	4	2.38%	4	-	-	100	168	4.83	.58
2.17 I use my Tablet PC to receive and make calls.	23.49 %	39	8.43%	14	16.27 %	27	28.92 %	48	22.89 %	38	100	166	2.81	1.49

Statement	Always		Often		Sometimes		Rarely		Never		Total %	Total n	Mean	SD
	%	N	%	n	%	N	%	n	%	N				
2.18 I use my Tablet PC to perform backups of learning material, files and documents.	16.07	27	24.4%	41	39.88 %	67	13.1%	22	6.55%	11	100	168	3.3	1.09

Source: Question 2

Note: Likert scale values range from Never (1) to Always (5), the higher the mean score the higher the Tablet is used, n=number of respondents, M=Mean, SD=Standard Deviation

Note: Total number of respondents could not be equal to 169 in some questions as some respondents could not provide all the answers to the questionnaire questions.

5.5.2.1 Tablet PC uses not listed in the questionnaire

In order to identify any other uses that respondents may have for the Tablet PC, respondents were required to indicate by means of an open ended question, for what other purposes they use the Tablet PC. The responses are indicated in Table 5.4 below.

Table 5. 4 Uses not listed in the questionnaire

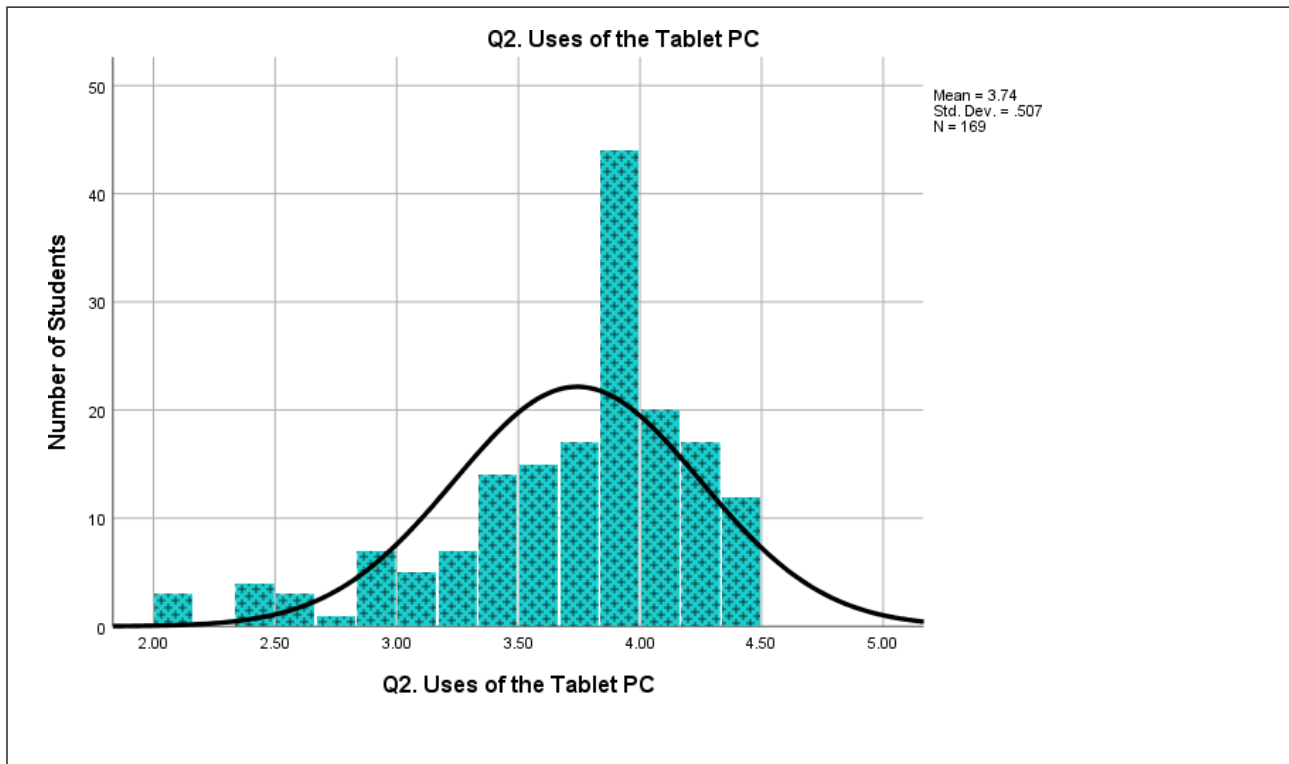
Other Tablet PC uses	Frequency (n)	Percentage (%)
read news	1	20
take pictures of notes on the board	1	20
apply for jobs	1	20
check academic record	1	20
do online banking	1	20
Total	5	100

As indicated in Table 5.4 a total of five responses were mentioned by respondents as other uses of the Tablet PC apart from the ones provided as statements. It is clear from these responses that there are no any noteworthy additional uses of the Tablet PC as most of the responses are non-academic.

5.6 Distribution of data on the uses of the Tablet PC

Normal distribution was performed in order to show the spread of responses regarding the use of Tablet PC using a normal distribution curve as shown below.

Figure 5. 2 : Distribution of data on the uses of the Tablet PC



As shown in Figure 5.2, a total number of 169 respondents represented by the histogram had an average mean score of 3.74 and a standard deviation of .507 when answering the questions related to the uses of the Tablet PC. All standard deviations were below and slightly above 1 indicating that the majority of the mean ratings fell between 2 and 5 (± 1 standard deviations from the mean). Therefore, it is clear from the diagram that the distribution of data is slightly skewed to the left and the bell curve is slightly flat due to a larger standard deviation hence data is more spread out on one side of the scale measurement items indication.

5.6.1 Determine the underlying construct of the variable “uses of the Tablet PC”

Initially, the variable “uses of the Tablet PC” had 18 items. EFA was performed on the 18 items, due to cross loading, ten items in the variable were dropped resulting to eight remaining. The communalities ranged from .468 to .678 and the majority of the communalities were above .6. KMO and Bartlett’s sphericity tests were conducted on the eight remaining items and the results are shown in Table 5.5.

Table 5. 5 KMO and Bartlett's Test for uses of the Tablet PC

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.736
Bartlett's Test of Sphericity	Approx. Chi-Square	370.871
	Df	28
	Sig.	<i>p</i> < .001

Table 5.5 indicates a KMO of .736 indicating that the correlations were adequate for factor analysis. The Bartlett's test of sphericity had a chi-square value of 370.871 with a p-value less than .001 indicating that there were sufficient correlations among the items. The results from the KMO and Bartlett's tests are acceptable to perform a factor analysis. The factor analysis resulted in two constructs as shown in Table 5.6.

Table 5. 6 Factor rotation matrix solution for uses of the Tablet PC

Statement	Component	
	1	2
I use my Tablet PC to watch video tutorials.	.789	
I use my Tablet PC to interact on social networks about academic matters.	.780	
I use my Tablet PC to communicate with my lecturers and other students.	.743	
I use my Tablet PC for recreation purposes (watching movies, playing games etc).	.726	
I use my Tablet PC to submit assignments online.		.780
I use my Tablet PC to study for offline exams.		.779
I use my Tablet PC to study for online exams.		.675
I use my Tablet PC to prepare for class lectures in advance.		.547
Eigenvalue	2.638	2.034
% of Total Variation	32.971	25.424

As indicated in Table 5.6, the first construct had four items with an Eigen value of 2.638 and it accounted for 32.971% of the total variation. *The construct was labelled “interaction on academic matters and entertainment purposes”.* The second construct had an Eigen value of 2.034 and total variation of 25.424% with four items. The construct was labelled “*academic purposes.*” The factor solution was a robust solution as it accounted for 58.4% (33% and 25.4%) of the total variation.

5.6.2 Determining differences in mean scores for uses of Tablet PC by gender

In order to test the difference in mean scores of the uses of the Tablet PC by gender, Levene’s test of equality of variance was performed. The test resulted in all constructs having equal variances and in this case statistics under equal variances assumed were presented. The test on equality of variance resulted in all the constructs having equal mean scores for male and female respondents as shown in Table 5.7.

Table 5. 7 Independent t-test to determine differences in mean scores for uses of the Tablet PC by gender

Indicator	Group Statistics				Levene's Test for Equality of Variances			T-test for Equality of Means	
	Gender	N	Mean	SD	Equal variances	F	Sig	t-value	Sig (2-tailed p-score)
Q2a. Academic purposes	Male	69	3.755	.362	Assumed	1.164	.282	.958	.339
	Female	100	3.695	.423	Not			.986	.326
Q2b. Interaction on academic matters and entertainment purposes	Male	69	3.882	.690	Assumed	3.182	.076	1.651	.101
	Female	100	3.684	.811	Not			1.701	.091
Q2. Uses of the Tablet PC	Male	69	3.818	.481	Assumed	1.489	.224	1.612	.109
	Female	100	3.690	.521	Not			1.636	.104

As indicated in Table 5.7, the results of the independent t-tests revealed that for all the items on uses of the Tablet PC, there was no statistically significant difference in mean scores across gender. All the mean scores were close to four indicating that the respondents agreed that the uses of the Tablet PC as a mobile learning device occurred quite often.

5.6.3 Determining difference in mean scores for uses of the Tablet PC by year of study

In order to determine the difference in mean scores for the Tablet PC uses by year of study, an ANOVA test was conducted and the results are shown in Table 8 below.

Table 5. 8 : ANOVA test

Constructs	Levene's test for equality of variance		Test for equality of means	
	F	p-value	F	p-value
Q2a. Academic purposes	2.786	.065	6.224	.007
Q2b. Interaction on academic matters and entertainment purposes	9.793	p	13.424 ^b	p
		< .001		< .001
Q2. Uses of the Tablet PC	9.524	p	12.6230 ^b	p
		< .001		< .001

^b Welch F-statistic

As indicated in Table 5.8, the ANOVA F tests revealed that there was a statistically significant difference between the mean scores on issues measuring *uses of the Tablet PC, academic purposes and interaction on academic matters and entertainment purposes*. The views of the respondents were not the same across categories of year of study. Year of study had an impact on the students' perceptions regarding the efficiency and contribution to learning of the Tablet Personal Computer (PC) as a mobile learning device in these aspects.

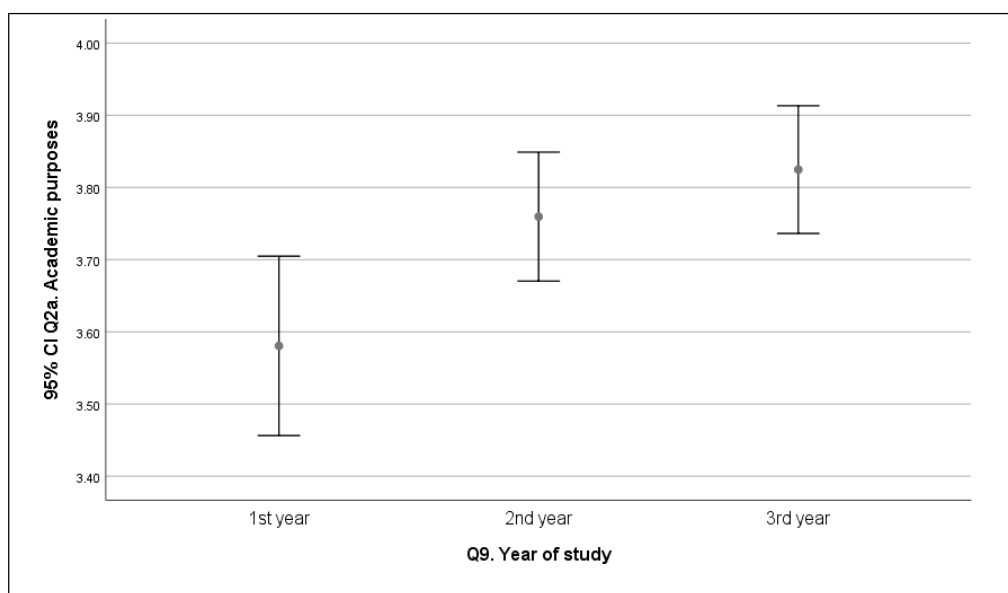
The results of the ANOVA test for *uses of the Tablet PC for academic purposes* indicated a statistically significant difference across year of study, $(2,166) = 6.224, p = .002$. The Tukey HSD post hoc test was conducted and resulted in two homogeneous groups as indicated in Table 5.24.

Table 5. 9: Tukey HSD homogeneous group for uses of the Tablet PC for academic purposes by year of study

Tukey HSD ^{a,b}	Q9. Year of study	N	Subset for alpha = 0.05	
			1	2
	1 st year	59	3.580 5	
	2 nd year	52		3.75 96
	3 rd year	58		3.82 47

A Tukey HSD post hoc test was performed and resulted in two homogeneous groups namely 3rd year ($M = 3.82, SD = .34$) 2nd year ($M = 3.76, SD = .32$) respondents who had significantly higher mean scores than those in the 1st year of study ($M = 3.58, SD = .48$). This difference can be shown in Figure 5.4 below.

Figure 5. 3 : Confidence interval error bars for uses of the Tablet PC for academic purposes by year of study.



As shown in Figure 5.3, all mean scores were close to four and thus all groups indicated that they use the Tablet PC quite often for academic purposes but the usage was higher for 3rd year levels than 1st and 2nd year study levels.

The Welch F test was performed to test for uses of the Tablet PC for interaction on academic matters and entertainment purposes and it resulted into a statistical

significant difference across year of study, $Welch F(2,108.817) = 13.424, p < .001$.

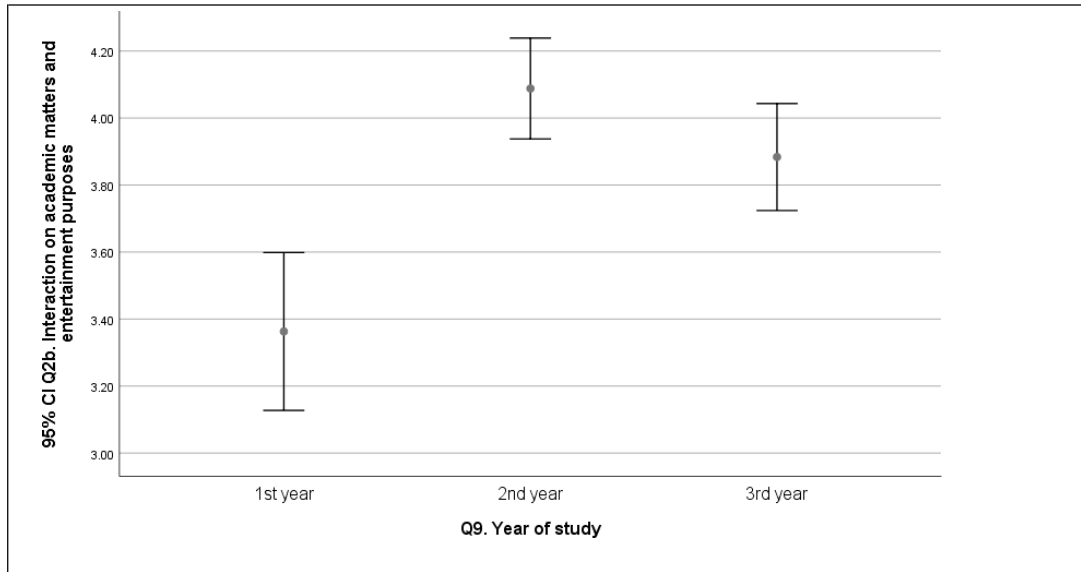
The Games-Howell post-hoc test was conducted and resulted in two homogeneous group as shown in Table 5.10.

Table 5. 10 : Games-Howell homogeneous group for uses of the Tablet PC for interaction on academic matters and entertainment purposes by year of study

Games- Howell	Q9. Year of study	N	Subset for alpha = 0.05	
			1	2
	1 st year	59	3. 36 30	
	2 nd year	52		4.0881
	3 rd year	58		3.8836

As indicated in Table 5.10, the Games-Howell test revealed that respondents in the 2nd year of study had a mean score of ($M = 4.08$) and those in the 3rd year of study had a mean score of ($M = 3.88$) and these mean scores were significantly higher than those in the 1st year of study ($M = 3.36$). A moderate effect size of $\omega^2 = .13$ was obtained and approximately 13% of the variation in advantages of using the Tablet for interaction on academic matters and entertainment purposes is attributable to differences in years of study. The confidence interval error bars for the differences are shown in Figure 5.4 below.

Figure 5. 4 : Confidence interval error bars for uses of the Tablet PC for interaction on academic matters and entertainment purposes by year of study



As shown in Figure 5.4, 2nd and 3rd year mean scores were close to four while the mean scores for 1st years were close to three. This revealed that 2nd and 3rd year respondents agreed on the advantages of using the Tablet PC for interaction on academic matters and entertainment purposes while 1st years were closer to neutral.

A One-way ANOVA test was performed to test “challenges of using the Tablet PC” and resulted in a statistically significant mean difference across years of study, (*Welch F*(2, 108.818) = 12.620, *p* < .001). Using the Games-Howell post-hoc test, two homogeneous groups resulted as presented in Table 5.11.

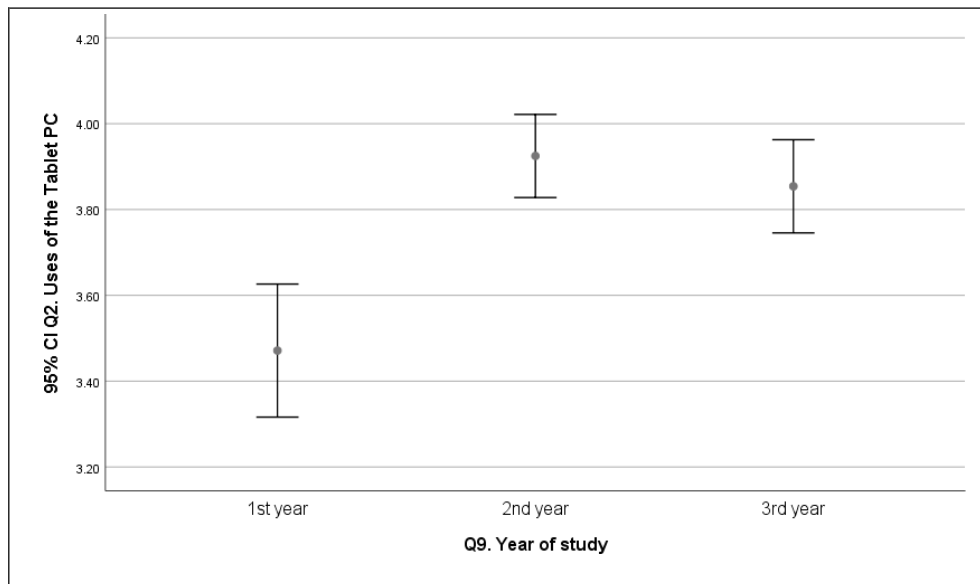
Table 5.11: Games-Howell homogeneous group for uses of the Tablet PC by year of study

Games-Howell	Q9. Year of study	N	Subset for alpha = 0.05	
			1	2
			1 st year	59
2 nd year	52		3.9248	
3 rd year	58		3.8541	

As indicated in Table 5.26, the Games-Howell test resulted to significantly higher mean scores in 2nd year (*M* = 3.92) and 3rd year (*M* = 3.85) compared to 1st years (*M* =

3.47). A moderate effect size of $\omega^2 = .12$ was obtained and approximately 12% of the total variation in challenges of using the Tablet PC was attributable to differences in year of study. The confidence interval error bars are shown in Figure 5.6 below.

Figure 5. 5 : Confidence interval error bars for uses of the Tablet PC by year of study



As shown in Figure 5.5, respondents in 1st and 2nd year of study had mean scores close to four indicating that they agreed to use the Tablet PC as a mobile learning device while those in the 1st year were neutral. This implies that 2nd year and 3rd year respondents use the Tablet PC as a mobile learning device quite often compared to 1st year students.

In the next section, the advantages of the Tablet PC are presented using frequency tables, normal distribution, EFA, independent t-tests and ANOVA for the relevant constructs and variables.

5.7 ACADEMIC APPLICATION OF THE TABLET PC

The academic application of the Tablet PC was concerned with the advantages and challenges that respondents face when using the Tablet PC. Two questions were asked under this section of the questionnaire. The first question focussed on the advantages of the Tablet PC and the second question focussed on the challenges of the Tablet PC. These questions are addressed in the next section.

5.7.1 Advantages of the Tablet PC

Question 3 of the online survey addressed advantages of the Tablet PC and required respondents to indicate their response on a 5 point Likert scale ranging from strongly disagree (1) to strongly agree (5). A total of 18 optional statements were presented to respondents and were required to indicate to what extent they agree with these statements.

It is clear from Table 5.12 that a number of advantages were identified by respondents. These advantages will be presented in descending order and only outstanding responses will be reported. A total of 98.23% or 166 respondents strongly agree (42.01%;n=71) or agree (56.22%;n=95) that the Tablet PC is light weight making it easy to move from one class to the other. This was followed by equal proportions of respondents in number with a total of 98.80% or 165 who strongly agree (68.86;n=115) or agree (29.94%;n=50) that the Tablet PC has a good screen size which displays learning material in a visible manner, 97.63% or 165 of respondents who strongly agree (44.97%;n=76) or agree (52.66%;n=89) that the Tablet PC enables them to do research at the campus and at home and a total of 97.63 or 165 who strongly agree (56.21%;n=95) or agree (41.42%;n=70) that the Tablet PC gives them the flexibility to work at own pace. A total of 97.05 or 164 respondents strongly agree (57.99%;n=98) or agree (39.06%;n=66) that the Tablet PC provides easy access to study material on and off the campus.

As indicated in Table 5.12, an outstanding total of 73.37% or 124 of the respondents strongly disagree (33.14%;n=56) or disagree (40.23%;n=68) that the Tablet PC allows them to access examination results online. This was followed by a total of 62.49 or 105 respondents who indicated that they strongly disagree (33.93%;n=57) or disagree (28.56%;n=48) that the Tablet PC allows them to write assessments online anytime anywhere. A total of 58.58% or 99 respondents indicated they strongly disagree (13.02%;n=22) or disagree (45.56%;n=77) with the statement that the Tablet PC comes with a physical keyboard that allows them to type assignments and lecture notes.

A total of 8.93% or 15 respondents were neutral that the Tablet PC enables them to

be more creative in solving coursework problems. This was followed by equal proportions of respondents who were neutral 8.28% or 14 that the Tablet PC allows them to communicate online with peers and lecturers regarding academic matters and that the Tablet PC has a long battery life which allows them to accomplish daily class work.

Table 5. 12 : Advantages of the Tablet PC

Statement	Strongly agree		Agree		Neutral		Disagree		Strongly Disagree		Total %	Total n	Mean	SD
	%	N	%	n	%	n	%	n	%	n				
3.1 The Tablet PC allows me to easily access study material on and off campus.	57.99 %	98	39.06 %	66	1.18%	2	1.18%	2	.59 %	1	100	169	4.5 3	.6 5
3.2 The Tablet PC gives me the flexibility to work at my own pace.	56.21 %	95	41.42 %	70	1.78%	3	.59%	1	-	-	100	169	4.5 3	.5 7
3.3 The Tablet PC reduces the cost of purchasing study material such as text books and stationery as I use e- books.	55.36 %	93	41.07 %	69	2.38%	4	1.19%	2	-	-	100	168	4.5 1	.6 1

Statement	Strongly agree		Agree		Neutral		Disagree		Strongly Disagree		Total %	Total n	Mean	SD
	%	N	%	n	%	n	%	n	%	n				
3.4 The Tablet PC enables me to effectively prepare for lectures in advance thereby enhancing my understanding of study material.	55.63 %	94	39.05 %	66	4.73%	8	.59%	1	-	-	100	169	4.5	.62
3.5 The Tablet PC improves my computer skills.	21.3%	36	73.97 %	125	2.96%	5	1.18%	2	.59%	1	100	169	4.14	.57
3.6 The Tablet PC improves my academic knowledge due to a wider access of information.	57.99 %	98	37.87 %	64	4.14%	7	-	-	-	-	100	169	4.54	.58
3.7 The Tablet PC allows me to communicate online with my peers and lecturers regarding academic matters.	30.18 %	51	58.58 %	99	8.28%	14	2.37%	4	.59%	1	100	169	4.15	.72

Statement	Strongly agree		Agree		Neutral		Disagree		Strongly Disagree		Total %	Total n	Mean	SD
	%	N	%	n	%	n	%	n	%	n				
3.8 The Tablet PC reduces access barriers to learning as I receive the same study material like others regardless of my location.	57.99 %	98	36.09 %	61	2.96%	5	2.96%	5	-	-	100	169	4.49	.70
3.9 The Tablet PC is light weight making it easy for me to move from one classroom to the other.	68.86 %	115	29.94 %	50	1.2%	2	-	-	-	-	100	167	4.68	.49
3.10 The Tablet PC has a long battery life which allows me to accomplish daily class work.	21.43 %	36	55.36 %	93	8.33%	14	14.29 %	24	.59		100	168	3.83	.95
3.11 The Tablet PC has a good screen size which	42.01 %	71	56.22 %	95	.59%	1	1.18%	2	-	-	100	169	4.39	.57

Statement	Strongly agree		Agree		Neutral		Disagree		Strongly Disagree		Total %	Total n	Mean	SD
	%	N	%	n	%	n	%	n	%	n				
displays learning material in a visible manner														
3.12 The Tablet PC allows me to easily access my examination results online.	9.47%	16	13.02 %	22	4.14%	7	40.23 %	68	33.14%	56	100	169	2.25	1.3
3.13 The Tablet PC comes with a physical keyboard that allows me to quickly type assignments and lecture notes	7.1%	12	30.18 %	51	4.14%	7	45.56 %	77	13.02%	22	100	169	2.73	1.2
3.14 The Tablet PC enables me to be more creative in solving course work problems.	5.95%	10	85.12 %	143	8.93%	15	-	-	-		100	168	3.97	.39
3.15 The Tablet PC allows me to share course material	17.36 %	29	74.85 %	125	6.59%	11	1.2%	2	-		100	167	4.08	.53

Statement	Strongly agree		Agree		Neutral		Disagree		Strongly Disagree		Total %	Total n	Mean	SD
	%	N	%	n	%	n	%	n	%	n				
with my lecturers and peers regardless of location.														
3.16 The Tablet PC enables me to do research on given class work at the campus and at home.	44.97 %	76	52.66 %	89	2.37%	4	-	-	-	-	100	169	4.43	.54
3.17 The Tablet PC increases my participation in class as I am able to study for my lectures in advance.	58.68 %	98	37.13 %	62	4.19%	4	-	-	-	-	100	167	4.54	.58
3.18 The Tablet PC allows me to write online assessments anywhere anytime.	13.1%	22	20.24 %	34	4.17%	7	28.56 %	48	33.93%	57	100	168	2.5	1.5

Note: Total number of respondents could not be equal to 169 in some questions as some respondents could not provide all the answers to the questionnaire questions

5.7.2 Tablet PC advantages not listed in the questionnaire

Question 3.19 required respondents to give additional advantages of the Tablet PC using their own words. This gave respondents a platform to express themselves freely using their own words compared to the closed-ended question where they were required to choose from the given optional statements. The responses are indicated in Table 5.13 below.

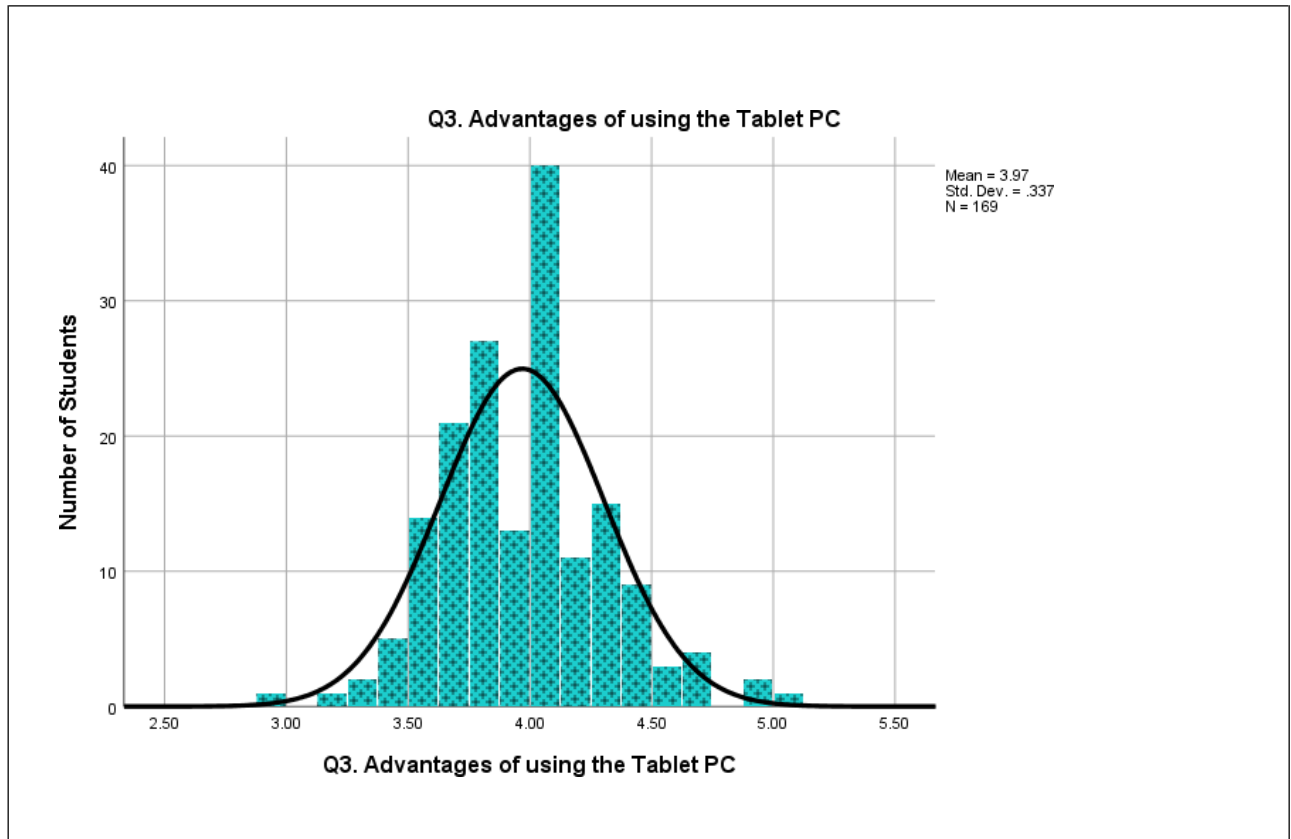
Table 5. 13 : Tablet PC advantages not listed in the questionnaire

Other advantages of Tablet PC	Frequency (n)	Percentage (%)
Tablet PC helps to download previous question Papers	1	20
Tablet PC serves as a textbook	1	20
Facilitate sharing of music with others	1	20
Allows listening to music while studying	1	20
Easy to charge	1	20
Total	5	100

Source: Question 3.19

It is clear from Table 5.13 that respondents mentioned five additional advantages of the Tablet PC. These advantages provided a better insight of other advantages received by respondents as they use the Tablet PC.

Figure 5. 6 : Distribution of data on the advantages of the Tablet PC



As shown in Figure 5.6, a total of 169 respondents had a high average mean score of 3.97 and a small standard deviation of .337. A small standard deviation means that the values in a data set are close to the average mean score leading to a slightly narrow bell curve resembling normal distribution of data. It can therefore be interpreted that data was normally distributed across scale measurements and that the majority of respondents strongly agreed or agreed to the Tablet PC advantages.

5.7.3 Determine the underlying construct of the variable advantages of the Tablet PC

The variable “advantages of using the Tablet PC” had 17 items initially. However, when EFA was performed, six items were dropped due to cross loadings or insignificant factors resulting to only 11 items remaining with a cut off of .6. The communalities ranged from .352 to .770 and most of them were above .6. The KMO and Bartlett’s Test of Sphericity was conducted thereafter. The results are shown in Table 5.14.

Table 5. 14 : KMO and Bartlett's Test for advantages of the Tablet PC

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.704
Bartlett's Test of Sphericity	Approx. Chi-Square	452.507
	Df	55
	Sig.	<i>p</i> < .001

As indicated in Table 5.14, the KMO measure of sampling adequacy was .704 indicating that the correlations were adequate for factor analysis. The Bartlett's test of Sphericity resulted in lack of sufficient correlation between variables as the p-value was less than .05 ($p < .001$). The results from KMO and Bartlett's tests showed that the factor analysis was acceptable.

Three constructs were retained and the first construct accounted for 21.26% of the total variation; the second construct accounted for 18.68% and the third construct accounted for 18.33%. When added together the factors accounted for 58.3% of the total variance and thus the solution was robust. The factors extracted are shown in Table 5.15.

Table 5. 15 : Factor rotation matrix solution for advantages of the Tablet PC

Statement	Component		
	1	2	3
The Tablet PC allows me to easily access study material on and off campus.	.875		
The Tablet PC gives me the flexibility to work at my own pace.	.792		
The Tablet PC reduces the cost of purchasing study material such as text books and stationery as I use e-books.	.735		
The Tablet PC enables me to effectively prepare for lectures in advance thereby enhancing my understanding of study material.	.546		

The Tablet PC allows me to easily access my examination results online.		.866	
The Tablet PC allows me to write online assessments anywhere anytime.		.814	
The Tablet PC has a long battery life which allows me to accomplish daily class work.		.597	
The Tablet PC enables me to be more creative in solving course work problems.			.785
The Tablet PC increases my participation in class as I am able to study for my lectures in advance.			.645
The Tablet PC enables me to do research on given class work at the campus and at home.			.603
The Tablet PC allows me to share course material with my lecturers and peers regardless of location.			.559
Eigenvalue	2.338	2.055	2.016
% of Total Variation	21.257	18.680	18.325

As indicated in Table 5.15, the Eigen value of all the constructs were 2.338, 2.055 and 2.016 respectively. The first construct had four items with an Eigen value of 2.338 and total variation of 21.257. The construct was labelled “*promote access to learning material*”. The second construct had three items with an Eigen value of 2.055 and total variation of 18.680. The construct was named “*easy access to academic matters*”. The third construct consisted of four items, with an Eigen value 2.016 and 18.325 total variation. The factor was labelled “*increased motivation to learn.*”

5.7.3 Determining difference in mean scores for advantages of the Tablet PC by gender

Levene’s test of homogeneity of variance was performed to test gender differences in the mean scores for advantages of using the Tablet PC. The test on equality of means resulted in all the constructs having equal mean scores for male and female respondents as shown in Table 5.16 below.

Table 5. 16 : Independent t-test to determine difference in mean scores for advantages of the Tablet PC by gender

Indicator	Group Statistics				Levene's Test for Equality of Variances			T-test for Equality of Means	
	Gender	N	Mean	SD	Equal variances	F	Sig	t-value	Sig (2 – tailed p-score)
Q3a. Promote access to learning material	Male	69	4.453	.495	Assumed	1.560	.213	-1.394	.165
	Female	100	4.559	.482	Not			-1.387	.168
Q3b. Easy access to academic matters	Male	69	2.756	.945	Assumed	.673	.413	-1.163	.247
	Female	100	2.933	.994	Not			-1.174	.242
Q3c. Increased motivation to learn	Male	69	4.265	.353	Assumed	.110	.741	.231	.817
	Female	100	4.252	.355	Not			.232	.817
Q3. Advantages of using the Tablet PC	Male	69	3.924	.313	Assumed	.613	.435	-1.452	.148
	Female	100	4.000	.351	Not			-1.483	.140

As indicated in Table 5.16, the results of the independent t-test reveal that in the variable “advantages of using Tablet PC”, there was no statistically significant difference between the mean scores for females and females. For the items such as: “*promote access to learning*”, “*increased motivation to learn*” and the overall variable “*advantages of using the Tablet PC*”, all the mean scores were close to four suggesting that both groups agreed on the issues.

5.7.4 Determining difference in mean scores in advantages of the Tablet PC by year of study

ANOVA was performed to determine whether *year of study* had an impact on the students’ perceptions regarding the advantages of using the Tablet Personal Computer (PC) as a mobile learning device. Levene’s test for equality of variances resulted in the constructs *easy access to academic matters* and *advantages of using the Tablet PC* having unequal variances with p-values of less than .001 and .009 respectively. In this case the Welch robust tests was used to test for equality of means and the Games-Howell test was used as a post-hoc test if differences existed. Since variances were equal for the constructs “*promote access to learning material*” and “*increased motivation to learn*”, the ANOVA F test were used for testing equality of means and the Tukey HSD was used as a post hoc test where differences existed. The results of the F tests are shown in Table 5.17 below.

Table 5. 17 : ANOVA test to determine difference in mean score for advantages of the Tablet PC by year of study

Constructs	Levene’s test for equality of variance		Test for equality of means	
	F	p-value	F	p-value
Q3a. Promote access to learning material	.798	.452	.445	.642
Q3b. Easy access to academic matters	12.016	$p < .001$	20.239 ^b	$p < .001$
Q3c. Increased motivation to learn	1.342	.264	1.115	.330

Q3. Advantages of using the Tablet PC	4.819	.009	10.86 6 ^b	<i>p</i> < .001
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^bWelch F-statistic

As indicated in Table 5.17, the ANOVA F tests revealed that there was no statistically significant difference between the mean variables on issues measuring “*promote access to learning material*” and “*increased motivation to learn*”. The views were similar across categories of years of study. However, there was statistically significant differences on the constructs *easy access to academic matters*, and *advantages of using the Tablet PC*. The views for the respondents were not the same across categories of year of study. Year of study had an impact on the students’ perceptions regarding the efficiency and contribution to learning of the Tablet Personal Computer (PC) as a mobile learning device on these issues.

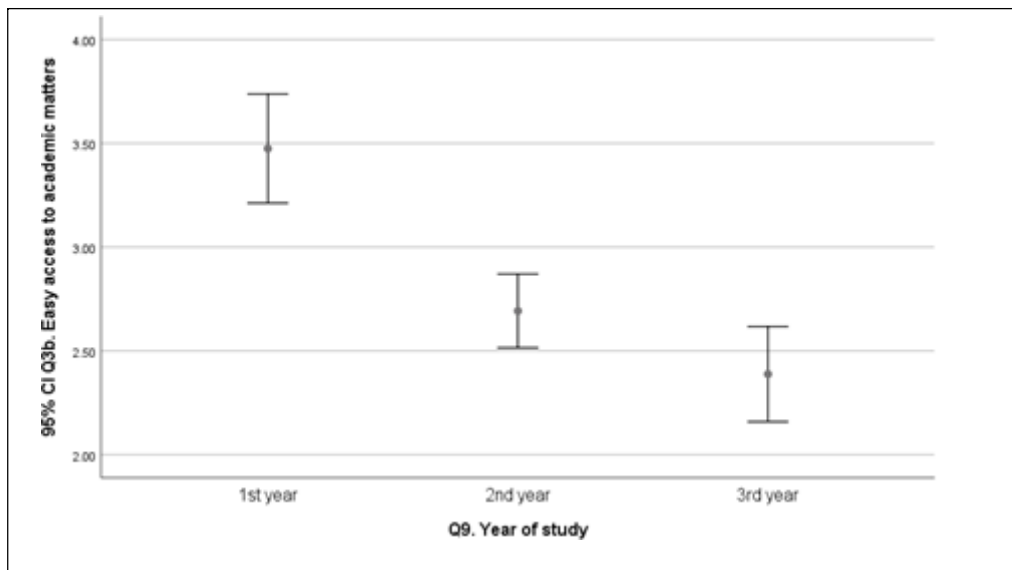
The results from the ANOVA test for *easy access to academic matters* showed a statistically significant difference across year of study, *Welch’s* (2, 109.240) = 20.239, $p < .001$. Therefore, the Games-Howell post hoc test was conducted and resulted in two homogeneous groups as shown in Table 5.28.

Table 5. 18 : Games-Howell homogeneous group for advantage of the Tablet PC for easy access to academic matters by year of study

Games Howell	Q9. Year of study	N	Subset for alpha = 0.05	
			1	2
	1 st year	59		3.47 46
	2 nd year	52	2.692 3	
	3 rd year	58	2.387 9	

As indicated in Table 5.18, respondents in the 1st year of study had a significantly higher mean score of ($M = 3.47$) than those in the 3rd year of study ($M = 2.39$) and 2nd year of study ($M = 2.69$). The confidence interval error bars are shown in Figure 5.8.

Figure 5. 7 : Confidence interval error bars for advantage of the Tablet PC for easy access to academic matters by year of study



As shown in Figure 5.7, all mean scores were close to three. However, the level of agreement decreased as level of study increased. Respondents in the 1st year of study were more in agreement than those in the 2nd and 3rd year.

The Welch robust test of equality of means for advantages of using the Tablet PC resulted in a statistical significant mean difference across years of study, (*Welch F*(2, 107.998) = 10.866, *p* < .001). The Games-Howell post-hoc test resulted in two homogeneous group as presented in Table 5.19.

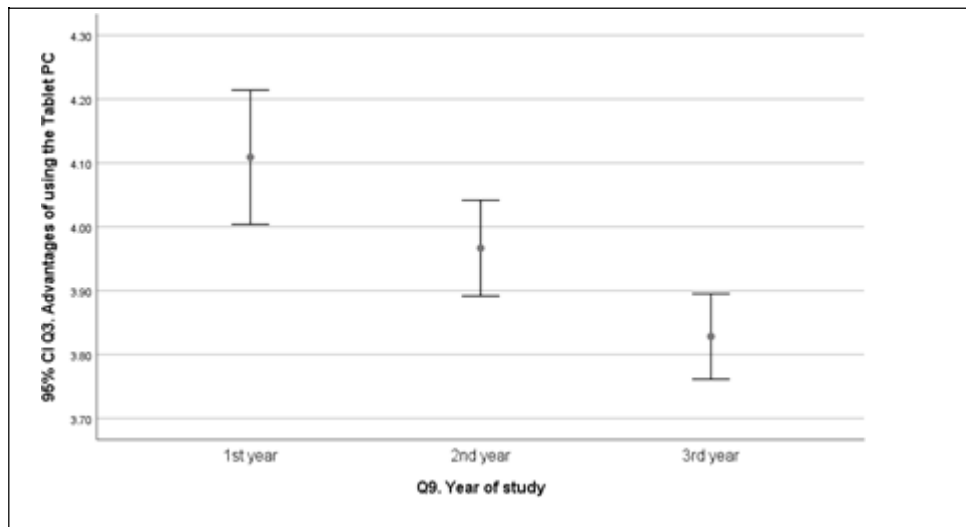
Table 5. 19 : Games-Howell homogeneous group for advantage of the Tablet PC as increased motivation to learn by year of study

Games-Howell	Q9. Year of study	N	Subset for alpha = 0.05	
			1	2
	1 st year	59		4.1089
	2 nd year	52		3.9666
	3 rd year	58	3.8282	

As indicated in Table 5.19, respondents in the 3rd year of study had a significantly lower mean of (= 3.82) compared to those in the 2nd and 1st years of study with a slight increase in the mean scores of (*M* = 3.96)(*M* = 4.10) respectively. A moderate effect size of $\omega^2 = .15$ was obtained and approximately 15% of the total variation in

advantages of using the Tablet is attributable to differences in years of study. The confidence interval error bars are shown in Figure 5.9 below.

Figure 5. 8 : Confidence interval error bars for advantages of the Tablet PC by year of study



As shown in Figure 5.8, the level of agreement tends to decrease as year of study increases. The 1st years are more in agreement than 3rd year respondents. This signifies that respondents in the 1st year of study agreed more in getting advantages by using the Tablet PC as a mobile learning device compared to 2nd and 3rd year students.

5.8 CHALLENGES OF THE TABLET PC

Question 4 addressed challenges of the Tablet PC and required respondents to indicate their responses on a 5 point Likert scale ranging from never (1) to always (5). A total of 15 optional statements were presented to respondents and they were required to indicate the extent to which they face challenges when using the Tablet PC. Always or often and rarely or never will be combined for reporting purposes.

As indicated in Table 5.20, a total of 83.23% or 139 respondents reported that they always (33.53%;n=56) or often (49.7%;n=83) find it difficult to work with the Tablet PC especially when drawing graphs and diagrams followed by a total of 68.64% or 116 respondents who reported that they always (24.26%;n=41) or often (44.38%;n=75) find it difficult to access results online using the Tablet PC.

It is clear from Table 5.20 that total of 93.49% or 158 respondents reported to never (84.02%;n=142) or rarely (9.47%;n=16) find it difficult to download learning material using the Tablet PC. This was followed by a total of 92.82% or 155 respondents who indicated that they never (21.56%;n=36) or rarely (71.26%;n=119) find it difficult to read learning material on the Tablet PC due to its screen size and a further total of 92.91% or 154 respondents who never (23.95%;n=40) or rarely (68.26%;n=114) face difficulties in logging in to social sites in order to interact with others.

Table 5.20 indicate that only a small percentage of 7.1% or 12 respondents sometimes find it difficult to upload learning material using the Tablet PC. This was further followed by equal proportions of 6.51% or 11 respondents who reported that they sometimes find it difficult to connect to the campus Wi-Fi hotspots and that they find it difficult to study with the Tablet PC for a long time as their eyesight end up being strained.

Table 5. 20 : Challenges of the Tablet PC

Statement	Always		Often		Sometimes		Rarely		Never		Total %	Total n	Mean	SD
	%	N	%	n	%	n	%	n	%	n				
4.1 I find it difficult to connect to the campus Wi-Fi hotspots.	2.37%	4	6.51%	1 1	6.51%	11	62.72 %	10 6	21.89 %	37	100	169	2.05	.87
4.2 I find it difficult to connect to off-campus Wi-Fi hotspots such as McDonalds, Tshwane free Wi-Fi etc.	1.79%	3	5.95%	1 0	3.57%	6	68.45 %	11 5	20.24 %	34	100	168	2.01	.80
4.3 I find it difficult to concentrate in class when using the Tablet PC.	.59%	1	19.53%	3 3	3.55%	6	65.09 %	11 0	11.24 %	19	100	169	2.33	.94
4.4 I find it difficult to upload additional learning material in to the Tablet PC.	.59%	1	5.92%	1 0	7.1%	12	75.15 %	12 7	11.24 %	19	100	169	2.09	.68

Statement	Always		Often		Sometimes		Rarely		Never		Total %	Total n	Mean	SD
	%	N	%	n	%	n	%	n	%	n				
4.5 I find it difficult to play recorded video lectures using the Tablet PC.	1.2%	2	14.97%	25	4.19%	7	70.06%	117	9.58%	16	100	167	2.28	.88
4.6 I find it difficult to make and receive calls as the Tablet PC fails to read the sim card.	2.96%	5	37.87%	64	3.55%	6	47.93%	81	7.69%	13	100	169	2.80	1.12
4.7 I find it difficult to download learning material using the Tablet PC.	1.18%	2	2.96%	5	2.37%	4	84.02%	142	9.47%	16	100	169	2.02	.59
4.8 I find it difficult to read learning material on the Tablet PC due to its screen size.	2.99%	5	1.2%	2	2.99%	5	71.26%	119	21.56%	36	100	167	1.93	.75
4.9 I find it difficult to use the Tablet PC as it suddenly	.59%	1	28.99%	49	2.96%	5	60.95%	103	6.51%	11	100	169	2.56	1.00

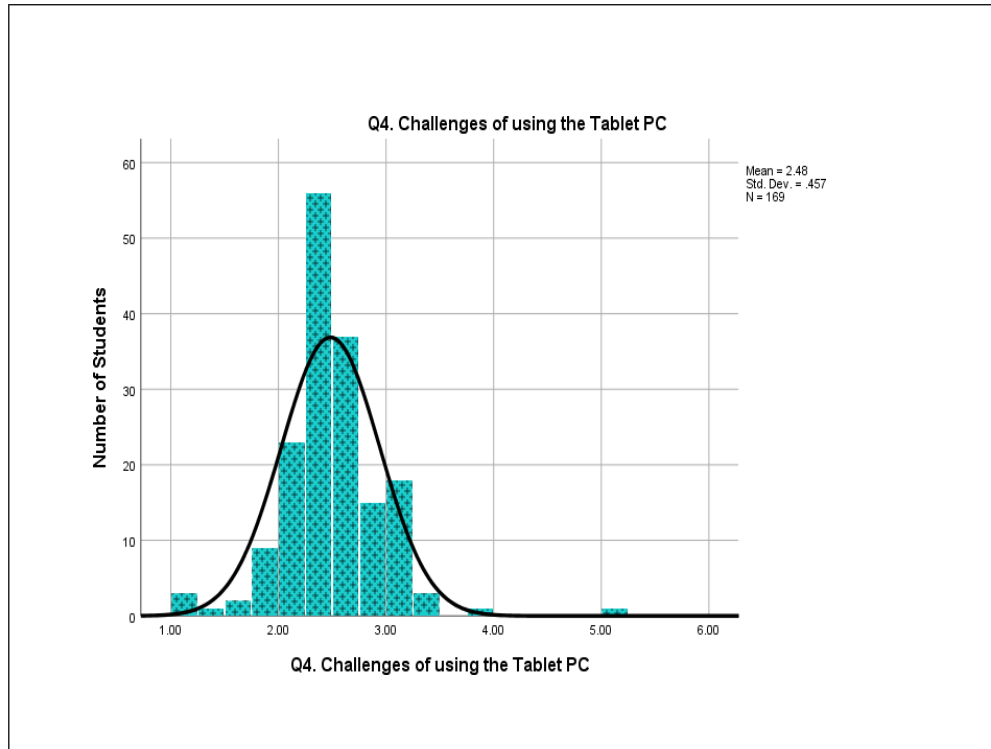
Statement	Always		Often		Sometimes		Rarely		Never		Total %	Total n	Mean	SD
	%	N	%	n	%	n	%	n	%	n				
hangs up while busy working on it.														
4.10 I find it difficult to work with the Tablet PC especially when drawing graphs and diagrams.	33.5 3 %	5 6	49.7%	8 3	5.99%	10	8.38%	14	2.4%	4	100	167	4.04	.98
4.11 I find it difficult to charge the Tablet PC when battery is low.	2.4%	4	20.1%	3 4	1.8%	3	63.9%	10 8	11.8%	20	100	169	2.37	1.0 1
4.12 I find it difficult to study with the Tablet PC for a long time as my eyesight end up being strained.	3.55%	6	33.73%	5 7	6.51%	11	52.07 %	88	4.14%	7	100	169	2.80	1.0 7
4.13 I find it difficult to access my examination results online using the Tablet PC.	24.2 6 %	4 1	44.38%	7 5	2.96%	5	21.3%	36	7.1%	12	100	169	3.57	1.2 6

Statement	Always		Often		Sometimes		Rarely		Never		Total %	Total n	Mean	SD
	%	N	%	n	%	n	%	n	%	n				
4.14 I find it difficult to do backups with the Tablet PC.	3.55%	6	24.85%	4 2	2.96%	5	63.91%	10 8	4.73%	8	100	169	2.59	1.03
4.15 I find it difficult to log in to social sites in order to interact with others using the Tablet PC.	1.8%	3	1.2%	2	4.79%	8	68.26%	11 4	23.95%	40	100	167	1.89	.70

Source: Question 4

Note: Total number of respondents could not be equal to 169 in some questions as some respondents could not provide all the answers to the questionnaire questions.

Figure 5. 9 : Distribution of data on the challenges of the Tablet PC



As illustrated in Figure 5.9, a total number of 169 respondents achieved a mean value of 2.48 and a standard deviation of .457. The standard deviation was smaller compared to the average mean thereby resulting to a narrow bell curve that resembles normal distribution of data. It can therefore be interpreted that responses were normally distributed across scale measurement items and that the majority of students rarely and never face challenges in using the Tablet PC.

5.8.2 Challenges of the Tablet PC not listed in the questionnaire

Question 4.15 of the online survey was an open-ended question and addressed other challenges of the Tablet PC. Using their own words, respondents were asked to indicate the challenges they face when using the Tablet PC. These challenges are indicated in Table 5.21.

Table 5. 21 : Challenges of the Tablet PC not listed in the questionnaire

Other challenges	Frequency (n)	Percentage (%)
Lack of sim card activation	1	20
Lack of knowledge to creating Backup	1	20
Difficult to type and save notes	1	20
Sometimes the Tablet PC is too Slow	1	20
Sometimes the Tablet PC freezes	1	20
Total	5	100

As indicated in Table 4.15, five challenges were raised by respondents in addition to the ones in the optional statements. Most of the challenges mentioned by respondents are technical in nature meaning that there is need to provide more knowledge and information to respondents on how they can effectively use the Tablet PC for them to avoid some of the challenges.

5.8.3 Determining the underlying construct on the challenges of the Tablet PC variable

Out of the 15 items measuring challenges of using the Tablet PC, only 1 item was dropped from the analysis leaving 14 items. The principal component analysis with a varimax rotation resulted in a KMO measure of sampling adequacy .817 and a highly significant Bartlett's test of Sphericity as shown in Table 5.22.

Table 5. 22 : KMO and Bartlett's Test for challenges of the Tablet PC

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.817
Bartlett's Test of Sphericity	Approx. Chi-Square	647.315
	Df	91
Sig.		$p < .001$

As indicated in Table 5.22, the results of KMO and Bartlett's tests showed that the data was appropriate for factor analysis. Based on the varimax rotation using Kaiser Normalisation, three constructs were extracted with 5 items, 6 items and three items respectively. Each construct consisted of items with factor loadings greater than .5 as shown in Table 5.23.

Table 5. 23: Factor rotation matrix solution for challenges of the Tablet PC

Statement	Component		
	1	2	3
Q4.11 I find it difficult to charge the Tablet PC when battery is low.	.795		
Q4.6 I find it difficult to make and receive calls as the Tablet PC fails to read the sim card.	.779		
Q4.9 I find it difficult to use the Tablet PC as it suddenly hangs up while busy working on it.	.773		
Q4.5 I find it difficult to play recorded video lectures using the Tablet PC.	.666		
Q4.12 I find it difficult to study with the Tablet PC for a long time as my eyesight end up being strained.	.624		
Q4.2 I find it difficult to connect to off-campus Wi-Fi hotspots such as McDonalds, Tshwane free Wi-Fi etc.		.691	
Q4.15 I find it difficult to log in to social sites in order to interact with others using the Tablet PC.		.650	
Q4.4 I find it difficult to upload additional learning material in to the Tablet PC.		.648	
Q4.8 I find it difficult to read learning material on the Tablet PC due to its screen size.		.645	
Q4.1 I find it difficult to connect to the campus Wi-Fi hotspots.		.617	

Q4.7 I find it difficult to download learning material using the Tablet PC.		.615	
Q4.3 I find it difficult to concentrate in class when using the Tablet PC.			.730
Q4.13 I find it difficult to access my examination results online using the Tablet PC.			.661
Q4.10 I find it difficult to work with the Tablet PC especially when drawing graphs and diagrams.			.576
Eigenvalue	3.129	2.731	1.924
% of Total Variation	22.353	19.504	13.741

As indicated in Table 5.23, the first construct had five items, an Eigen value of 3.129 and it constituted 22.35% of the total variation. The factor was named “*technical performance and screen display*”. The second construct had six items, an eigenvalue of 2.731 with a total variation of 19.5% and was named “connectivity problem”. The third construct was named “classroom distraction and access restriction” and it had an Eigen value of 1.924 and it accounted for 13.74% of the total variation. It consisted of three items. Combining the three constructs accounted for 55.6% (22.4%; 19.5%; 13.7%) of the total variation.

Table 5. 24 : Independent t-test to determine difference in mean scores for challenges of the Tablet PC by gender

Indicator	Group Statistics				Levene's Test for Equality of Variances			T-test for Equality of Means	
	Gen	N	Mean	SD	Equal variances	F	Sig	t-value	Sig (2 – tailed p-score)
Q4a. Internet connectivity	Male	69	1.911	.329	Assumed	4.987	.027	-1.951	.053
	Female	100	2.057	.560	Not			-2.135	.034
Q4b. Classroom distraction and access restriction	Male	69	3.343	.769	Assumed	.212	.646	.461	.646
	Female	100	3.288	.751	Not			.459	.647

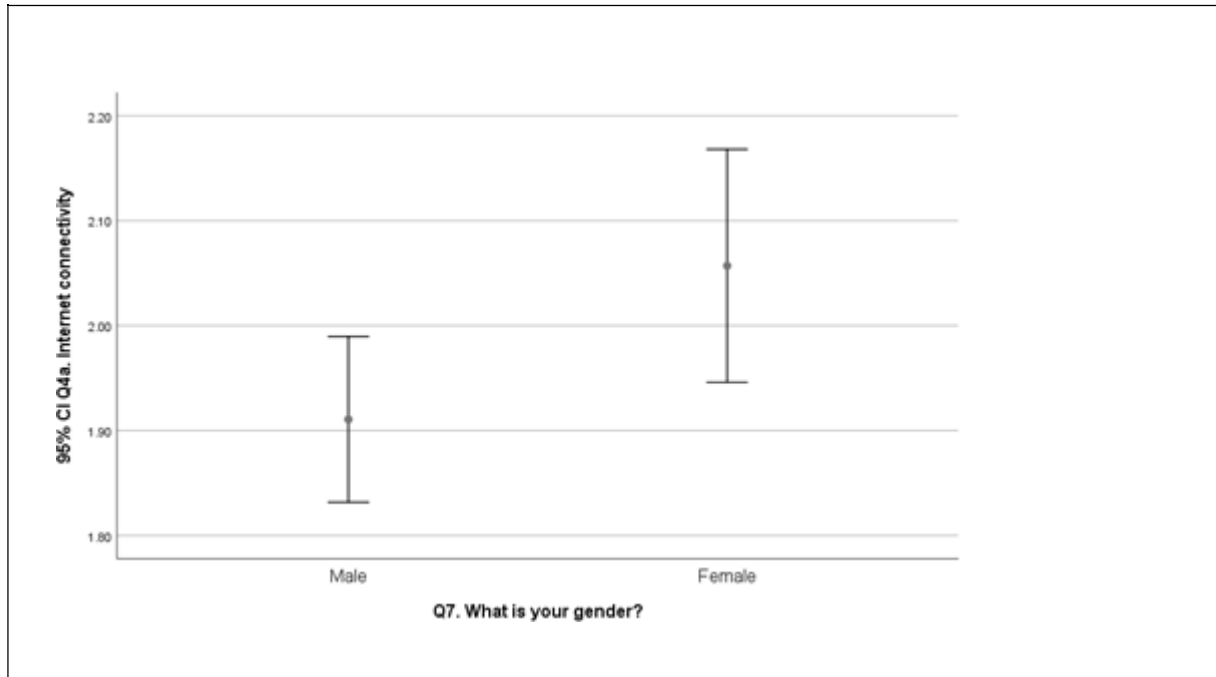
Q4c. Technical performance and screen display	Male	69	2.53 0	.747	Assumed	.493	.484	-.504	.615
	Female	100	2.59 2	.802	Not			-.511	.610
Q4. Challenges of using the Tablet PC	Male	69	2.44 0	.390	Assumed	1.7 2 5	.191	-1.037	.301
	Female	100	2.51 4	.498	Not			-1.084	.280

As indicated in Table 5.24, there was no statistically significant difference across gender for the items “*classroom distraction and access restriction*”, “*technical performance and screen display*” and “*challenges of using Tablet PC*” between male and female respondents. The mean score for three items were below three indicating that the level of occurrence of the Tablet PC challenges were low. Classroom distraction and access restriction had mean scores close to three indicating that both male and female respondents were indicating that the challenges sometimes occurred. Both male and female respondents did not see most of the asked questions as challenges of using Tablet PC as a learning mobile device. However, the level of occurrence differed in challenges involving internet connectivity.

The results of the independent t-tests revealed that for the item “*internet connectivity*”, there was a statistical significant difference in mean scores across gender, ($t(163.312) = -$

2.135, $p = .034$). The mean for females ($M = 2.06$, $SD = .56$) was significantly higher than the mean for males ($M = 1.91$, $SD = .33$). This is supported by the confidence interval error bars with a small overlap as shown in Figure 5.10.

Figure 5. 10 : Confidence interval error bars for internet connectivity as challenges of the Tablet PC by gender



As shown in Figure 5.10, male and female mean scores were close to two indicating that the challenges of using the Tablet PC rarely occurred. However, male respondents were significantly less challenged than females in terms of internet connectivity.

5.8.3 Determining difference in mean scores for challenges of the Tablet PC by year of study

Univariate analysis of variance was performed to determine the impact of year of study on challenges of using the Tablet Personal Computer (PC) as a mobile learning device. Levene's test for homogeneity of variance was used and resulted in the items *internet connectivity*, *classroom distraction and access restriction* and *technical performance and screen display* having unequal variances with all having p-values of less than .001. In this case the Welch robust tests was used to test for equality of means and where mean differences existed, the Games-Howell test was conducted as a post-hoc test. Since variances were equal for the variable "*challenges of using*

the *Tablet PC*”, the ANOVA F test was used for testing equality of means and the Tukey HSD was used as a post hoc test. The results of the F tests are shown in Table 5.25 below.

Table 5. 25 : ANOVA test to determine difference in mean score for challenges of the Tablet PC by year of study

Constructs	Levene’s test for equality of variance		Test for equality of means	
	<i>F</i>	<i>p-value</i>	<i>F</i>	<i>p-value</i>
Q4a. Internet connectivity	8.966	<i>p</i> < .001	2.093 ^b	.128
Q4b. Classroom distraction and access restriction	11.823	<i>p</i> < .001	2.115 ^b	.126
Q4c. Technical performance and screen display	5.519	<i>p</i> < .001	32.116 ^b	<i>p</i> < .001
Q4. Challenges of using the Tablet PC	2.613	.076	11.127	<i>p</i> < .001

^b Welch F-statistic

The F tests showed that there was no statistical significant difference between the means on issues measuring internet connectivity and classroom distraction and access restriction. The views were similar across categories of years of study. However, there was statistical significant difference on technical performance, screen display and challenges of using the Tablet PC. The views for the respondents were not the same across categories of year of study. Thus, year of study had an impact on the students’ perceptions regarding the efficiency and contribution to learning of the Tablet Personal Computer (PC) as a mobile learning device on these issues.

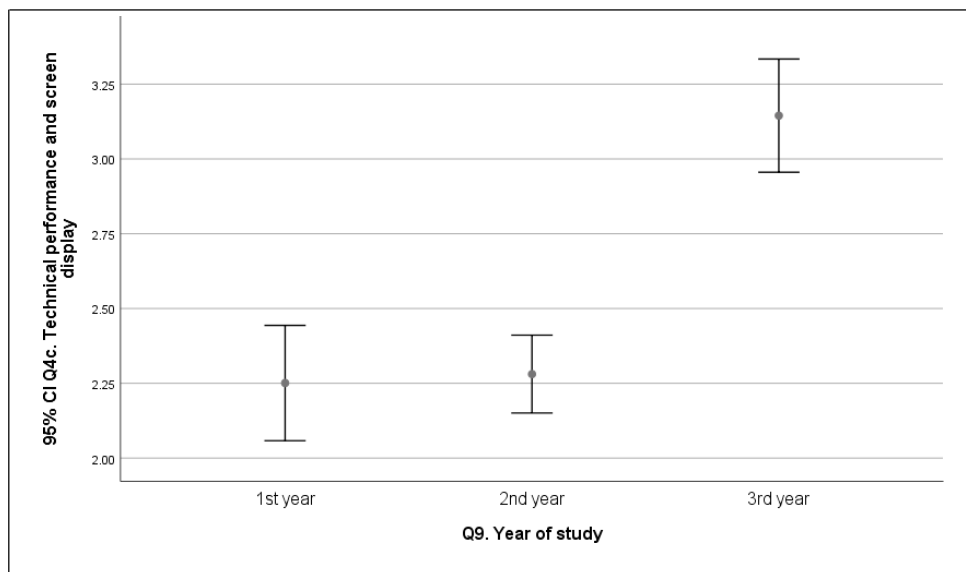
The results of the ANOVA test for challenges involving *technical performance and screen display* showed a statistically significant difference across year of study, *Welch’s* $F(2, 108.372) = 32.116, p < .001$. The Games-Howell post-hoc test resulted in two homogeneous group as presented in Table 5.26.

Table 5. 26 : Games-Howell homogeneous group for technical performance and screen display as challenges of the Tablet PC by year of study

Games-Howell	Q9. Year of study	N	Subset for alpha = 0.05	
			1	2
	1 st year	59	2.2508	
	2 nd year	52	2.2808	
	3 rd year	58		3.1448

As indicated in Table 5.26, respondents in the 3rd year ($M = 3.14$) had a significantly higher mean score of ($M = 3.14$) than those in 2nd year ($M = 2.28$) and 1st year ($M = 2.25$). The confidence interval error bars are shown in Figure 5.11 below.

Figure 5. 11: Confidence interval error bars for technical performance and screen display as challenges of the Tablet PC by year of study



As shown in Figure 5.11, 1st and 2nd year respondents had a mean close to two indicating that they rarely experience the challenges involving technical performance and screen display while respondents in the 3rd year of study had a mean score close to three indicating that they sometimes experience the challenges involving technical performance and screen display.

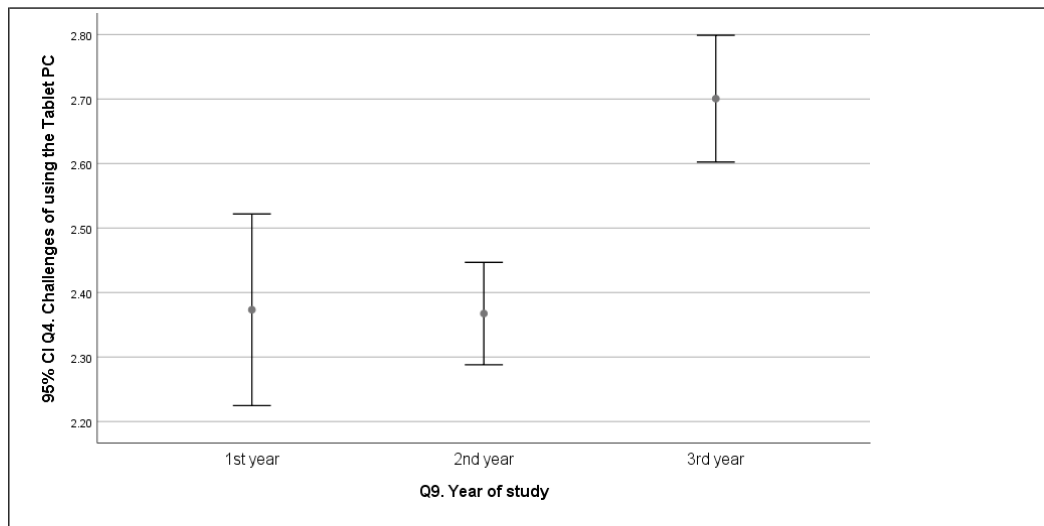
One-way univariate analysis of variance measuring challenges of using the Tablet PC resulted in a statistical significant mean difference across years of study, ($F(2,166) = 11.127, p < .001$). The Tukey HSD post-hoc test resulted in two homogeneous groups as shown in Table 5.27.

Table 5. 27 : Tukey HSD homogeneous group for challenges of the Tablet PC by year of study

Tukey HSDa,b	Q9. Year of Study	N	Subset for alpha = 0.05	
			1	2
	1 st year	59	2.373 3	
	2 nd year	52	2.367 4	
	3 rd year	58		2.70 05

As indicated in Table 5.27, respondents in the 3rd year ($M = 2.7$) of study had a significantly higher mean score than those in those in the 2nd year ($M = 2.36$) and 1st years ($M = 2.37$). The confidence interval error bars are shown in Figure 5.12.

Figure 5. 12 : Confidence interval error bars for challenges of the Tablet PC by year of study



As shown in Figure 5.12, respondents in the 1st and 2nd year of study had mean scores close to two indicating that they rarely experience the challenges while respondents in the 3rd year had a mean close to three indicating that they sometimes experience the challenges. This implies that 3rd year respondent's face more challenges in using the Tablet PC as a mobile learning device compared to 1st and

2nd year students.

5.9 TABLET PC TECHNICAL ASPECTS

Tablet PC technical aspects were addressed in Question 5 of the online survey. Respondents were required to indicate their responses on a 5 point Likert scale ranging from strongly disagree (1) to strongly agree (5). A total of 19 statements were presented to respondents and they were required to indicate the extent to which they agree with the statements measuring the Tablet PC technical aspects.

As indicated in Table 5.28, several responses were recorded and these responses will be presented in descending order. Only high frequencies will be reported. A total of 96.45% or 163 respondents reported to strongly agree (14.2%;n=24) or agree (82.25%;n=139) that the Tablet PC is compatible with other devices making it easy to share learning material with others. This was followed by a total of 95.86% or 162 respondents who strongly agree (26.04%;n=44) or agree (69.82%;n=118) that the Tablet PC easily install and uninstall applications. A further total of 95.26% or 161 respondents strongly agree (34.91%;n=59) or agree (60.35%;n=102) that the Tablet PC is user friendly. Equal proportions of 94.09% or 159 in number of respondents strongly agree (36.69;n=62) or agree (57.4%;n=97) that the Tablet PC visibly displays learning material in an easily readable manner and a total of 94.08% or 159 respondents indicated that they strongly agree (12.43%;n=21) or agree (81.65%;n=138) that the Tablet PC can quickly download learning material.

It is clear from Table 5.28 that a total of 22.48% or 38 respondents strongly disagree (.59%n=1) or disagree (21.89%;n=37) that the Tablet PC has a long battery life. A total of 17.75% or 30 respondents disagree that the Tablet PC can effectively play recorded lecture videos. None of the respondents strongly disagree on the statement.

As indicated in Table 5.28 a total of 23.81% or 40 respondents were neutral on the technical aspect that the Tablet PC can effectively perform back up of learning material. This was followed by a small percentage of 10.65% or 18 respondents who were neutral that the Tablet PC has a long battery life.

Table 5. 28 : Tablet PC technical aspects

Statement	Strongly agree		Agree		Neutral		Disagree		Strongly disagree		Total %	Total n	Mean	SD
	%	N	%	N	%	n	%	n	%	n				
5.1 My Tablet PC is user friendly.	34.91%	59	60.35%	102	2.96%	5	1.78%	3	-	-	100	169	4.3	.69
5.2 My Tablet PC connects fast to the campus Wi-Fi.	30.77%	52	56.22%	95	8.28%	14	3.55%	6	1.18%	2	100	169	4.1	.79
5.3 My Tablet PC connects fast to off-campus free Wi-Fi hotspots.	20.71%	35	64.5%	109	9.47%	16	4.14%	7	1.18%	2	100	169	4.0	.76
5.4 My Tablet PC visibly displays learning material in an easily readable manner.	36.69%	62	57.4%	97	4.73%	8	1.18%	2	-	-	100	169	4.3	.61
5.5 My Tablet PC can open multiple applications at the same time which can	28.4%	48	64.5%	109	4.14%	7	2.96%	5	-	-	100	169	4.2	.64

Statement	Strongly agree		Agree		Neutral		Disagree		Strongly disagree		Total %	Total n	Me an	SD
	%	N	%	N	%	n	%	n	%	n				
facilitate quick access to information.														
5.6 My Tablet PC can effectively play recorded lecture videos.	11.24%	19	63.91 %	108	7.1%	12	17.75 %	30	-	-	100	169	3.69	.89
5.7 My Tablet PC has a good operating system.	15.98%	27	76.92 %	130	6.51%	11	.59%	1	-	-	100	169	4.08	.49
5.8 My Tablet PC is compatible with other devices making it easy to share learning material/files with others.	14.2%	24	82.25 %	139	3.55%	6	-	-	-	-	100	169	4.11	.41
5.9 My Tablet PC can easily install and uninstall applications.	26.04%	44	69.82 %	118	3.55%	6	.59%	1	-	-	100	169	4.21	.53

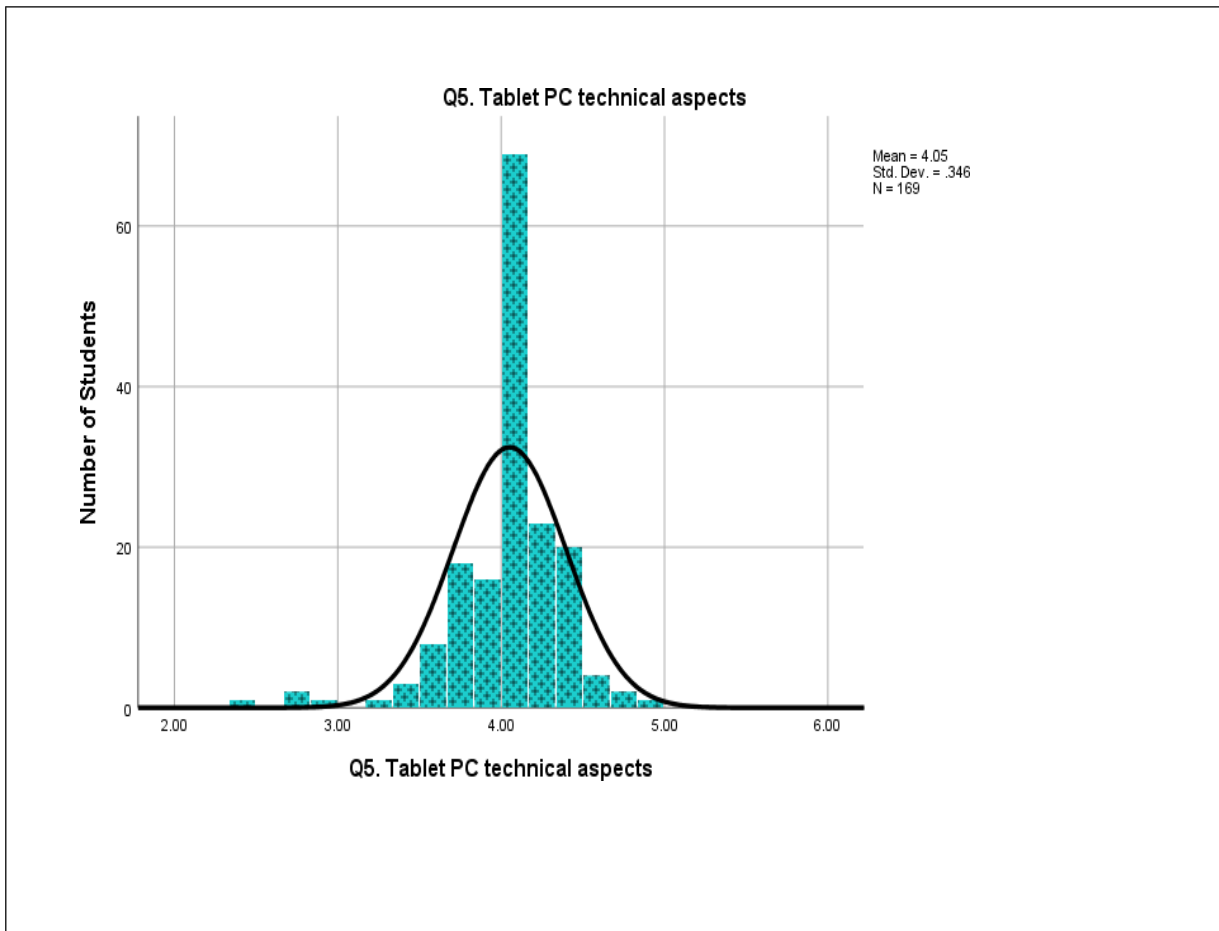
Statement	Strongly agree		Agree		Neutral		Disagree		Strongly disagree		Total %	Total n	Me an	SD
	%	N	%	N	%	n	%	n	%	n				
5.10 My Tablet PC can quickly download learning material.	12.43%	21	81.65 %	138	4.14	7	1.78%	3	-	-	100	169	4.05	.49
5.11 My Tablet PC can quickly save educational files and documents.	11.83%	20	80.48 %	136	6.51%	11	1.18%	2	-	-	100	169	4.03	.48
5.12 My Tablet PC has a good size which facilitate easy handling.	45.24%	76	48.81 %	82	4.76%	8	1.19%	2	-	-	100	168	4.38	.64
5.13 My Tablet PC has a larger internal storage capacity.	13.02%	22	78.6%	133	5.33%	9	2.37%	4	.59 %	1	100	169	4.01	.58
5.14 My Tablet PC has a larger external storage capacity.	17.26%	29	72.03 %	121	8.33%	14	2.38%	4	-	-	100	168	4.04	.59

Statement	Strongly agree		Agree		Neutral		Disagree		Strongly disagree		Total %	Total n	Mean	SD
	%	N	%	N	%	n	%	n	%	n				
5.15 My Tablet PC allows me to customise settings to suit my personal needs and preferences.	42.01%	71	51.48%	87	5.92%	10	.59%	1	-	-	100	169	4.35	.62
5.16 My Tablet PC has a long battery life.	6.51%	11	60.36%	102	10.65%	18	21.89%	37	.59%	1	100	169	3.5	.93
5.17 My Tablet PC can effectively perform back-up of learning material/files.	5.95%	10	66.67%	112	23.81%	40	3.57%	6	-	-	100	168	3.75	.62
5.18 My Tablet PC can perfectly play educational games.	7.69%	13	80.48%	136	8.28%	14	2.96%	5	.59%	1	100	169	3.92	.57
5.19 My Tablet PC has a multi-touch screen which gives extra functionality.	16.57%	28	73.37%	124	7.69%	13	2.37%	4	-	-	100	169	4.04	.58

Source: Question 5

Note: Total number of respondents could not add up to 169 in some questions as some respondents could not provide all the answers to the questionnaire question

Figure 5. 13 : Distribution of data on the Tablet PC technical aspects



As shown in Figure 5.13, a total of 169 respondents had an average mean of 4.05 and a small standard deviation of .346. These results produced a steep narrow bell curve which is a sign of normal distribution of data. Therefore, it can be concluded that the responses were fairly distributed across the measurement scale items.

5.9.2 Tablet PC technical aspects not appearing in the questionnaire

Question 5.20 was an open-ended question and addressed the other Tablet PC technical aspects besides the ones in the optional statements. Respondents were required to mention any additional technical aspects using their own words. These responses are indicated in Table 5.29.

Table 5. 29 : Technical aspects of Tablet PC not listed in the questionnaire

Other Technical aspects	Frequency (n)	Percentage (%)
Do screenshots	1	50
Good speaker volume	1	50
Total	2	100

As indicated in Table 5.29, only two additional technical aspects were mentioned by respondents. Respondents indicated that the Tablet PC is able to do screen shots and has a good speaker volume.

5.9.3 Determine the underlying constructs of the variable Tablet PC technical aspects

Exploratory factor analysis was performed on nineteen (19) items of the Tablet PC technical aspects and one item was dropped due to a factor loading that was less than .5. The principal component analysis method analysis was used to extract factors with a verimax rotation. The measures for the appropriateness of factor analysis are shown in Table 5.30.

Table 5. 30 : KMO and Bartlett's Test for Tablet PC Technical Aspects

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.797
Bartlett's Test of Sphericity	Approx. Chi-Square	1207.0
	Df	21
	Sig.	<i>p</i>
		< .001

As shown in Table 5.30, the KMO statistic value was .797, which is greater than .5 indicating that the correlations were adequate for factor analysis. The Bartlett's Test of sphericity a highly significant p-value ($p < .001$), which led to the rejection of the null hypothesis of lack of sufficient correlation between variables. The factor extraction demonstrated an emergence of four factors with a total variance of 60.12% as shown in the table below.

Table 5. 31: Factor rotation matrix solution for Tablet PC technical aspects

Statement	Component			
	1	2	3	4
My Tablet PC connects fast to the campus Wi-Fi.	.763			
My Tablet PC visibly displays learning material in an easily readable manner.	.742			
My Tablet PC is user friendly.	.724			
My Tablet PC connects fast to off-campus free Wi-Fi hotspots.	.687			
My Tablet PC can open multiple applications at the same time which can facilitate quick access to information.	.669			
My Tablet PC has a good size which facilitate easy handling.	.548			
My Tablet PC has a larger internal storage capacity.		.770		
My Tablet PC has a larger external storage capacity.		.758		
My Tablet PC allows me to customise settings to suit my personal needs and preferences.		.735		
My Tablet PC can perfectly play educational games.		.585		
My Tablet PC has a multi-touch screen which gives extra functionality.		.535		
My Tablet PC can quickly save educational files and documents.			.785	
My Tablet PC is compatible with other devices making it easy to share learning material/files with others.			.757	

My Tablet PC can quickly download learning material.			.709	
My Tablet PC can easily install and uninstall applications.			.643	
My Tablet PC has a long battery life.				.860
My Tablet PC can effectively play recorded lecture videos.				.805
My Tablet PC can effectively perform back-up of learning material/files.				.507
Eigenvalue	3.497	2.866	2.488	1.971
% of Total Variation	19.431	15.920	13.821	10.950

As indicated in Table 5.31, four categories were retained in this analysis. Based on the factor loadings, the most significant items were measuring ease of use, connectivity and portability. The second construct had five items, an Eigenvalue of 2.866 and 15.920% of the total variation. The construct was named “*storage capacity, customisation and functionality*”. The third construct was named “Processing of learning material and compatibility” It had three items, an Eigenvalue of 2.488 and it accounted for 13.821% of the total variation. The fourth construct was named “*Reliability and restoration of learning material*” and it had an Eigen value of 1.971 and it explained 10.950% of the total variation. A combination of all the four factor categories (19.43%, 15.92%, 13.82% and 11%) constituted to a total variation of 60.1% which was a robust result for analysis to be conducted.

5.9.4 Determining difference in mean scores for Tablet PC technical aspects by gender

Levene’s test of equality of variance resulted in all constructs having equal variances except the constructs “*ease of use, connectivity and portability*” and “*Tablet PC technical aspect*” with p-values of .018 and .021 respectively. For the two constructs statistics under equal variances not assumed were presented. The test on equality of means resulted in all the constructs having equal means for males and females as shown in Table 5.32 below.

Table 5. 32: Independent t-test to determine difference in mean scores for Tablet PC technical aspects by gender

Indicator	Group Statistics				Levene's Test for Equality of Variances			T-test for Equality of Means	
	Gender	N	Mean	SD	Equal variance	F	Sig	t-value	Sig (2-tailed p-score)
Q5a. Ease of use, connectivity and Portability	Male	69	4.22	.390	Assumed	5.686	.018	.402	.688
	Female	100	4.19	.575	Not assumed			.431	.667
Q5b. Reliability and restoration of learning material	Male	69	3.70	.630	Assumed	.615	.434	1.037	.301
	Female	100	3.60	.662	Not assumed			1.046	.297
Q5c. Processing of learning material and compatibility	Male	69	4.14	.338	Assumed	.000	.984	1.471	.143
	Female	100	4.06	.379	Not assumed			1.502	.135

Q5d. Storage capacity, customisation and functionality	Male	69	4.113	.342	Assumed	2.219	.138	1.002	.318
	Female	100	4.044	.497	Not			1.070	.286
Q5. Tablet PC technical aspects	Male	69	4.092	.242	Assumed	5.426	.021	1.247	.214
	Female	100	4.024	.402	Not			1.360	.176

The results of the independent t-tests revealed that there was no statistically significant difference in mean scores across gender in all the constructs on Tablet PC technical aspects. All the mean scores were close to four indicating that the respondents agreed on the issues related to the technical aspects of the Tablet PC as a learning mobile device. Therefore, the respondents were in agreement with the Tablet PC technical aspects in determining its performance as a mobile device used for learning purposes.

5.9.4 Determining difference in mean scores for Tablet PC technical aspects

To determine the perception of respondents regarding the Tablet PC technical aspects, the analysis of variance was done. The Levene's test for homogeneity of variance was used first and resulted in all constructs having unequal variances and this was followed by the Welch robust tests which was used to test for equality of mean scores where mean differences existed and the Games-Howell test was used as a post-hoc test. The results of the F tests are shown in Table 5.33 below.

Table 5. 33 : ANOVA test to determine difference in mean score for Tablet PC technical aspects by year of study

Constructs	Levene's test for equality of variance		Test for equality of means	
	<i>F</i>	<i>p-value</i>	<i>F</i>	<i>p-value</i>
Q5a. Ease of use, connectivity and portability	3.827	.024	2.569 ^b	.081
Q5b. Reliability and restoration of learning material	26.110	<i>p</i> < .001	43.663 ^b	<i>p</i> < .001
Q5c. Processing of learning material and compatibility	8.750	<i>p</i> < .001	2.948 ^b	.057
Q5d. Storage capacity, customisation and functionality	4.812	.009	1.932 ^b	.150
Q5. Tablet PC technical aspects	5.343	.006	9..658 ^b	<i>p</i> < .001

^bWelch F-statistic

As indicated in Table 5.33, the Welch F tests revealed that there was no statistical significant difference between the mean scores on items such as measuring ease of use, connectivity and portability, processing of learning material and compatibility and Storage capacity, customisation and functionality. The views were the same across categories of years of study. However, there was statistical significant difference on the constructs; reliability and restoration of learning material and challenges of using

the Tablet PC. Hence, the views of the respondents were not the same across categories of year of study on these items.

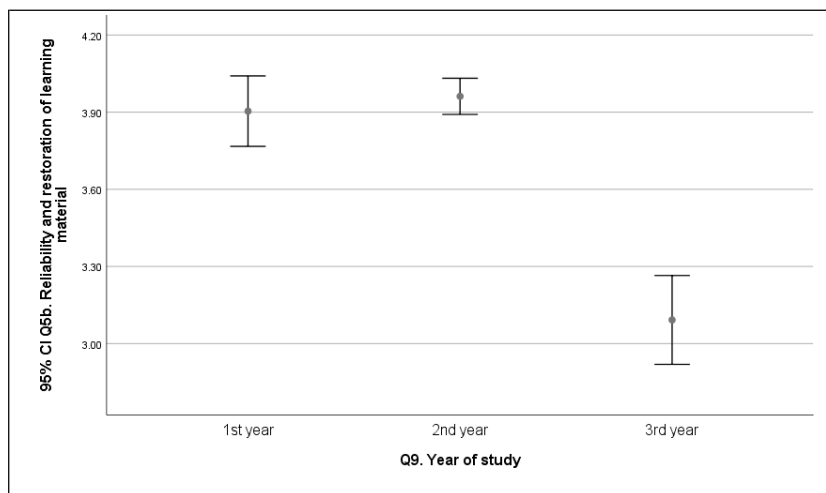
The results of ANOVA test for the Tablet PC technical aspect on reliability and restoration of learning material showed a statistically significant difference across year of study, *Welch's* $F(2, 98.889) = 43.663, p < .001$. The Games-Howell post-hoc test was conducted and resulted in two homogeneous group as shown in Table 5.34.

Table 5. 34: Games-Howell homogeneous group for reliability and restoration of learning material as Tablet PC technical aspects by year of study

Games-Howell	Q9. Year of study	N	Subset for alpha = 0.05	
			1	2
	1 st year	59		3.9040
2 nd year	52		3.9615	
3 rd year	58	3.0920		

As indicated in Table 5.34 above, 3rd year ($M = 3.09$) respondents had a significantly lower mean score of than those in the 2nd year ($M = 3.96$) and 1st year ($M = 3.90$).

Figure 5.14 : confidence interval error bars



As illustrated in Figure 5.14, 1st and 2nd year respondents had high mean scores close to four indicating that they were in agreement on issues on reliability and restoration

of learning material as Tablet PC technical aspects. Third year respondents have a mean close to three indicating that they were neutral. Thus the lower levels were more in agreement on issues regarding the Tablet PC technical aspects.

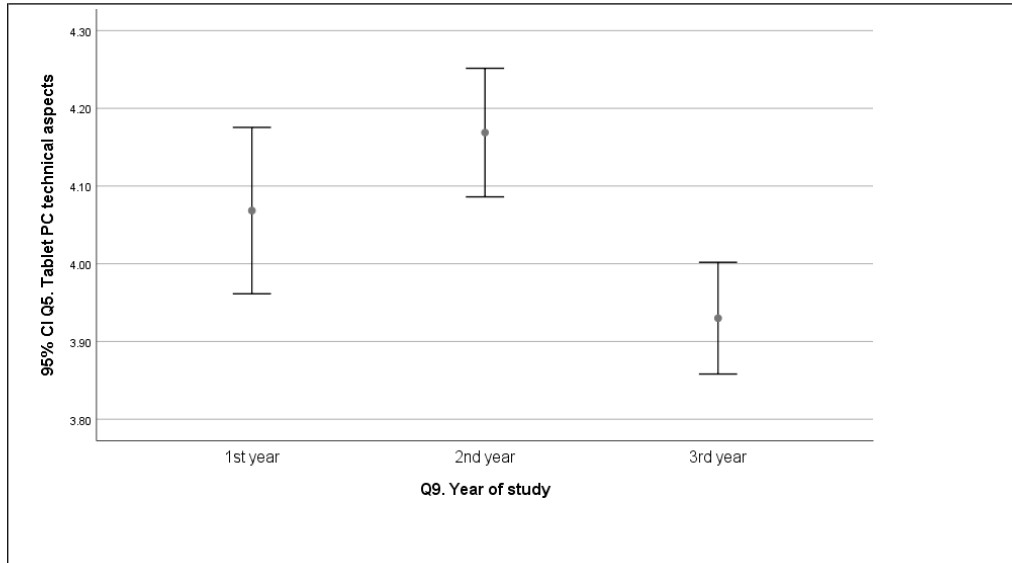
The Welch robust test of equality mean score for Tablet PC technical aspects revealed a statistically significance mean difference across categories of year of study, Welch's $(2, 108.252) = 9.658, p < .001$. The Games-Howell post hoc test resulted in two homogeneous group as shown in Table 5.35.

Table 5. 35: Games-Howell homogeneous group for Tablet PC technical aspects by year of study

Games-Howell	Q9. Year of study	N	Subset for alpha = 0.05	
			1	2
	1 st year	59		4.0684
	2 nd year	52		4.1688
	3 rd year	58	3.9300	

As indicated in Table 5.35 above, respondents in the 2nd year ($M = 4.16$) of study had a significantly higher mean score of and 1st years ($M = 4.06$) had a mean score of than those in the 3rd year ($M = 3.93$) of study. A moderate effect size $\omega^2 = .09$ was obtained and approximately 9% of the total variation in Tablet PC technical aspects is attributable to differences in year of study. The confidence interval error bars are shown in Figure 5.15 below.

Figure 5. 15 : Confidence interval error bars for Tablet PC technical aspects



As shown in Figure 5.15, mean scores for 1st and 3rd year respondents were close to four, but respondents in their 2nd year of study were more in agreement with the performance of the Tablet PC. This implies that 2nd year students agree more on the technical aspects of the Tablet PC compared to 1st and 3rd year respondents. The next section discusses the analysis of pedagogical opportunities offered by the Tablet PC.

5.10 PEDAGOGICAL OPPORTUNITIES OFFERED BY THE TABLET PC

Question 6 addressed pedagogical opportunities offered by the Tablet PC and required respondents to indicate their responses on a 5 point Likert scale ranging from not to any extent at all (1) to a very large extent (5). A total of 14 optional statements were presented to measure the extent to which pedagogical opportunities are offered by the Tablet PC. Always or often and never or rarely will be combined for reporting purposes. Responses with high frequencies will be reported in descending order.

As indicated in Table 5.36, respondents agreed to a very large extent or to a large extent on a number of statements regarding pedagogical opportunities offered by the Tablet PC. A total of 96.43% or 162 respondents indicated that the Tablet PC promotes independent learning to a very large extent (70.83%; n=119) or to a large extent (25.6%; n=43). This was followed by a total of 94.64% or 159 respondents who indicated that the Tablet PC strengthens their learning experience to a very large extent (45.24%; n=76) or to a large extent (49.4%;n=83) and a total of 94.05%

or 158 respondents indicated that the Tablet PC integrates knowledge and skills to a very large extent (29.76%;n=50) or to a large extent 64.29%;n=108). Equal proportions in number of respondents were reported as a total of 94.01% or 157 respondents indicated to a very large extent or to a large extent that the Tablet PC provide learning instructions of using it. This was further followed by a total of 92.90% or 157 respondents who indicated to a very large extent (60.53%;n=102) or to a large extent (32.54%;n=55) that the Tablet PC enhances collaboration with other students.

It is clear from Table 5.36 that a total of only 10.06% or 17 respondents agree to some extent that the Tablet PC support gifted students. This was followed by a total of 9.52% or 16 respondents who indicated that the Tablet PC strengthens their communication skills. A further small total of 8.98% or 15 respondents indicated that the Tablet PC strengthens their problem solving skills to some extent.

Table 5.36: Pedagogical opportunities offered by the Tablet PC

Statement	To a very large extent		To a large extent		To some extent		To a little extent		Not to any extent at all		Total %	Total n	Mean	SD
	%	N	%	N	%	N	%	N	%	n				
6.1 The Tablet PC strengthens my learning experience.	45.24%	76	49.4%	83	1.79%	3	1.79%	3	1.79%	3	100	168	4.35	.77
6.2 The Tablet PC increases motivation towards learning.	47.9%	80	44.91%	75	4.79%	8	2.4%	4	-	-	100	167	4.38	.69
6.3 The Tablet PC facilitates active teaching and learning methods.	29.76%	50	62.5%	105	6.55%	11	1.19%	2	-	-	100	168	4.21	.61
6.4 The Tablet PC promotes independent learning.	70.83%	119	25.6%	43	2.98%	5	.6%	1	-	-	100	168	4.67	.57
6.5 The Tablet PC strengthens my problem-solving skills.	32.34%	54	55.09%	92	8.98%	15	2.99%	5	.6%	1	100	167	4.16	.75

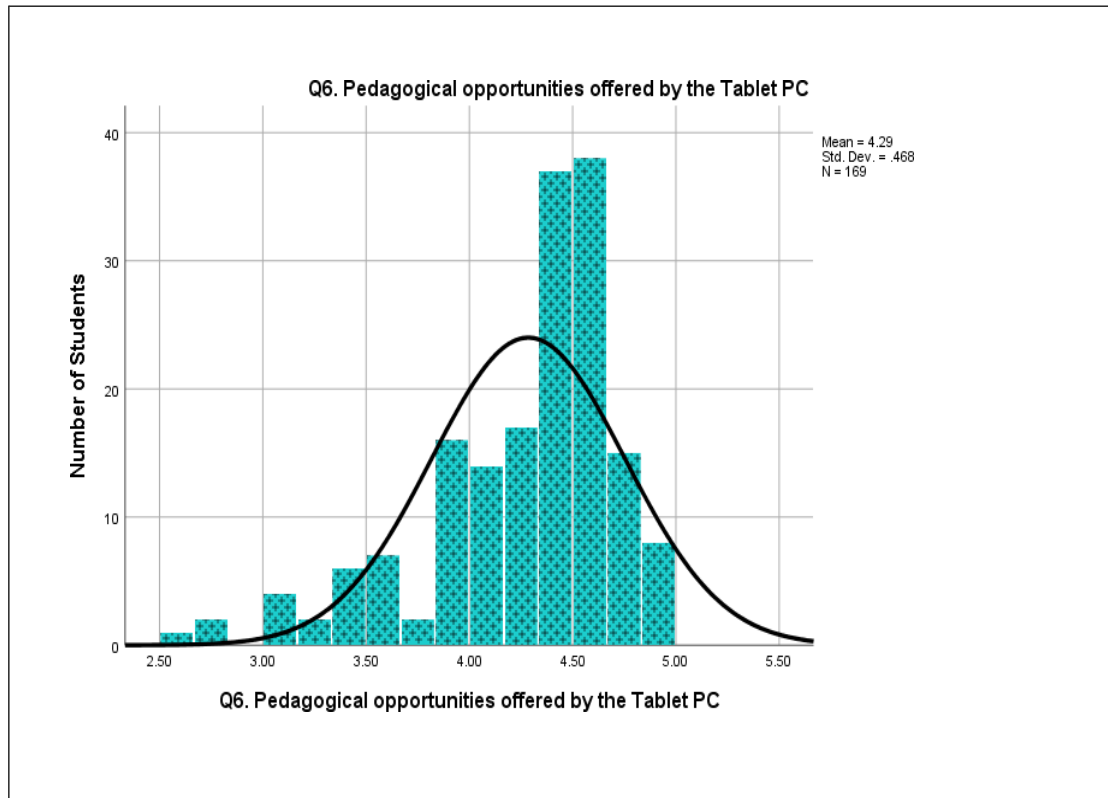
Statement	To a very large extent		To a large extent		To some extent		To a little extent		Not to any extent at all		Total %	Total n	Mean	SD
	%	N	%	N	%	N	%	N	%	n				
6.6 The Tablet PC strengthens my communication skills.	56.55%	95	30.95	52	9.52%	16	2.98%	5	-	-	100	168	4.41	.78
6.7 The Tablet PC enhances collaboration with other students.	60.36%	102	32.54	55	6.51%	11	.59%	1	-	-	100	169	4.53	.65
6.8 The Tablet PC integrates knowledge and skills.	29.76%	50	64.29	108	4.76%	8	1.19%	2	-	-	100	168	4.23	.59
6.9 The Tablet PC improves learning outcomes.	49.11%	83	43.79	74	6.51%	11	.59%	1	-	-	100	169	4.41	.64
6.10 The Tablet PC supports low-performing students.	29.09%	48	61.21	101	6.67%	11	3.03%	5	-	-	100	165	4.16	.67

Statement	To a very large extent		To a large extent		To some extent		To a little extent		Not to any extent at all		Total %	Total n	Mean	SD
	%	N	%	N	%	N	%	N	%	n				
6.11 The Tablet PC supports gifted students.	32.54%	55	51.48%	87	10.06%	17	5.33%	9	.59%	1	100	169	4.10	.83
6.12 The Tablet PC can be used as an assessment tool.	31.55%	53	61.31%	103	5.95%	10	1.19%	2	-	-	100	168	4.23	.61
6.13 The Tablet PC enhances learning knowledge content.	21.3%	36	71.01%	120	5.92%	10	.59%	1	1.18%	2	100	169	4.11	.63
6.14 The Tablet PC provide learning instructions of using it.	14.97%	25	79.04%	132	4.79%	8	.6%	1	.6%	1	100	167	4.07	.52

Source: Question 6

Note: Total number of respondents could not add up to 169 in some questions as some respondents could not provide all the answers to the questionnaire questions.

Figure 5. 16 : Distribution of data on pedagogical opportunities offered by the Tablet PC



As illustrated in Figure 5.16, a total number of 169 respondents had an overall mean score of 4.29 and a small standard deviation of .468. A small standard deviation reflects how the values are close to the mean leading to a slightly narrow curve. It can therefore be interpreted that responses were evenly distributed across the measuring scales items.

5.10.2 Pedagogical opportunities offered by the Tablet PC not listed in the questionnaire

Question 6.15 of the questionnaire was an open-ended question and addressed other pedagogical opportunities offered by the Tablet PC. Respondents were requested to indicate additional pedagogical opportunities offered by the Tablet PC apart from the ones given in the optional statements. Table 5.37 indicate the responses.

Table 5. 37: Pedagogical opportunities offered by the Tablet PC not listed in the questionnaire

Other Pedagogical opportunities offered by the Tablet PC	Frequency (n)	Percentage (%)
Gives freedom to learn	1	25
Improves computer skills	1	25
Makes studying easier	1	25
Give opportunity to record videos	1	25
Total	4	100

As indicated in Table 5.37, a total of four responses were indicated as additional pedagogical opportunities offered by the Tablet PC to respondents.

5.10.3 Determine the underlying constructs on the variable pedagogical opportunities offered by the Tablet PC

Exploratory factor analysis was performed on the variable pedagogical opportunities and all the items were retained in the analysis. The results of the KMO and Bartlett's tests are indicated below in Table 5.38 below.

Table 5. 38: KMO and Bartlett's Test for pedagogical opportunities

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.909
Bartlett's Test of Sphericity	Approx. Chi-Square	1196.557
	Df	91
	Sig.	$p < .001$

As shown in Table 5.38, a KMO statistic of .909 was obtained indicating that the correlations were adequate for factor analysis. The Bartlett's Test of sphericity had a highly significant p-value ($p < .001$), which leads to the rejection of the null hypothesis of lack of sufficient correlation between variables. This means there is a significant correlation of items within the constructs. Based on the principal component analysis with a verimax rotation using Kaiser Normalisation, two factors were obtained and they constitute 59% of the total variation as indicated in the Table 5.39.

Table 5. 39 : Factor rotation matrix solution for pedagogical opportunities offered by the Tablet PC

Statement	Component	
	1	2
The Tablet PC strengthens my communication skills.	.817	
The Tablet PC increases motivation towards learning.	.777	
The Tablet PC facilitates active teaching and learning methods.	.760	
The Tablet PC strengthens my learning experience.	.759	
The Tablet PC enhances collaboration with other students.	.720	
The Tablet PC strengthens my problem-solving skills.	.710	
The Tablet PC promotes independent learning.	.706	
The Tablet PC integrates knowledge and skills.	.562	
The Tablet PC can be used as an assessment tool.		.814
The Tablet PC provide learning instructions of using it.		.726
The Tablet PC enhances learning knowledge content.		.646
The Tablet PC improves learning outcomes.		.566
The Tablet PC supports low-performing students.		.558
The Tablet PC supports gifted students.		.553
Eigenvalue	5.134	3.121
% of Total Variation	36.670	22.291

As indicated in Table 5.39, the first factor category had eight items with 36.7% of the total variation and it had an Eigen value of 5.134. Based on the factor loadings, the factor was named “*pedagogical impact on communication and motivation towards learning*”. Second factor category had six items, an Eigenvalue of 3.121 and a total variation of 22.29%. The factor was named “*pedagogical usefulness and learner support*”.

5.10.3 Determining difference in mean scores for pedagogical opportunities offered by the Tablet PC by gender

The Levene’s test of homogeneity of variances showed that all the constructs had equal variances and statistics under equal variances assumed were presented. The test on equality of means resulted in all the constructs having equal means for males and females as shown in Table 5.40.

Table 5. 40 : Independent t-test to determine difference in mean scores for pedagogical opportunities offered by the Tablet PC by gender

Indicator	Group Statistics				Levene's Test for Equality of Variances			T-test for Equality of Means	
	Gender	N	Mean	SD	Equal variances	F	Sig	t-value	Sig (2-tailed p-score)
Q6a. Pedagogical impact on communication and motivation towards Learning	Male	69	4.391	.475	Assumed	2.989	.086	.571	.569
	Female	100	4.345	.552	Not			.587	.558
Q6b. Pedagogical usefulness and learner support	Male	69	4.205	.417	Assumed	1.580	.210	.536	.593
	Female	100	4.164	.523	Not			.558	.577
Q6. Pedagogical opportunities offered by the Tablet PC	Male	69	4.311	.423	Assumed	2.613	.108	.597	.551
	Female	100	4.267	.498	Not			.616	.539

It is clear from Table 5.40 that the results of the independent t-test to determine Whether males and females differ on pedagogical opportunities showed that there was no significantly different for both males and females in all the constructs.

Both groups had means close to four suggesting that there were agreeing that the pedagogical opportunities occurred to a large extent. This implies that the pedagogical opportunities offered by the Tablet PC as a mobile learning were to a large extent influential to both males and females.

5.10.3 Determining differences in mean scores for pedagogical opportunities offered by the Tablet PC

Levene’s test for homogeneity of variance was conducted and resulted in the constructs as indicated in Table 5.41 below.

Table 5. 41: Pedagogical opportunities offered by the Tablet PC by year of study

Constructs	Levene’s test for equality of variance		Test for equality of means	
	F	p-value	F	p-value
Q6a. Pedagogical impact on communication and motivation towards learning	8.576	<i>p</i> < .001	7.645 ^b	.001
Q6b. Pedagogical usefulness and learner support	2.219	.112	2.949	.055
Q6. Pedagogical opportunities offered by the Tablet PC	6.263	.002	6.458 ^b	.002

^b Welch F-statistic

As indicated in Table 5.41 above, ANOVA F tests revealed that there was no statistical significant difference between the mean scores measuring pedagogical usefulness and learner support. The views were the same across categories of years of study. However, there was statistically significant difference between the mean scores on issues measuring *pedagogical impact on communication and motivation*

towards learning and pedagogical opportunities. The views for the respondents were not the same across categories of year of study for these two issues.

The results of ANOVA test for *pedagogical impact on communication and motivation towards learning* showed a statistical significant difference across year of study, *Welch's* (2, 108.626) = 7.645, $p = .001$. Therefore, the Games-Howell post hoc test was conducted and resulted in two homogeneous groups as shown in Table 5.42.

Table 5. 42: Games-Howell homogeneous group for pedagogical impact on communication and Motivation towards learning as pedagogical opportunities offered by the Tablet PC by year of study

Game s- Howell	Q9. Year of study	N	Subset for alpha = 0.05	
			1	
	1 st year	59	4.15 62	
	2 nd year	52		4.5313
	3 rd year	58		4.4246

As indicated in Table 5.42, respondents in the 2nd year of study had the highest mean score of ($M = 4.53$) followed by and 3rd year of study with ($M = 4.42$) compared to 1st year of study who had a lower mean score of ($M = 4.15$). A moderate effect size of $\omega^2 = .07$ was obtained and approximately 7% of the total variation in pedagogical impact on communication and motivation towards learning as pedagogical opportunities offered by the Tablet PC is attributable to differences in year of study. The confidence interval error bars are shown in Figure 5.17 below.

Figure 5.17 Confidence interval error bars for pedagogical impact

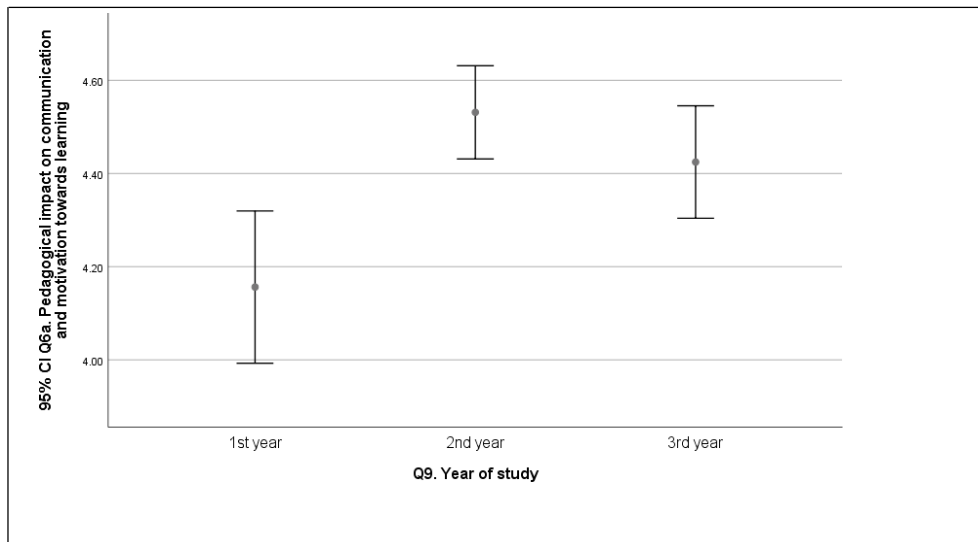


Figure 5.17 illustrate interval error bars of respondents in the 1st and 3rd year of study who had mean scores close to four while the 2nd years had a mean close to five. Thus, the 2nd year study level indicated that was the pedagogical impact on communication and motivation towards learning as pedagogical opportunities offered by the Tablet PC occurred to a very large extent compared to 1st and 3rd year levels of study who indicated the occurrence to a large extent.

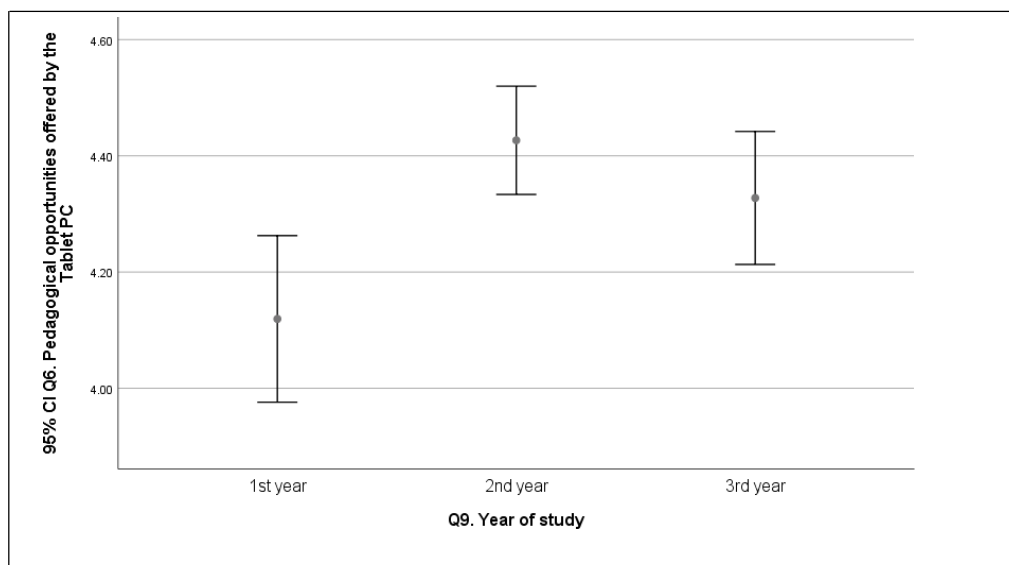
Table 5. 43: Games-Howell homogeneous group for pedagogical opportunities offered by the Tablet PC by year of study

Games-Howell	Q9. Year of study	N	Subset for alpha = 0.05	
			1	2
	1 st year	59	4.1193	
	2 nd year	52		4.4267
	3 rd year	58		4.3275

As indicated in Table 5.43, respondents in the 2nd year of study had the highest mean score of ($M = 4.42$) followed by 3rd years who had a mean of ($M = 4.32$) compared to 1st year of study with mean score of ($M = 4.12$) which was the lowest. A moderate effect size $\omega^2 = .06$ was obtained and approximately 6% of the total variation in pedagogical opportunities offered by the Tablet PC is attributable to differences in year

of study. The confidence interval error bars are shown in Figure 5.18.

Figure 5. 18 : Confidence interval error bars for pedagogical opportunities



As shown in Figure 5.18, all mean scores for the three study levels were close to four. However, respondents in the 2nd year of study indicated that pedagogical opportunities offered by the Tablet PC occurred to a large extent as compared to the other year levels. This is of the interpretation that 2nd year respondents agreed more to the pedagogical opportunities offered by the Tablet PC as a mobile learning device compared to 1st and 3rd year respondents.

The next section will discuss the relationship between the research variables using correlation and regression analysis.

5.11 DETERMINING RELATIONSHIPS BETWEEN THE RESEARCH VARIABLES

As discussed in Chapter 4 Section 4.2.10.4, Pearson correlation coefficients were used to determine the degree of relationship between the five measured variables. The guidelines proposed by Salkind (2018) were used to interpret the relationship between the measured five variables. Salkind (2018) used the “eyeball method” to propose the following guidelines; where $r = .0$ and $.2$ very weak; $.2$ and $.4$ weak; $.4$ and $.6$ moderate; $.6$ and $.8$ strong; and $.8$ and 1.0 very strong. The main concern was the relationship between pedagogical opportunities offered by the Tablet PC and the other variables. Pedagogical opportunities revealed the ability of the Tablet PC to convey skills and knowledge in a manner that students can understand, use and

apply in future.

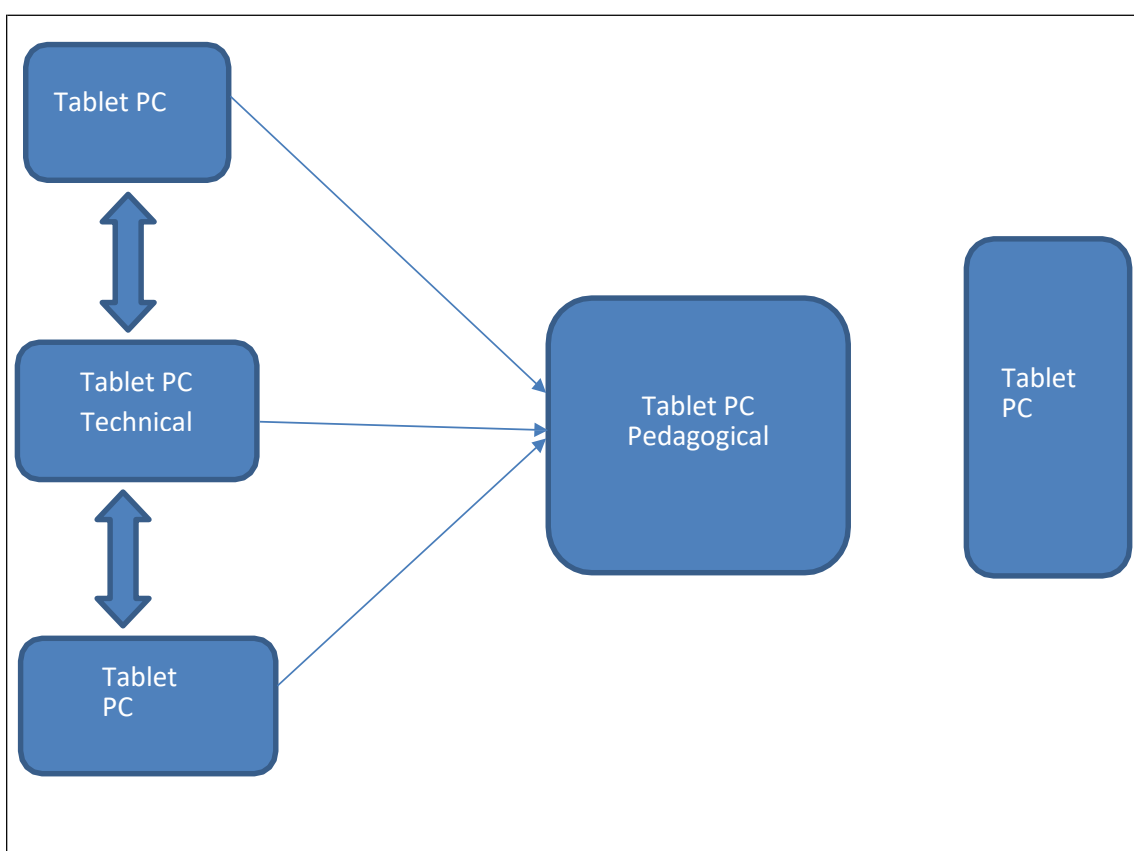
Table 5. 44 : Pearson correlation coefficients of the variables

Construct	1	2	3	4	5
1. Uses of the Tablet PC	-				
2. Advantages of the Tablet PC	.120	-			
3. Challenges of the Tablet PC	-.121	-.208 ^{**}	-		
4. Tablet PC Technical aspects	.309 ^{**}	.520 ^{**}	-.396 ^{**}	-	
5. Pedagogical opportunities offered by the Tablet PC	.213 ^{**}	.356 ^{**}	-.061	.631 ^{**}	-

* An indication of significant difference

As indicated in Table 5.44, there is a positive significant correlation between the pedagogical opportunities offered by the Tablet PC with uses of the Tablet PC ($r = .213, p < .001$), advantages of using the Tablet PC ($r = .356, p < .001$) and Tablet PC Technical aspects ($r = .631, p < .001$). The correlations were of low and large effect respectively. High levels of pedagogical opportunities offered by the Tablet PC are associated with high levels in uses of the Tablet PC, high levels in advantages of using the Tablet PC and high levels in Tablet PC technical aspects. Pedagogical opportunities offered by the Tablet PC were not significantly correlated to challenges of the Tablet PC. This resulted in the development of a conceptual model showing the relationship between the Tablet PC measured aspects namely uses advantages, challenges, technical aspects and pedagogical opportunities. The model is illustrated in Figure 5.19 below.

Figure 5. 19 : Tablet PC students' perception model



As indicated in Table 5.44, Tablet PC technical aspects has a significant positive correlation with uses of the Tablet PC ($r = .309, p < .001$) and advantages of using the Tablet PC ($r = .309, p < .001$) and a significant negative correlation with challenges of using the Tablet PC ($r = -.396, p < .001$). The higher the Tablet PC performance the more the advantages it possess and the more it is used for various academic purposes with less challenges. This relationship is depicted in Figure 5.19.

5.12 CONCLUSION

This chapter presented an analysis of the research findings from the online survey that was deployed as a data collection tool in the present study. The research methodology, demographics and internal consistency was briefly discussed. The analysis of data was conducted through descriptive statistics and inferential statistics in order to determine any significant differences among the research variables. To test the reliability of the questionnaire, Cronbach's alpha coefficients were calculated.

Results from the Exploratory Factor Analysis, independent t-tests and ANOVAs were holistically presented. A conceptual model showing the relationships between the research variables was developed. It can be concluded that the Tablet PC possesses many advantages, has good technical aspects, is used for academic purposes, and has a few challenges which result to pedagogical opportunities being offered. The next chapter focuses on conclusions and recommendations of the study.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This concluding chapter of the study provides a summation of the entire study and the observations, arguments and conclusions therein. The purpose of this study was to explore students' perceptions of the Tablet Personal Computer (PC) as a mobile learning device at a graduate institute in Tshwane as discussed in Chapter 1 Section 1.6. In the previous chapter, the empirical results and research findings from the online survey were presented and discussed. In this chapter, the main findings from the theoretical and empirical research are discussed. The research objectives will be revisited and a discussion of how each objective was achieved will be addressed. This is followed by the research limitations, recommendations and suggestions for future research. The main purpose of this chapter is to draw conclusions and make recommendations from the empirical research and theoretical findings addressed in Chapters 2 and 3.

6.2 MAIN FINDINGS OF THE THEORETICAL DISCUSSION

A detailed literature review of students' perceptions regarding the Tablet PC as a mobile learning device used in higher education institutions was presented in Chapter 2. This was followed by a discussion of the customer perception process in Chapter 3. Various academic sources including articles, journals, the internet, academic reports, textbooks and previous researches into the use of Tablet PC were consulted. The main findings from the literature review will be presented in this section.

According to Semerci (2018), whose aim was to explore student views on the use of Tablet PCs in education, it was noted that all the participating students had a positive attitude towards the use of Tablet PC's for educational purposes.

The results from a study focussing on user perceptions and usability of Tablet PCs in the classroom by university students and faculty demonstrated the need for significant training and support to assist students in understanding how to leverage Tablet PC's as educational tools (Percival & Claydon, 2015). Similarly, a study that was conducted by Shambare & Shambare (2016) highlighted that higher education institutions need not assume that students have enough knowledge of using the Tablet PC but instead they need to offer basic training to students right from the beginning of their academic life. These studies were supported by a study conducted by Phillips

(2017) who recommended the need for higher education faculty and administrators to devise comprehensive training and technology plans that support and encourage students to use mobile devices for educational purposes (Phillips, 2017).

According to Siemieniecki & Majeskwa (2015), students who owned a Tablet PC reported to frequently use the Tablet PC to study at home, at university, when travelling as well as during free time spent outside their home. The study also revealed that there was no statistical relationship between gender, frequency and form of using the Tablet PC when learning. Both male and female students used the Tablet PC to search, view, analyse, play back and assimilate the study materials available to them. Less often the Tablet PC was used to create long essays or complex presentations. Findings from the study further revealed that the majority of respondents were increasingly motivated and became active to learn when using the Tablet PC, hence they were able to solve given class work.

According to Tront (2015), training of faculty and support personnel was central to the success of the Tablet PC initiative. Improvements to infrastructure including network connectivity, additional classroom projection systems and increased availability of power connections were some of the physical challenges that required attention in the implementation of a Tablet PC programme. The study further noted that sound and frequent assessment of the successes and failures of the Tablet PC roll out program and identification of potentially fruitful avenues to pursue in the future were part of an institution's dominant deployment strategy from the beginning. In addition to these infrastructural challenges, the success of the Tablet PC program roll out was found to be dependent on the willingness of the faculty to make changes in the way in which they provide education to their students.

Research conducted by Stewart (2013) found that there were a number of key indicators that needed to be improved before rolling out a Tablet PC program. These indicators include amongst others the following: increased professional development for educators regarding the use of the Tablet PC in the classroom; increased time allocation for educators to investigate and create learning activities; and improvements in the institution's infrastructure and quality of the students' Tablet PCs. The study also recommended that once the key indicators have been met, a study focussing on the use of the Tablet PC should be conducted. Such a study will be able to give a more accurate indication of the role the Tablet PC has in education.

According to Pamuk, Cakir, Ergun, Yilmaz and Ayas (2013) during classroom observations, it became apparent that some students did not use the Tablet PC effectively. The Tablet PC was perceived as a tool that distracted some students from paying attention in the class lesson, hence some lecturers did not allow students to use the Tablets during their lesson time.

In a study conducted by Rikala et al (2013) the Tablet PC was found to increase motivation to learn, promote independent learning and highly engaging thereby enhancing effective student teaching and learning methods. According to Rossing, Miller, Cecil and Stamper (2012), students were very positive concerning the use of Tablet PC in higher education as they reported that they had immediate access to information and an improved learning experience. However, educators and instructors were encouraged to provide guidance and assistance to students for them to adopt the Tablet PC in the classroom.

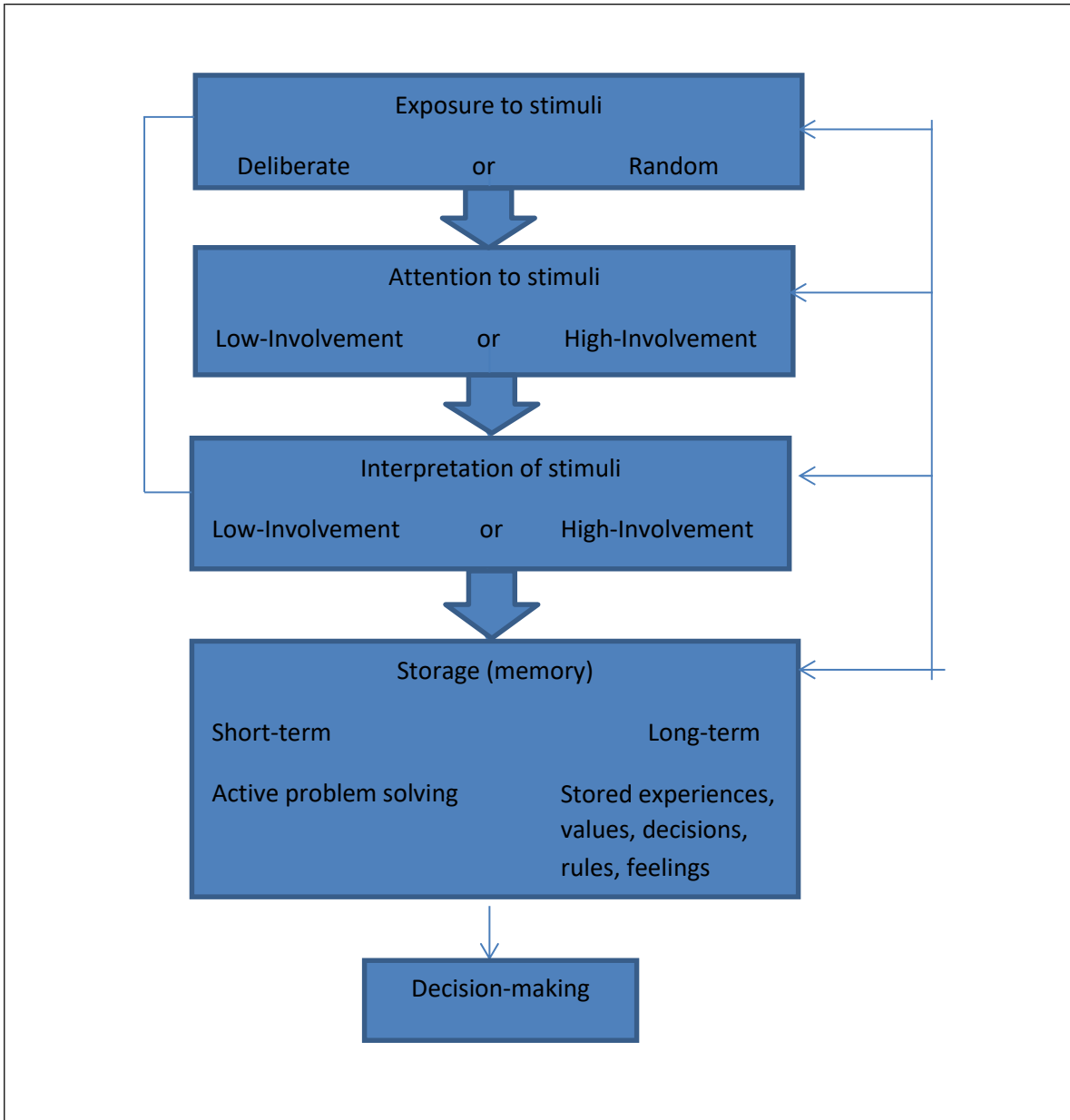
According to Franklin (2011), it is very crucial that the Tablet PC as a mobile learning device is integrated into both the academic and the social aspects of a student life in order to ensure its successful adoption by students.. This recommendation was supported by a study conducted by Wardley & Mang (2016) who advised that most students cannot adopt a tablet device voluntarily but however they would have seen the benefits of using the Tablet PC in improving their learning outcomes.

The aim of the study was to explore students' perceptions regarding the Tablet PC as a mobile learning device at a graduate institute in Tshwane. It was highlighted in Chapter 3 that perception involves seeing hearing, feeling, tasting and smelling of stimuli that will be relayed to the brain for interpretation (Du Plessis, Strydom and Jooste, 2012: 101). Through perception, people are able to perceive objects and the environment differently due to the differences in culture, experience, purpose and interpretation of the subject in question (Heffner, 2014). Therefore, perception does not only influence consumer behaviour but also affect the performance, profitability, success and failure of an institution (iResearch Services, 2017). This is due to the fact that a customers' perception of a product or service is based on the actual experience of using that particular product or service.

It was noted in Chapter 3 that students go through four stages of perception to perceive the Tablet PC namely; exposure, attention, interpretation and storage/memory. During exposure, students are introduced and given the Tablet PC for the first time upon

registration. It is during this stage that students are able to see, feel, touch and hold the Tablet PC in their hands. After being exposed to the Tablet PC, the students try to familiarise themselves with the Tablet PC through attention. During attention, students use and interact with the Tablet PC in their academic activities. This is followed by interpretation where the students try to make sense or understand the Tablet PC functions by comparing it with other mobile devices they are familiar with or what they have heard from others. During interpretation, students are able to identify the advantages, challenges and the overall performance (technical aspects) of the Tablet PC. Lastly, students perceive the Tablet PC through the storage or memory stage which is the last stage of the perception process. During this stage, students try to recall, retain and store the information they have been exposed to about the Tablet PC. If the information is useful, students might decide to keep the information or share with others but if not useful, students might decide to ignore and not share with others. These perception stages are illustrated in Figure 6.1 below.

Figure 6. 1 : Stages of Information Processing



Source: Adapted from (Joubert, 2013:57; Batra & Kazmi, 2009:108)

Based on the discussion above, it can be concluded that it is through perception that an organisation can understand what the target market think about its product offering and the reasons for using or not using a particular product.

6.3 MAIN EMPIRICAL FINDINGS

The research results from the web-based online survey as presented in Chapter 5 began with a discussion of the demographic profile results, uses of the Tablet PC, advantages of the Tablet PC, challenges of the Tablet PC, Tablet PC technical

aspects and pedagogical opportunities offered by the Tablet PC. The important findings deduced from these results will be addressed in this section.

Of the 169 respondents who completed the survey, 59.2% or 100 respondents were female and 40.8% or 69 were male. The majority of respondents (97%; n=164) were between the ages of 18 and 30 years and a small percentage (3%; n=5) were between the ages of 31 and 40 years. In terms of years of instruction, there was no significant difference between all the respondents. The highest number of respondents were 1st years with 34.9% (n=59) followed by 3rd year students with 34.3% (n=58) and lastly 2nd years with 30.8% (n=52). This shows that there is a fairly even distribution of respondents between the different years of tuition. The next section provides an overview of the other secondary objectives empirical findings.

The research results as discussed in Chapter 5 indicate that the majority of respondents (53.3% or 90) always and 41.4% or 70 often use the Tablet PC for their studies. Only a few of the respondents (5.3% or 9) indicated that they sometimes use the Tablet PC for study purposes. These results would seem to indicate that the Tablet PC is mainly used by students for academic purposes.

The research results found that more than 95% of the respondents (95.24% or 160) *always* or *often* use the Tablet PC to access study guides, 94.65% or 159 studies for online exams on the Tablet PC and 92.31% or 156 respondents conduct research on coursework. More than 90% of the respondents (92.85% or 155) never or rarely submit their assignments online on the Tablet PC. It was also found that more than 40% of the respondents (40.61% or 167) sometimes use the Tablet PC to download and read e-books.

As discussed in Chapter 5, it was found that (98.80% or 165) of the respondents strongly agree and agree that the Tablet PC has an advantage of being light weight making it easy to move from one class to the other, (98.23% or 165) of the respondents indicated that the Tablet PC has a good screen size which displays learning material in a visible manner, (97.63% or 165) enables to do research at the campus and at home, gives the flexibility to work at own pace, (97.05% or 164) provides easy access study material on and off campus, 97.63% or 165 enables them to do research at the campus and at home, (97.63 or 165) gives the flexibility to work at own pace, (97.05 or 164) provides easy access to study material on and off the campus. The research

results further indicated that more than 70% of the respondents (73.37% or 124) strongly agree or disagree that the Tablet PC easily access examination results online. More than 8% of the respondents (8.93% or 15) were neutral that the Tablet PC enables them to be more creative in solving course work problems, (8.33% or 14) has a long battery life which allows respondents to accomplish daily class work and (8.28% or 14) allows respondents to communicate online with peers and lecturers regarding academic matters.

In terms of Tablet PC challenges as presented in Chapter 5 Section 5.7, it was found that more than 80% of the respondents (83.23% or 139) *always* or *often* find it difficult to work especially when drawing graphs and diagrams. This suggests that respondents require some form of training or knowledge in using the Tablet PC to draw graphs and diagrams. It was further found that total of (68.64% or 116) respondents find it difficult to access examination results online using the Tablet PC. The results of the research found that more than 90% of the respondents (93.49% or 158) *never* or *rarely* find it difficult to download learning material, (92.91% or 157) log in to social sites in order to interact with others, (92.82% or 155) read learning material on the Tablet due to its screen size. Only a few of the respondents (7.1% or 12) indicated that they sometimes find it difficult to upload additional learning material.

The results of the empirical research found that more than 95% respondents (96.45% or 163) strongly *agree* or *agree* that the Tablet PC is compatible with other devices making it easy to share learning material with others, (95.86% or 162) indicated that the Tablet PC can easily install and uninstall applications and (95.26% or 161) strongly agree and agree that the Tablet PC is user friendly. It was found that more than 20% of the respondents (21.89% or 37) strongly disagree or disagree that the Tablet PC has a long battery life. The research further found that more than 20% of the respondents (23.81% or 40) is able to effectively perform back up of learning material.

As presented in Chapter 5 Section 5.9 regarding the pedagogical opportunities offered by the Tablet PC, the research found that more than 90% of the respondents (96.43% or 162) agree *to a very large extent* or *to a large extent* that the Tablet PC promotes independent learning, (94.64% or 159) strengthens their my learning experience, (94.05% or 158) integrates knowledge and skills, (94.01% or 157) provide learning

instructions of using it, (92.90% or 157) enhances collaboration with other students, (92.90% or 157) improves learning outcomes, (92.81% or 155) increase motivation towards learning, (92.26% or 155) facilitates active teaching and learning methods, (90.30% or 149) supports low-performing students. The research further found that more than 10% of the respondents (10.06% or 17) agree to some extent that the Tablet PC support gifted students while more than 5% of the respondents (5.92% or 10) agree to a little extent or not to any extent about the same technical aspect. The next section addresses the research objectives of this research.

6.4 CONCLUSIONS IN RESPECT OF THE RESEARCH OBJECTIVES

The primary objective of this research was to explore students' perceptions regarding the efficiency and contribution to learning of the Tablet PC as a mobile learning device in order to justify the adaptation of study material by students as stipulated in Chapter 1 Section 1.4.2. In order to achieve the primary research objective, several secondary research objectives were formulated as indicated in Chapter 1 Section 1.4.3 and Chapter 4 section 4.2.2. A discussion of how each secondary objective was achieved is discussed below.

6.4.1 Secondary research objective 1: “to explore the uses of the Tablet PC as a mobile learning device used by students to enhance learning at a graduate institute”.

Question 2 of the online survey addressed this objective. A rating scale ranging from Never (1) to Always (5) was used to measure responses. This objective was achieved by asking closed and open-ended questions in order to get more insight on the uses of the Tablet PC. As indicated in Chapter 5 Table 5.3, the majority of the respondents (95.24%:n=160) reported that they use the Tablet PC to access study guides, (94.65%:n= 159) study for online exams and (92.31%:n=156) conduct research on coursework.

None of the responses added any additional aspects related to enhanced learning.

Studies from the literature presented in Chapter 2 conducted by (Duran & Aytac, 2015; Shambare & Shambare, 2015; Percival & Claydon, 2015; Siemieniecki & Majeskwa, 2015; Stewart 2013) confirm several uses of the Tablet PC as revealed in the current research results. Therefore, it can be concluded that the first secondary

research objective was achieved as the Tablet PC was confirmed to always and often being used by students to enhance learning.

6.4.2 Secondary research objective 2: “to empirically identify the advantages of using the Tablet PC as a mobile learning device used by students to access learning material”.

This objective was measured with Question 3 of the questionnaire, where the focus was on the academic application of the Tablet PC and more specifically the advantages of using the Tablet PC. A rating scale ranging from strongly disagree (1) to strongly agree (5) was used to measure responses. Closed and open-ended questions were used to obtain answers from respondents regarding this objective. From the research conducted, respondents identified several advantages of the Tablet PC as discussed in Chapter 5 Section 5.6.1. As indicated in Chapter 5 Table 5.12, the majority of the surveyed respondents (98.80%;n=165) indicated that the Tablet PC is light weight, (98.23%;n=166) has a good screen size, (97.63%;n=165) enables to conduct research on campus and at home, (97.63%;n=165) gives the flexibility to work at own pace on the campus and at home and (97.05%;n=164) provides easy access to study material.

Respondents were asked to further indicate additional advantages of the Tablet PC through an open ended question as indicated in Chapter 5 Table 5.13. Results from the literature conducted by (Mang & Wardley, 2016; Percival & Claydon, 2015; Siemieniecki & Majeskwa, 2015; Lewis, 2013; Alyahya & Gall, 2012; Rossing et al, 2012; Mang & Wardley, 2012) confirm some of the advantages of using the Tablet PC as indicated in the current research results. It can therefore be concluded that the second secondary research objective was achieved due to the fact that the majority of respondents indicated that they agree and strongly agree that the Tablet PC offers advantages that enables respondents to easily access learning material.

6.4.3 Secondary research objective 3: “to discover challenges facing students when using the Tablet Personal Computer as a mobile learning device at a graduate institute in Tshwane”.

Question 4 of the online survey addressed the third secondary objective of the current study. A 5-point Likert scale ranging from Never (1) to Always (5) was used to select relevant responses. Closed and open ended questions were used to gather information from respondents. As indicated in Chapter 5 Table 5.20, the majority of

respondents (93.49%;n=158) reported that they never or rarely face challenges when using the Tablet PC to download learning material, (92.82%;n=155) read learning content due to the Tablet PC's screen size and (92.91%;n=55) log in to social media sites to interact with others among other challenges. The only challenges that the majority of respondents (83.23%;n=139) indicated were that they find it difficult to draw graphs and diagrams using the Tablet PC and (68.64%;n=116) indicated that they were not able to access their examination results online.

Using an open-ended question, respondents were asked to indicate additional challenges that they face when using the Tablet PC apart from the ones in the given statements. Challenges such as not able to do research at home due to lack of free data which is only given in the first year of study, not able to do backup because of lack of knowledge, difficult to save typed notes on the tablet and that the Tablet PC is too slow and sometimes freezes whilst working on it were mentioned by students as indicated in Chapter 5 Table 5.21.

Literature results from studies conducted by (Duran & Aytac, 2016; Shambare & Shambare; Siemieniecki & Majeskwa 2015; Stewart, 2013; Mang & Wardley) addressed some of the challenges faced by respondents when using the Tablet PC in the current study. It can therefore be concluded that the secondary research objective was achieved as respondents were able to identify challenges they face when using the Tablet PC as a mobile learning device.

6.4.4 Secondary research objective 4: “to determine the performance of the Tablet PC in terms of service quality as it is used by students for academic purposes.

Question 5 of the questionnaire addressed this objective. A rating scale of Strongly Disagree (1) to Strongly Agree (5) was used to select the relevant responses. Closed and open-ended questions were used to obtain more information from respondents. Chapter 5 Table 5.28 indicate the responses from the closed-ended question. As indicated in Chapter 5 Table 5.28, the majority of respondents (96.45%;n=163) indicated that the Tablet PC is compatible with other devices making it easier to share learning material with others, (95.86%;n=162) easily install and uninstall applications, (95.26%;n=161) is user friendly, (94.09%;n=159) displays learning material in an easily readable manner and (94.08%;n=159) can quickly download study material.

Through the open-ended question presented in Chapter 5 Table 5.29, respondents were required to indicate additional Tablet PC technical aspects regarding the Tablet PC as a mobile learning device using their own words. Respondents indicated that the Tablet PC offer technical aspects such as the ability to do screenshots and a high speaker volume.

The findings from the closed-ended questions demonstrate that the majority of respondents perceived the Tablet PC as having good technical aspects. Research results from studies conducted by (Clark & Luckin, 2013; Radosevich & Kahn, 2006) address some technical aspects of Tablet PC. From the above discussion it can be concluded that the Tablet PC is an effective and efficient tool that performs beyond student expectation. Therefore, the fourth secondary research objective was achieved as the majority of respondents agree or strongly agree to the Tablet PC performance in terms of service quality is satisfactory.

6.4.5 Secondary research objective 5: “to determine the pedagogical opportunities offered by the Tablet PC as a mobile learning device”.

Question 6 of the online survey addressed this objective. A rating scale of not to any extent at all (1) to a very large extent (5) was used. Closed and open-ended questions were used to gather more information from respondents. The recorded responses are shown in Chapter 5 Table 5.37 and Table 5.38.

From the responses recorded in Chapter 5 Table 5.37 the majority of respondents (96.43%;n=162) reported that the Tablet PC promotes independent learning, (94.64%;n=159) strengthens learning experience, (94.05%;n=158) integrates knowledge and skills, (94.01%;n=157) provide learning instructions of usage, (92.90%;n=157) enhances collaboration with other respondents, (92.90%;n=157) improves learning outcomes,(92.81%;n=155) increase motivation towards learning, (92.26%;n=155) facilitate active teaching and learning and (90.30%;n=149) support low performing students.

Respondents were further required to indicate additional pedagogical opportunities offered by the Tablet PC through an open ended question. The results as indicated in Table 5.38 show that the Tablet PC offer additional pedagogical opportunities such as freedom to learn, improve computer skills, make studying easier and the ability to record videos.

Previous studies conducted by (Bai, 2019; Tront, 2015; Chen, 2013; Rossing et al., 2012; Melhuish & Fallon, 2010; Clark & Luckin, 2013) address some of the pedagogical opportunities offered by the Tablet PC as indicated in the current research. Therefore, it can be concluded that the fifth secondary objective was achieved as the Tablet PC was found to offer pedagogical opportunities as a mobile learning device to a large and very large extent.

6.4.6 Secondary research objective 6: “to determine if students’ perceptions vary with age, gender and years of instruction”.

This objective was found in question 7, 8 & 9 of the questionnaire and measured three aspects of demographic information that is gender, age and years of instruction. Closed ended questions were used to gather responses under this objective. The main findings of the demographic characteristics as indicated in Chapter 5 Table 5.1 are addressed below.

- In terms of gender, more females responded to the survey than males. A total of 59.2% female students responded to the survey compared to male students with 40.8%.
- With regards to age, the majority (97%;n=164) of students who participated in the survey ranged from 18 – 30 years and a minority (3.0%;n=5) ranging from 31 – 40 years (n=5). This implies that the majority of respondents are the young generation who are technologically savvy and born during the digital revolution therefore their experience with mobile devices such as Tablet PC is high.
- In terms of years of instruction, there was no significant difference in respondents between them as 1st years constituted (34.9%;n=59), followed by 3rd years (34.3%;n=58) and lastly 2nd years (30.8%;n=52). Although, first year respondents had the highest number of participants compared to 2nd and 3rd years, there was no significant difference among the years of instruction.

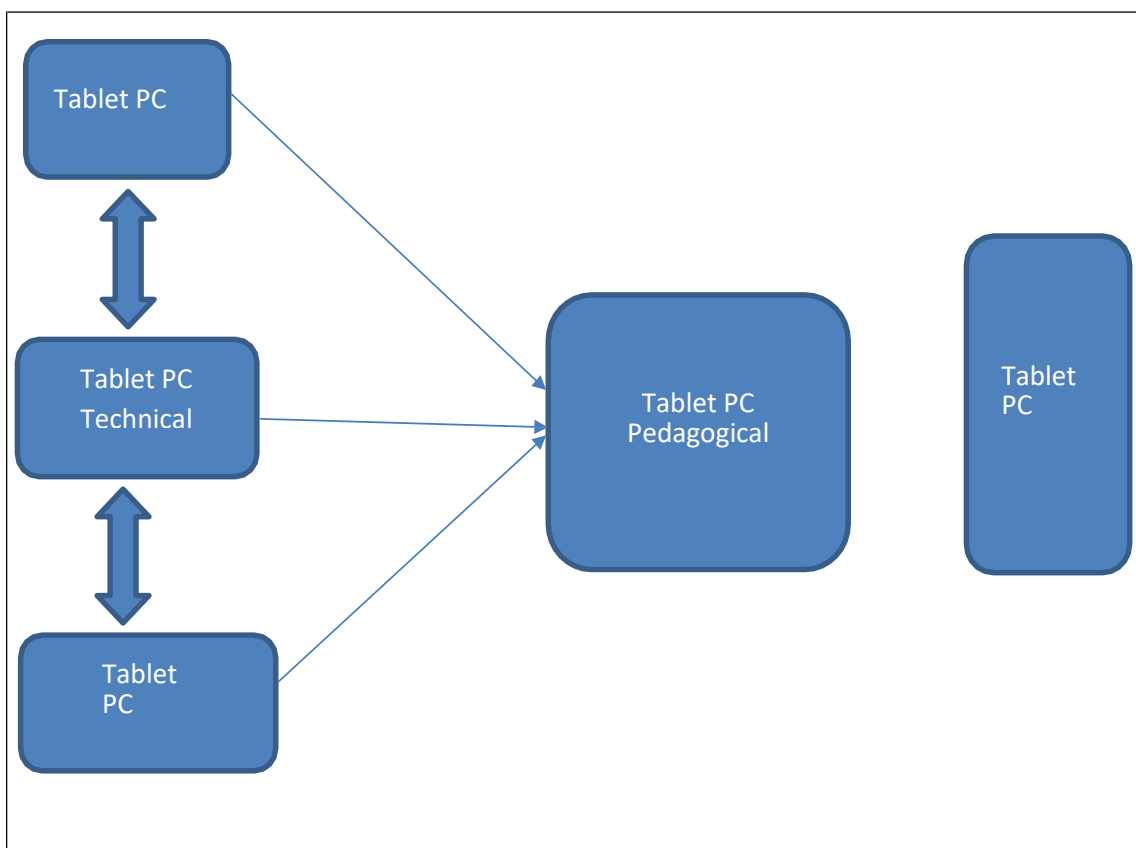
Several studies conducted by (Chikurunhe 2017; Phillips, 2017; Shambare & Shambare, 2015; Siemieniecki & Majeskwa, 2015; Pamuk et al., 2013) support this objective. Hence, it can be concluded that the sixth secondary objective was achieved in this research as there was no significant difference in students’ perceptions by age,

gender and years of instruction.

6.4.7 Primary objective: The primary research objective was “to explore students’ perceptions regarding the efficiency and contribution to learning of the Tablet PC as a mobile learning device in order to justify the adaptation of study material by students”.

From an analysis of the secondary research objectives, it is evident that the primary research objective was achieved as the exploration led to the development of a conceptual model known as “Tablet PC students’ perception model” as illustrated below.

Figure 6. 2 : Tablet PC students’ perception model



The model attempts to describe the relationship between the measured Tablet PC variables namely uses, advantages, challenges, technical aspects and pedagogical opportunities. As illustrated in the model, there is a positive correlation between the pedagogical opportunities offered by the Tablet PC with the technical aspects, the uses of the Tablet PC and the advantages of the Tablet PC. Pedagogical

opportunities offered by the Tablet PC were not significantly related to the Tablet PC challenges. It can be concluded that, the Tablet PC has good technical aspects and offers pedagogical opportunities which leads to more advantages and increased usage for learning purposes.

The proposed Tablet PC conceptual model as illustrated in Figure 6.1, therefore assist to understand the relationship between the Tablet PC technical aspects, uses, advantages and the challenges as it is used by respondents as a mobile learning device to enhance learning. The survey results reveal that the Tablet PC is more advantageous, can be used to serve many purposes, has good technical aspects, offer pedagogical opportunities and a few challenges. Therefore, it is evident that the research question “Do students perceive the Tablet Personal PC as a tool to enhance learning in higher education institutions”? was answered. It can be concluded that students perceive the Tablet PC as an important tool that can be used to enhance learning in higher education institutions. This is also evidenced by the Covid 19 2020 pandemic where face to face classes were not conducted due to lockdown restrictions.

6.5 LIMITATIONS OF THE STUDY

- This study was limited to full-time undergraduate students registered at a BEMS campus in the city of Tshwane therefore results cannot be generalised to all campuses in South Africa.
- The use of a web online survey to explore students’ perceptions was a limitation in that it did not provide room to assist students in understanding the questions and answering it correctly and also various response errors could have occurred due to misinterpretation of questions and instructions thereby altering the research results.
- Analysis of semi-structured questions in a questionnaire tends to be time consuming due to the nature of data collected.
- The use of a small sample size can be insufficient to make reliable conclusions and cannot be used to present the perceptions of the entire study population.
- Using convenience sampling to select participants has no guarantee that everyone will have a chance to be selected, only those respondents who will have access and available will stand a chance to participate. Therefore the results obtained cannot be a representative of the entire population.

- The use of data analysis software such as SPSS (Statistical Program for Social Sciences) requires the skills and knowledge of an expert to effectively draw conclusions.

6.6 RECOMMENDATIONS BASED ON RESEARCH FINDINGS

Based on the findings of the research results in Chapter 5, the following can be recommended.

Examination results are very important to every student. From the findings of this research study, students reported that they find it difficult to access examination results online. This can be problematic as many students travel home at the end of every semester and will be far away from the campus. Coming back to the campus to collect examination results during semester holidays tend to be costly and time consuming. With the Tablet PC initiative program, it can be recommended that the institution improve their results administration system so that students can easily access their results online from wherever they are.

Based on the results of the empirical research, respondents reported that they find it difficult to do research at home due to lack of data as free data. It can be recommended that the institution consider giving all students free data for the entire study period so that they can continue to have access to the internet even when they are not at the campus.

The results of the empirical research revealed that respondents find it difficult to use the Tablet PC especially when drawing graphs and diagrams. Though the Tablet PC is believed to provide learning instructions of using it, the institution need to consider offering basic face to face training to students' right from the beginning of their studies and on a continuous basis in order to equip them with basic knowledge. This will avoid problems such as inability to draw graphs and diagrams, download learning content, creating backups, saving of typed work and other various activities. It can be recommended that the institution provide proper guidance and training on how to use the Tablet PC as some students struggle to effectively use it to complete various academic tasks.

According to the manufacturers guarantee, the Tablet PC has a guarantee of two years. Therefore, for a student who is studying a three year qualification, it is of the interpretation that in the third year of study the Tablet PC would have lost its normal performance as the students get only one Tablet PC in their first year of study. It can be recommended that the institution find ways to extend the life span of the Tablet PC either through a swap or an exchange for a new device.

Overall, in order to enhance learning and due to unforeseen and unpredicted global events such as the Covid 19 2020 pandemic. It is recommended that all higher education institutions consider issuing the Tablet PC to students as learning can still continue anywhere at any time if lockdown restrictions are enforced or if any other event takes place that can affect learning.

6.7 SUGGESTIONS FOR FUTURE RESEARCH

- Only undergraduate students at a campus in Tshwane were considered for this study, surveying all RGIT students in all campuses can yield different results
- Perceptions of both students, lecturers and faculty should also be considered in future research
- Surveying students from different levels of education and other educational institutions may also produce different results.
- As illustrated in Figure 6.1 the Tablet PC conceptual model can be used in further research to explore further how the uses, advantages and technical aspects of the Tablet PC can enhance learning in higher education institutions.
- The relationship between the research variables was tested using Pearson correlation coefficient and resulted to the development of a conceptual model which can be used in future as it shows that there is no significant correlation between Tablet PC pedagogical opportunities and the Tablet PC challenges. Hence, it can be suggested that future research focus on how the Tablet PC pedagogical opportunities are influenced by Tablet PC challenges. Or explore how students are affected by the difference in tablet pc challenges and its impact on pedagogical opportunities.

6.8 CONCLUSION

This chapter has presented the conclusions and recommendations of the present study. The aim of the study was to explore students' perceptions of the Tablet PC as a mobile learning device at a graduate institute in Tshwane. The chapter provided an outline of the main findings of the theoretical discussion and the empirical findings. How each research objectives was met, limitations of the research, recommendations and suggestions for future research were highlighted. It can therefore be concluded that the Tablet PC is an important device that enables learning to take place without boundaries and limits as information can be accessed anywhere at any time.

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ANNEXURE A: RESEARCH INSTRUMENT

**Student Consent to participate in the online survey
Department of Retail and Marketing Management
Students' perceptions regarding the Tablet Personal Computer (PC) as a mobile
learning device at a graduate institute in Tshwane: An exploratory study.**

Dear Student

My name is Perpetual Enock and I am student at UNISA pursuing an MCOM degree in Business Management specialising in Marketing Management. As part of my studies, I am undertaking a research project entitled 'Students' perceptions regarding the Tablet Personal Computer (PC) as a mobile learning device at a graduate institute in Tshwane: An exploratory study'.

It is expected that this study will benefit RGIT and other higher education institutions in South Africa as they incorporate technology in their curriculum particularly the use of the Tablet Personal Computer (PC) to enhance student learning.

I am inviting you to take part in answering the questionnaire which will take you approximately 15 minutes to complete.

No direct benefits will be received from participating in this study, and there are no disadvantages or penalties for not participating. Your participation in this study is voluntary and you are allowed to withdraw at any time. Your response will be treated in the strictest confidence. You do not need to identify yourself and, similarly, the researcher will uphold anonymity in that there will be no possibility of any respondent being identified or linked in any way to the research findings in the final research report.

If you have any questions about this research or require a summary of the research, feel free to contact me through my e-mail: 57635390@mylife.unisa.ac.za and if you have any queries, concerns or complaints regarding the ethical procedures of this study, you are welcome to contact my academic supervisor Prof MC Cant e-mail: cantmc@unisa.ac.za or Prof JA Wiid e-mail: jwiid@unisa.ac.za

Kind Regards

Perpetual Enock

SECTION A: USES OF THE TABLET PC

Please answer all the questions truthfully and honestly. Indicate your answer by clicking the appropriate box and type your response in the given space where necessary.

QUESTION 1

How often do you use the Tablet PC for your studies? Please click the appropriate box?

Never	1	
Rarely	2	
Sometimes	3	
Often	4	
Always	5	

QUESTION 2

The following question focusses on the **uses** of the Tablet PC as a mobile learning device. Using a rating scale of 1 to 5 where 1= Never, 2= Rarely, 3= Sometimes, 4= Often and 5= Always. Please indicate the level of occurrence in using the Tablet PC in the given statements below.

Item	Statement					
		1 (Never)	2 (Rarely)	3 (Sometimes)	4 (Often)	5 (Always)
2.1	I use my Tablet PC to study for online exams	1	2	3	4	5
2.2	I use my Tablet PC to study for offline exams	1	2	3	4	5
2.3	I use my Tablet PC to prepare for class lectures in advance	1	2	3	4	5
2.4	I use my Tablet PC to do research on course work	1	2	3	4	5
2.5	I use my Tablet PC to type assignments	1	2	3	4	5
2.6	I use my Tablet PC to submit assignments online	1	2	3	4	5
2.7	I use my Tablet PC for recreation purposes (watching movies, playing games etc)	1	2	3	4	5
2.8	I use my Tablet PC to type class notes	1	2	3	4	5
2.9	I use my Tablet PC to share academic information	1	2	3	4	5
2.10	I use my Tablet PC to download and read e-books	1	2	3	4	5

2.11	I use my Tablet PC to log in to Moodle student portal	1	2	3	4	5
2.12	I use my Tablet PC to communicate with my lecturers and other students	1	2	3	4	5
2.13	I use my Tablet PC to record class lectures	1	2	3	4	5
2.14	I use my Tablet PC to watch video tutorials	1	2	3	4	5
2.15	I use my Tablet PC to interact on social networks about academic matters	1	2	3	4	5
2.16	I use my Tablet PC to access study guides	1	2	3	4	5
2.17	I use my Tablet PC to receive and make calls	1	2	3	4	5
2.18	I use my Tablet PC to perform backups of learning material, files and documents	1	2	3	4	5
2.19	Other uses: Please click the relevant button and specify below					

SECTION B: ACADEMIC APPLICATION OF THE TABLET PC

QUESTION 3

The following question aims to establish the **advantages** of using the Tablet PC as a mobile learning device. Using a rating scale of 1 to 5 where 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree and 5= Strongly Agree, please indicate the advantages that you have identified in using the Tablet PC in the given statements below.

Item	Statement	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
3.1	The Tablet PC allows me to easily access study material on and off campus	1	2	3	4	5
3.2	The Tablet PC gives me the flexibility to work at my own pace	1	2	3	4	5
3.3	The Tablet PC reduces the cost of purchasing study material such as text books and stationery as I use e-books	1	2	3	4	5
3.4	The Tablet PC enables me to effectively prepare for lectures in advance thereby enhancing my understanding of study material	1	2	3	4	5

3.5	The Tablet PC improves my computer skills	1	2	3	4	5
3.6	The Tablet PC improves my academic knowledge due to a wider access of information	1	2	3	4	5
3.7	The Tablet PC allows me to communicate online with my peers and lecturers regarding academic matters	1	2	3	4	5
3.8	The Tablet PC reduces access barriers to learning as I receive the same study material like others regardless of my location	1	2	3	4	5
3.9	The Tablet PC is light weight making it easy for me to move from one classroom to the other	1	2	3	4	5
3.10	The Tablet PC has a long battery life which allows me to accomplish daily class work	1	2	3	4	5
3.11	The Tablet PC has a good screen size which displays learning material in a visible manner	1	2	3	4	5
3.12	The Tablet PC allows me to easily access my examination results online	1	2	3	4	5
3.13	The Tablet PC comes with a physical keyboard which allows me to quickly type assignments and lecture notes	1	2	3	4	5
3.14	The Tablet PC enables me to be more creative in solving course work problems	1	2	3	4	5
3.15	The Tablet PC allows me to share course material with my lecturers and peers regardless of location	1	2	3	4	5
3.16	The Tablet PC enables me to do research on given class work at the campus and at home	1	2	3	4	5
3.17	The Tablet PC increases my participation in class as I am able to study for my lectures in advance	1	2	3	4	5
3.18	The Tablet PC allows me to write online assessments anywhere anytime	1	2	3	4	5
3.19	Other advantages: Please click the relevant button and specify below					

QUESTION 4

The following question aims to identify the **challenges** you face, if any, when using the Tablet PC as a mobile learning device. As a student at RGIT. Using a rating scale of 1 to 5, where 1= Never, 2= Rarely, 3= Sometimes, 4= Often and 5= Always, please indicate the extent to which you face challenges when using the Tablet PC in the given statements below.

Item	Statement	1 (Never)	2 (Rarely)	3 (Sometimes)	4 (Often)	5 (Always)
4.1	I find it difficult to connect to the campus Wi-Fi hotspots	1	2	3	4	5
4.2	I find it difficult to connect to off-campus Wi-Fi hotspots such as McDonalds, Tshwane free Wi-Fi etc	1	2	3	4	5
4.3	I find it difficult to concentrate in class when using the Tablet PC	1	2	3	4	5
4.4	I find it difficult to upload additional learning material in to the Tablet PC	1	2	3	4	5
4.5	I find it difficult to play recorded video lectures using the Tablet PC	1	2	3	4	5
4.6	I find it difficult to make and receive calls as the Tablet PC fails to read the sim card	1	2	3	4	5
4.7	I find it difficult to download learning material using the Tablet PC	1	2	3	4	5
4.8	I find it difficult to read learning material on the Tablet PC due to its screen size	1	2	3	4	5
4.9	I find it difficult to use the Tablet PC as it suddenly hangs up while busy working on it	1	2	3	4	5
4.10	I find it difficult to work with the Tablet PC especially when drawing graphs and diagrams	1	2	3	4	5
4.11	I find it difficult to charge the Tablet PC when battery is low	1	2	3	4	5
4.12	I find it difficult to study with the Tablet PC for a long time as my eyesight end up being strained	1	2	3	4	5
4.13	I find it difficult to access my examination results online using the Tablet PC	1	2	3	4	5
4.14	I find it difficult to do backups with the Tablet PC	1	2	3	4	5
4.15	I find it difficult to log in to social sites in order to interact with others using the Tablet PC	1	2	3	4	5
4.16	Other challenges: Please click the relevant button and specify below					

SECTION C : TABLET PC TECHNICAL ASPECTS

QUESTION 5

The following question aims to determine the **performance** of the Tablet PC as a mobile device used for learning purposes. On a rating scale of 1 to 5, where 1 = Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree and 5 = Strongly Agree, please indicate the extent to which you agree on the performance of the Tablet PC in the given statements below.

Item	Statement	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
5.1	My Tablet PC is user friendly	1	2	3	4	5
5.2	My Tablet PC connects fast to the campus Wi-Fi	1	2	3	4	5
5.3	My Tablet PC connects fast to off-campus free Wi-Fi hotspots	1	2	3	4	5
5.4	My Tablet PC visibly displays learning material in an easily readable manner	1	2	3	4	5
5.5	My Tablet PC can open multiple applications at the same time which can facilitate quick access to information	1	2	3	4	5
5.6	My Tablet PC can effectively play recorded lecture videos	1	2	3	4	5
5.7	My Tablet PC has a good operating system	1	2	3	4	5
5.8	My Tablet PC is compatible with other devices making it easy to share learning material/files with others	1	2	3	4	5
5.9	My Tablet PC can easily install and uninstall applications	1	2	3	4	5
5.10	My Tablet PC can quickly download learning material	1	2	3	4	5
5.11	My Tablet PC can quickly save educational files and documents	1	2	3	4	5
5.12	My Tablet PC has a good size which facilitate easy handling	1	2	3	4	5

5.13	My Tablet PC has a larger internal storage capacity	1	2	3	4	5
5.14	My Tablet PC has a larger external storage capacity	1	2	3	4	5
5.15	My Tablet PC allows me to customise settings to suit my personal needs and preferences	1	2	3	4	5
5.16	My Tablet PC has a long battery life	1	2	3	4	5
5.17	My Tablet PC can effectively perform back-up of learning material/files	1	2	3	4	5
5.18	My Tablet PC can perfectly play educational games	1	2	3	4	5
5.19	My Tablet PC has a multi-touch screen which gives extra functionality	1	2	3	4	5
5.20	Other performance: Please click the relevant button and specify below					

SECTION D: PEDAGOGICAL OPPORTUNITIES

QUESTION 6

The following question measures the extent to which **pedagogical opportunities** are offered by the Tablet PC as a mobile learning device. On a rating scale of 1 to 5, where 1= Not to any extent at all, 2= To a little extent, 3= To some extent, 4= To a large extent and 5= To a very large extent, please indicate the extent to which the following issues regarding the Tablet PC can give pedagogical opportunities in future?

Item	Statement	1 (Not to any extent at all)	2 (To a little extent)	3 (To some extent)	4 (To a large extent)	5 (To a very large extent)
6.1	The Tablet PC strengthens my learning experience	1	2	3	4	5
6.2	The Tablet PC increases motivation towards learning	1	2	3	4	5

6.3	The Tablet PC facilitates active teaching and learning methods	1	2	3	4	5
6.4	The Tablet PC promotes independent learning					
6.5	The Tablet PC strengthens my problem-solving skills	1	2	3	4	5
6.6	The Tablet PC strengthens my communication skills	1	2	3	4	5
6.7	The Tablet PC enhances collaboration with other students	1	2	3	4	5
6.8	The Tablet PC integrates knowledge and skills	1	2	3	4	5
6.9	The Tablet PC improves learning outcomes	1	2	3	4	5
6.10	The Tablet PC supports low-performing students	1	2	3	4	5
6.11	The Tablet PC supports gifted students	1	2	3	4	5
6.12	The Tablet PC can be used as an assessment tool	1	2	3	4	5
6.13	The Tablet PC enhances learning knowledge content	1	2	3	4	5
6.14	The Tablet PC provide learning instructions of using it	1	2	3	4	5
6.15	Other opportunities: Please click the relevant button and specify below					

SECTION E: DEMOGRAPHIC INFORMATION

QUESTION 7

What is your gender?

Male	1	
Female	2	
Prefer not to answer	3	

QUESTION 8

Please indicate your current age range.

Below 18 years	1	
18 – 30 years	2	

31 – 40 years	3	
41 – 50 years	4	
51 – 60 years	5	
Older than 60 years	6	

QUESTION 9

Please indicate your year of study below?

1 st year	1	
2 nd year	2	
3 rd year	3	
4 th year	4	

Thank you for taking part in this survey. You can submit your questionnaire by clicking the submit button below.

ANNEXURE B: CEMS ETHICAL CLEARANCE



UNISA DEPARTMENT OF MARKETING AND RETAIL MANAGEMENT ETHICS REVIEW COMMITTEE

Date: 6 May 2019

Dear: Ms Perpetual Enock

**Decision: Ethics Approval from
2019 - 2022**

NHREC Registration #: (if applicable)

ERC Reference #: 2019_MRM_003

Name: Ms Perpetual Enock

Student #: 57635390

Staff #: N/A

Researcher(s): Ms Perpetual Enock, 0790490184, 57635390@mylife.unisa.ac.za

Supervisor (s): Prof Michael C Cant, 0124294456, cantmc@unisa.ac.za
Prof Johannes A Wiid, 0124292831, jwiid@unisa.ac.za

Working title of research:

Students' perceptions regarding the Tablet Personal Computer (PC) as a mobile learning device at a graduate Institute in Tshwane: An exploratory study

Qualification: Postgraduate degree

Thank you for the application for research ethics clearance by the Unisa Department of Marketing and Retail Management Ethics Review Committee for the above mentioned research. Ethics approval is granted for 3 years.

*The **low risk application** was **reviewed** by the Department of Marketing and Retail Management Ethics Review Committee on 23 April 2019 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:



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ANNEXURE C: PERMISSION LETTER TO CONDUCT RESEARCH



Richfield Graduate Institute of Technology (Pty) Ltd
Reg No.: 2090/0075207

RICHFIELD
GRADUATE INSTITUTE OF TECHNOLOGY

Main Campus
292 Anton Lembede (Smith) Street
Durban, 4001, South Africa
Private Bag X23
Umhlanga Rocks, 4320
Tel: +27 31 304 9340
Fax: +27 31 306 7936
Email: info@richfield.ac.za
www.richfield.ac.za

1st June 2018

Dear Perpetual Enock

RE: APPROVAL TO USE UNDERGRADUATE STUDENTS OF RICHFIELD GRADUATE INSTITUTE OF TECHNOLOGY AS YOUR TARGET POPULATION FOR YOUR MASTERS RESEARCH

With reference to your application dated 31st May 2018, regarding the above subject, I am pleased to inform you that your application has been approved. However, this approval is subject to three conditions:

- 1) Your research must be taken nationally i.e. use all the BEMS campuses.
- 2) Your study must also focus on the perceptions of students regarding service quality in terms of the tablet PC.
- 3) Submission of your ethical clearance

I wish you success with your research.

Sincerely,

Stephen Akandwanaho, Ph.D.
Head of Research &
Dean, Faculty of AI and Security
Richfield Graduate Institute of Technology
Umhlanga, Rocks, 4320
Durban, South Africa.
Mob: +27836079914
Email: stephena@richfield.ac.za

ANNEXURE D: ETHNOGRAPHIC REFLECTION

As I reflect on my Masters journey, I share my experiences with feelings of relief, fear and excitement at the same time. This journey had uncountable obstacles and distractions which if I was not strong I would not be able to share my experience today. I have learnt the following lessons through my Masters journey:

- Never give up, hold on until the end
- Commit yourself fully to your studies in order to achieve your dreams
- Work with your supervisors and follow their advice and feedback as they are there to take you to your final destination.
- No matter the challenges, obstacles, hardships or setbacks never give up
- Be prepared or gear yourself for any changes that may arise in the course of your study. Don't expect things to go as you planned, as many changes are likely to take place at any stage of your research such as changes in systems and structures, methodology or supervision. You must just be ready to adapt..
- Involve your statistician in every step of the way from the beginning of your research to the end. However, don't seat back and relax and trust that all will be done according to your expectations.
- Stay focussed and motivated no matter how many times you fall, get back to your fit and complete what you started.
- Be patient and have hope always.
- Communicating and collaborating with other students currently studying the same qualification or who have already completed their masters and PhDs, it helps in sharing knowledge and understanding of your studies.
- If you want to achieve your dreams you need to work hard no matter the situation.

ANNEXURE E: EDITOR'S LETTER



Editorial Letter

28 February 2020

Ref: To Whom It May Concern

I William Mpofu write to confirm that I have conducted the editing of a dissertation titled: *Students' Perceptions regarding the Tablet Personal Computer (PC) as a Mobile Learning Device at a Graduate Institute in Tshwane: An Exploratory Study*, written by Perpetual Enock.

For any further information please do not hesitate to contact me: 0027718022947, William.mpofu@wits.ac.za.

William Mpofu

jwm

ANNEXURE F: DIGITAL REPORT



Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author: **Perpetual Enock**
Assignment title: **Complete dissertation/thesis for exa...**
Submission title: **Students' perceptions regarding the...**
File name: **ENOCK_MASTER_S DISSERTATIO.**
File size: **2.69M**
Page count: **296**
Word count: **77,560**
Character count: **428,784**
Submission date: **06-Mar-2020 01:31AM (UTC+0200)**
Submission ID: **1270156684**

