A FORMATIVE EVALUATION OF THE UCT PMD PROGRAMME

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COMPULSORY DECLARATION

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works of other people has been attributed, cited and referenced.

Signature: Signed by candidate Date: 15 August 2017

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Executive Summary

Personal mobile devices (PMDs) such as tablets (also referred to as tablet computers or tablet pc) have become important educational technology components for university students. These portable devices offer students distinctive learning opportunities in contrast to traditional learning approaches. Traditional learning approaches require students to be located in a classroom or computer lab, whereas with the use of PMDs, students are afforded mobility and flexibility in their learning regardless of their location.

Although advances in wireless, mobile technology have resulted in PMDs becoming widely available and less expensive, PMD ownership still presents a substantial capital outlay beyond the means of many South African university students. Thus, there is a need to explore the opportunities low cost PMD initiatives present, as means of providing students with access to these devices. Thus far, limited research has been conducted on if and how flexible learning is achieved through low cost PMDs in the South African higher education context, where access to technology and internet access is inconsistent amongst the student population.

This study aims to evaluate the outcomes of the PMD Programme at the University of Cape Town (UCT). The programme aims to create a flexible teaching and learning environment for students in higher education, through the use of low cost tablets. This study focused on whether the programme's short-term outcomes, namely, improved mobile technology knowledge, portability, mobility, communication, information sharing and collaboration were achieved. The extent to which the programme's medium-term goals (digital literacy and access to course information) were achieved, were also investigated. Lastly, the degree to which students believed the low cost tablet was good enough for their studies was assessed.

Multiple sources of data were used to attempt to address the two evaluation questions, namely, to what extent does the PMD Programme improve flexible learning of first year extended degree programme students, and to what extent is the provision of a low cost tablet good enough for achieving flexible learning? Students enrolled in the UCT PMD Programme participated in an online questionnaire developed by the evaluator (N = 52).

Secondary data was collected from programme records in the form of focus group transcripts and Vula session data from UCT's Learning Management System.

This evaluation found that the UCT PMD Programme plays a crucial role in providing students with access to affordable mobile technology in the form of low cost tablets and has demonstrated enhancement of students' ability to learn in a flexible manner. The UCT PMD Programme facilitated improvement in students' mobile technology knowledge, mobility of learning and portability of information immensely. Improved communication and collaboration between peers and lecturers were noted. Information sharing was not enhanced through the use of the tablet. Students' digital literacy skills increased and access to information improved immensely through using the tablet. Overall, through the use of the tablet, improvement in students' flexibility of learning was achieved and students found the low cost tablet adequate for their studies. The paper concludes with recommendations for further enhancement of the UCT PMD Programme.

Key words: Tablet, mobile technology knowledge, portability of information, mobility of learning, communication, information sharing, collaboration, digital literacy, access to information, flexibility of learning, first year students, university, South Africa.

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List of Acronyms

PMD	Personal mobile device
UCT	University of Cape Town
DHET	Department of Higher Education and Training
CILT	Centre for Innovation in Learning and Teaching
ADP	Academic Development Programme
EDP	Extended Degree Programme
ICT	Information and communication technology

Chapter 1: Introduction

The aim of this study is to evaluate the outcomes of the personal mobile device (PMD) Programme at the University of Cape Town (UCT). The programme aims to create a flexible teaching and learning environment for students in higher education, through the use of low cost tablets.

PMDs such as laptops, tablets (also referred to as tablet computers or tablet pc) and smartphones have become an important educational technology component for university students (Brown & Pallitt, 2015). PMDs allow students to learn, communicate, collaborate and share information with the aid of the internet and mobile technologies (Al-Emran, Elsherif & Shaalan, 2016). Through wireless internet connections, PMDs facilitate students' ability to access information on demand, at any location and at any time (Motiwalla, 2007). These portable devices offer students distinctive learning opportunities in contrast to traditional learning approaches. Traditional learning approaches require students to be located at a venue such as a classroom or computer lab, where students can access a computer and the internet, whereas with the use of PMDs, students are afforded mobility and flexibility in their learning approach (Al-Emran et al., 2016; Brand & Kinash, 2010).

Flexibility of learning is the main over-arching concept used for the purposes of this evaluation. Flexible learning is viewed as an extension of mobile learning (m-learning) and electronic learning (e-learning) (Peters, 2007). Effective uptake and use of flexible learning approaches are characterised by students' digital literacy skills, access, portability of information, communication, collaboration and information sharing (Rees & Loughlin, 2015; Brand & Kinash, 2010; Sharpe & Beetham, 2010). Mobile learning can be viewed as the use of mobile devices and wireless networks to facilitate, support, enhance and extend learning activities that are not fixed to a specific physical location (Wu, Wu, Chen, Kao, Lin & Huang, 2012). Moving on from the definition of mobile learning, the term flexibility of learning, for this evaluation is characterised by students' ability to *choose* how, where and when to learn that is suited to their needs, where their learning experience is mediated by mobile technology (Wade, 1994).

The evaluator added three important qualifications to the definition which differentiates flexible learning from mobile learning in the context of this evaluation. First, mobility still plays an important role, where students are free to move within, beyond and between different environments, on campus or off campus. Second, the use of PMDs means that learning is not confined to formal educational contexts as learning can extend outside of the classroom environment. Lastly, learning is not internet dependent, as is the case with mobile learning. Students chose the environment in which to study at a convenient time and place, but their choices are not limited to having an internet connection.

In higher education, PMDs have become an integral part of the educational process for students (Brown & Pallit, 2015; Dahlstrom, Brooks, Grajek & Reeves, 2015). The 2015 EDUCAUSE Centre for Analysis and Research (ECAR) Study of undergraduate students and information technology, indicated that 92% of students surveyed globally, owned smartphones, 91% owned laptops and 54% of students owned tablets, revealing a rapid increase in ownership since 2013 (Dahlstrom et al., 2015). Moreover, the study indicated that, "students wanted more technologies incorporated into their learning experiences" (Dahlstrom et al., 2015, p. 34) which highlights the importance of higher education institutions adapting to the rapidly changing educational environment owing to technological innovations. Johnson, Adams, Becker, Estrada and Freeman (2015) anticipate that higher education learning environments need to become more flexible in their teaching and learning approaches and actively pursue re-designing of learning spaces in anticipation of this change.

Enhancing and transforming teaching and learning practices, through the use of technology, especially PMDs, is gaining momentum at South African higher education institutions, albeit slow (Brown & Pallit, 2015; Ng'ambi, Brown, Bozalek, Gachago, Wood, 2016). Bozalek, Ng'ambi and Gachago (2013) have noted that some of the challenges impeding adoption and implementation of technologies are linked to infrastructure, institutional policy and the willingness and ability of academics to adopt technologies. They have argued that "institutional leaders need to purposefully create an enabling environment to encourage institutional-wide engagement with emerging technologies" (Bozalek et al., 2013, p. 1). In addition to this challenge, the resource-constrained environment within which South African higher education institutions find themselves, results in competing priorities vying for the limited funding provided by the Department of Higher Education and Training

(DHET) of South Africa, student fees and donor funding and thus can limit access to technology (Department of Higher Education and Training of South Africa, 2015).

Although advances in wireless and mobile technology have resulted in PMDs becoming pervasive, more convenient and less expensive, student access to mobile devices in a South African context still remain a concern (Wu et al., 2012; Brown & Czerniewicz, 2010). Mobile device ownership still presents a substantial capital outlay for South African university students who cannot afford, despite efforts made the Purchasing Consortium (PURCO) for South African higher education institutions to offer cost effective laptop and tablet purchasing schemes (Brown, 2014). Thus, for students at South African higher education institutions, there is a need to explore the prospects offered by low cost mobile device initiatives (Brown & Pallit, 2015) and a means of providing students access to these devices. Thus far, limited research has been conducted on whether and how flexible learning is achieved through low cost PMDs in the South African context where access to technology and internet access is uneven.

This study therefore evaluates the learning experiences of students who received tablets, through the UCT PMD Programme. The findings of this evaluation could assist decision makers at programme level, educator, institutional and at governmental levels in designing tablet initiatives as a means of improving access to mobile technologies and afford flexibility of learning for students in higher education.

Programme Description

This chapter provides an overview of the UCT PMD Programme and is divided into two sections. The first section provides the background to the origins of the UCT PMD Programme as it formed part of a larger DHET collaborative study. This section is further divided into three subsections, which explains the aim and objectives of the DHET collaborative study, the major research questions the study intends to answer and the roll-out of the DHET collaborative study over the three-year period. The second section provides a description of the UCT PMD Programme. The information contained in this section of the dissertation was obtained through informal interviews with the programme manager (C. Brown, personal communication, March 4, 2016), the Humanities course convenor for the UCT PMD

Programme (A. Hunma, personal communication, March 4, 2016) and programme documents (Brown, 2014).

Background to the UCT PMD Programme

In 2014, the Department of Higher Education and Training (DHET) of South Africa put out a call out to support collaborative projects focusing on blended- and e-learning approaches with a view of potentially investing in mobile device programmes across the country (DHET, 2014a). DHET subsequently approved a programme collaboration between five universities to investigate how PMDs can enhance teaching and learning for lecturers and students, with University of Cape Town (UCT) assuming the project lead role for the collaboration (DHET, 2014b). The five universities involved in the collaborative study are illustrated in Figure 1 and includes the University of Cape Town (UCT), the University of the Free State (UFS), the University of the Witwatersrand (Wits), the University of Johannesburg (UJ) and Sol Plaatjie University (SPU) (DHET, 2014a). Each university designed its own PMD Programme with the view of comparing and contrasting experiences at the end of each year in lieu of improving their programmes for the following year. From here onwards, the collaboration between the five universities will be referred to as the DHET collaborative study.

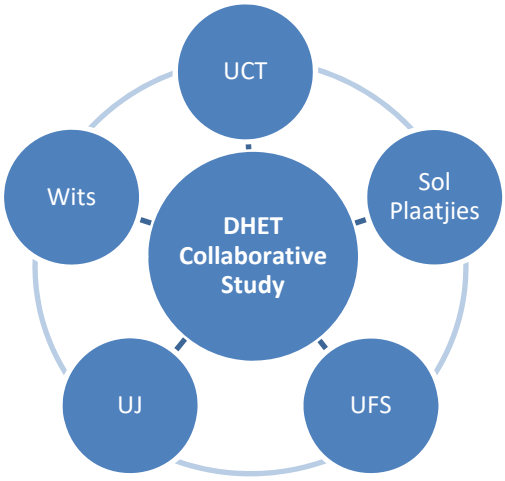


Figure 1: The DHET collaborative study between five South African universities of which UCT is the project lead.

The information presented in the following subsections were obtained from the DHET collaborative study proposal submission (Brown, 2014). The proposal presented the project's aim and objects, the major research questions the study intends to answer and provides a description of the rollout of the DHET collaborative study across three years.

Overall aim and objectives of the DHET collaborative study

The overall aim and objective of the DHET collaborative study was to better understand how access to a PMDs, specifically low cost tablets, enables greater flexibility of teaching and learning in the higher education sector both in and outside the classroom. In addition to the overall aim, the following objectives were set out to understand:

1) How the use of PMDs changes teaching practice.
    a) Whether course objectives within a range of disciplinary contexts can be achieved more flexibly through use of PMDs.
    b) The nature and extent of the developmental needs (staff and students) arising from this.
2) How the use of PMDs enables greater flexibility of learning in and out of the classroom.
3) How the use of PMDs influences students' and academics' digital literacy.
4) How students perceive PMDs adding value to their overall learning experience at university (Brown, 2014).

In addition to the aim and objectives of the collaborative study, a series of research questions the study intends to answer were formulated and are presented next.

Major research questions of the DHET collaborative study

1) In what ways are students able to integrate PMDs into their learning?
2) In what ways do PMDs introduce a positive dimension to the way students organize and implement their learning?
3) In what ways do PMDs introduce a negative dimension into the ways students organize and implement their learning?

4) In what ways are academic staff able to integrate universal student access to PMDs into the way they facilitate student learning? What are the needs of staff and the learning environment in this respect?
5) Do staff experience any disruption or interference in their facilitation of student learning by universal student access to PMDs? (Brown, 2014).

In the next section, the implementation of the DHET collaborative study is described.

Description of the roll out of the DHET collaborative study

The roll out of the DHET collaborative study took place over three years, from 2015 to 2017. The first year intended to test small pilot projects at various institutions. All institutions used tablets in their individual programmes, except Sol Plaatjies University, where laptops were issued to students. Figure 2 provides a summary of the roll out over the three years and is described next.

Year 1: Pilot project

Symposium. A one day symposium and workshop was planned by the programme manager to meet all the representatives from participating universities. Each partner institutions presented their current practices, unpacked issues, challenges and collaborated toward developing pilot projects at each university (Brown, 2014).

Recruit and train required staff. The programme manager appointed the lead researcher at UCT. Each institution subsequently appointed a project manager and institutional researcher. Data collected from the symposium were collated and the development of the pilot project coordinated. In the case of UCT, the lead researcher fulfilled the same role as the institutional researcher and was expected to undertake local monitoring and evaluation and interact with key stakeholders (Brown, 2014).

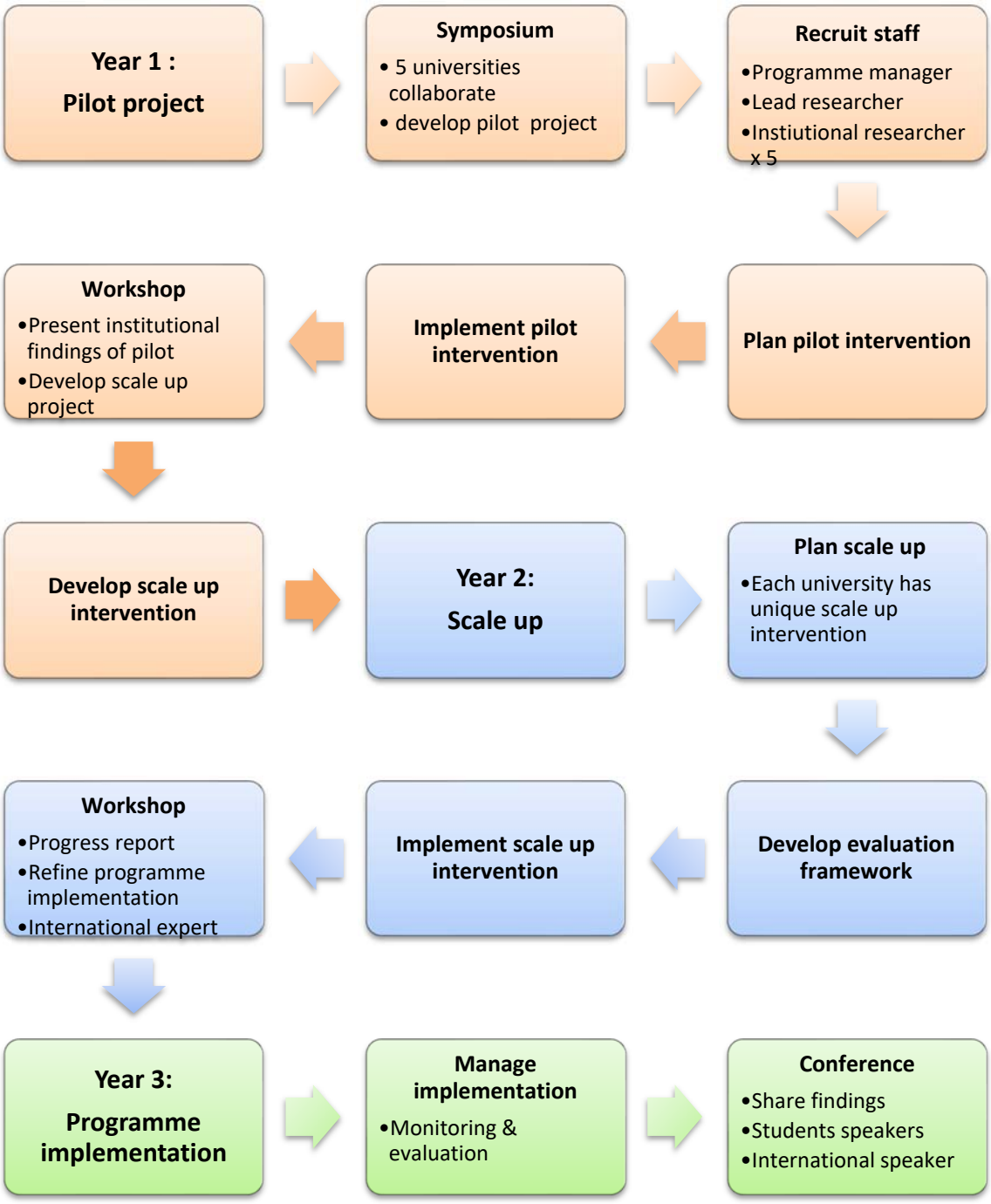


Figure 2: Graphical representation of the roll out of the DHET collaborative study

Pilot intervention. It was proposed that courses selected should be similar across the five higher education institutions. The intention was to make PMDs a requirement for the course and then use the DHET funding to provide tablets to financial aid students and potentially other students who demonstrated financial hardship. Once courses were selected, devices (either laptop or tablet depending on the unique need at each university) were

procured. Devices were distributed to students and device training were provided. Students were observed and “followed" throughout the year (Brown, 2014).

One criterion for selecting courses was that the programme, as a whole, needed to commit to engaging with students in way that would support the use of the device. The value of this approach was that students often only become aware of the value and potential of having their own laptop or tablet after having had it for a while. This enabled the examination of how PMDs were used across a course in first year and possibly second year, and facilitate working with a range of lecturers in different courses, in different semesters and years of a programme (Brown, 2014).

Workshop. A workshop was held at the end of the year with all collaborating universities. Universities presented their institutional findings of their pilot interventions including what worked well, as well as the challenges faced. This allowed each university to learn from each other’s experiences and develop and strengthen scale-up interventions for the following year (Brown, 2014).

Year 2: Scaled-up programme

In year two of the collaborative study, each university planned and established a scaled-up version of their pilot intervention. The focus in the second year was to develop a monitoring and evaluation framework to ensure smooth implementation of the programme and allow for data collection from students, lecturers and the institution. A workshop was held at the end of the year for collaborating institutions to share experiences and findings and discuss the way forward for development of their own PMD Programme (Brown, 2014).

Year 3: Programme implementation

During the final year, the PMD Programmes would have been established and improved versions of the interventions rolled out. Monitoring and evaluation of the programmes would continue and students’ and lecturers’ experiences would be documented (Brown, 2014).

The programme would conclude with a national symposium / conference including, an international keynote speaker, and provide opportunities for researchers to learn from the

experiences of student participants themselves. The focus at the end of the three-year cycle was to develop resource guides for academics seeking to incorporate PMDs into their teaching practices, integrating PMDs into the classroom and support learning outside of the classroom as well as how to develop students' digital literacies through using PMDs. In addition, the development of an online visual guide on using laptops and tablets in the classroom was further proposed. Lastly, the collaborative study aimed to provide DHET with criteria and conditions for creating an enabling environment for effective uptake and use of PMDs in teaching and learning at South African higher education institutions (Brown, 2014).

The above information offers some background to the UCT PMD Programme and how the UCT PMD Programme fits into a larger collaborative study. The next section briefly discusses another pilot project at UCT and provides additional background to the rationale for undertaking the UCT PMD Programme. The Flexible Learning Pilot Project is presented in the next section.

In 2013, the Flexible Learning Pilot Project, also known as the UCT Laptop Project, required mandatory one-to-one laptop access for undergraduate students in four courses in Chemical Engineering, Physics, Law and Architecture (Brown & Pallit, 2015). Students who were enrolled in these courses and did not have access to a laptop, were offered a laptop through the Flexible Learning Pilot Project. The Flexible Learning Pilot Project concluded in 2015 and reported significant benefits and enriched educational experiences for students in the pilot courses (Chernotsky, Brown & Marquard, 2016). Further to this, data collected from the study showed that 42% of students did not bring their laptop to campus as they "did not want to carry a bulky laptop around" (Chernotsky et al., 2016, p. 34). This generated the interest of the UCT PMD Programme manager, who at that stage, was working on the Flexible Learning Pilot Project. She was interested in establishing whether the tablet could do the same job as a laptop, but with the added benefit of being lighter, safer (easier to conceal in a handbag) and having a better battery life. This added further motivation for initiating a programme investigating the potential of low cost tablets in creating an enabling environment of flexible teaching and learning.

The programme description of the UCT PMD Programme is presented in the following section.

Description of the UCT PMD Programme

In May 2015, the UCT PMD Programme was initiated with the aim to better understand how access to a tablet enables greater flexibility and effectiveness in teaching and learning at UCT, both in and outside the classroom. A further objective of the programme was to determine how teaching staff adapts to the knowledge that the students have access to a tablet and how this influence or enables greater flexibility and effectiveness in teaching approaches (Brown, 2014).

Criteria for selecting courses for the UCT PMD Programme

The programme manager used a set of criteria for selecting a course in which to trial the intervention. The criteria used were the year of study (e.g. first year, second year), type of course (e.g. in extended degree or three-year degree programmes), the degree of lecturer's interest in using devices, the number of students in the class and faculties who had not previously benefited from this type of intervention (C. Brown, personal communication, March 4, 2016).

The project team initiating the UCT PMD Programme consisted of the programme manager, the programme coordinator and the information and communication technology (ICT) experts working at CILT. The team was interested in working with first year students, especially students on extended degree courses and a request was put out to lecturers working in first year courses, who would be interested in participating. Extended degree courses form part of an extended degree programmes (EDP) of study, offered by most faculties at UCT. EDP offers students a structured curriculum over a four-year period, as opposed to a general three-year programme, to assist students with making the transition from high school to university easier. Students take up a reduced work load in their first year and are offered additional support to maximise the potential of completing the degree within the four-year period (Education Development Unit, n.d.)).

The course selected had to demonstrate the need for use of the device in the course. As an example, courses that required students to conduct online research or submit online reports during a lecture, could not be fully implemented as all students did not have access to mobile devices. In addition, programme staff sought lecturers who were willing and

proactively seeking ways of using technology inside and outside the classroom. The course was then selected based on the interest shown by lecturers (C. Brown, personal communication, March 4, 2016).

The class size was an important consideration for selecting a course in which to conduct the programme. The project team estimated that the programme would be able to provide 60 to 70 tablets to students in need. The team estimated that 30% of students in any given class may not have access to PMDs and based on this calculation, would translate to a class size of approximately 210 students (C. Brown, personal communication, March 4, 2016). In addition, faculties such as Science, Law, Engineering and courses in Architecture were excludes as students in these faculties had already benefited from the Flexible Learning Pilot Project (Chernotsky et al., 2016). Courses in Humanities, Commerce and Health Sciences faculties were thus eligible for selection. Based on the above criteria, two courses, Language in the Humanities and Texts in the Humanities, in the extended degree programme within the Humanities faculty, were selected.

Criteria for selecting participants

Students were eligible to receive a tablet based on the following conditions, 1) students needed to be registered at UCT, 2) students had to receive financial aid, and 3) students should not own a laptop or tablet or have access to either of these devices.

Due to budgetary constraints, the UCT PMD Programme could only purchase 60 to 70 tablets and thus could only accommodate 60 to 70 students in the programme. To establish how many students did not have access to a PMDs (excluding smartphones), a survey was conducted at orientation of the course. At that stage, students were given no indication that they would receive a tablet based on their responses to the survey questions. Once the survey data were analysed by the programme coordinator, students who indicated that they did not have access to a laptop or a tablet, were invited to participate in the programme (A. Hunma, personal communication, March 4, 2016).

Students who then received the tablet needed to use the device as often as possible, in and outside the classroom. Students had to ensure that the device was kept safe, that they

use the device themselves and not give it away or sell it. Students were required to report any loss or breakage as soon as possible (Brown, 2014).

Criteria for selecting devices

The project team searched for tablets available on the market. The team compiled a list of available devices for review and compared the devices based on criteria displayed in Table 1 below.

Table 1: List of devices investigated for use on the UCT PMD Programme

Price	Name	OS	Size	Memory	Disk Space	Wi-Fi	3G
R 5 865	Samsung Galaxy Tab 4 - 10.1" tablet	Android	10.1"	?	16GB	Yes	Yes
R 4 050	Lenovo - 10.1" tablet	Android	10.1"	1GB	16GB	Yes	Yes
R 3 650	Samsung Galaxy Tab 4 - 7" tablet	Android	7"	2GB	8GB	Yes	Yes
R 1 746	Acer Iconia B1 - 7" tablet	Android	7"	512MB	8GB	Yes	No
R 1 580	**Proline - 10.1" tablet**	**Android**	**10.1"**	**1GB**	**8GB**	**Yes**	**No**

The price of the device, the size of the device, memory and storage disk capacity where few of the criteria reviewed, with pricing bearing a higher weighting. Two devices, the Acer Iconia and the Proline tablets, were tested by the project team to establish which device could assist students most adequately with their studies. A few of the activities conducted to test the device included, typing up documents, searching for information on the internet, logging into Vula (UCT's learning management system) and sending emails. Based on the outcome of these tests, it was established that the Proline 10.1' tablet would be cost effective, yet adequate for use by students (C. Brown, personal communication, March 4, 2016). Table 2 provides a list of the specifications for the Proline 10.1' tablet selected for use in the UCT PMD Programme.

Table 2: Device specifications of the Proline 10’ tablet used in the UCT PMD Programme

Proline 1015H 10’ Tablet Product Specifications	
10.1’ Panel, 1280 x 800 (10 point capacitive multi-touch screen)	Proline W835G QC 8’ IPS 1GB 16GB HSPA W8.1
8”WXGA IPS LED, 1280 x 800 (5point Multi-Touch)	Windows 8.1
Android 1.4	Intel Atom Z3735F 1.83GHz Quad Core
1.3GHZ Quad Core Processor	16GB storage
1GB RAM	Micro USB, Micro SIM Slot, Headphone out
16GB Flash Micro-SD Card slot	Thin and Light Design
W LAN 802.11b/g/n	Integrated 3G /HSPA
Bluetooth Version 4.0 BLE WWAN	5MP Camera (rear), 2MP Camera (front)
Integrated 3G/HSPA	3.5mm Headphone jack
Micro USB. Micro SIM Sloth, Headphone out	Built-in microphone

Once the course, participants and device were selected for the UCT PMD Programme, the pilot project was initiated and will be discussed in the next section.

Roll out of the UCT PMD Programme

Year 1: Pilot project

The programme manager and programme coordinator selected two courses, Language in the Humanities and Texts in the Humanities, in the Humanities Faculty offered by the Academic Development Programme (ADP), to conduct the pilot project in (Humanities Handbook, 2016). The two courses were first year courses in the extended degree programme (EDP), where the number of students in the class were approximately 200 students. These courses were offered in the second semester of 2015 (A. Hunma, personal communication, March 4, 2016).

Four lecturers presented the Language in the Humanities and Texts in the Humanities courses and were motivated to explore the use of tablets in the classroom (C. Brown, personal communication, March 4, 2016). The lecturers augmented the course by incorporating two hours of additional contact time and made it a requirement for all student to attend. This augmentation was made up of a one-hour tutorial class and a one-hour online writing hub. The lecturers believed that the online writing hubs would promote academic and digital literacies as well as enable students to grasp discipline-specific texts and concepts better (A. Hunma, personal communication, March 4, 2016). However, lecturers found that access to labs and devices were limited and thus initially could not expect students to perform these

tasks, as everyone did not have access to a PMDs. Through the UCT PMD Programme, lecturers were thus able to continue effectively with the online writing hub sessions.

At orientation for the above-mentioned courses, the programme coordinator conducted a survey to identify students who did not have access to a laptop or a tablet. Students who did not have access to a laptop or tablet were selected for the pilot study and were offered a Proline 10' tablet. Thirty eligible students were selected to participate in the pilot project in year one, as lecturers believed that tablets would assist with students' access to these crucial literacies (A. Hunma, personal communication, March 4, 2016). Students were requested to use their devices for the online writing hubs, inside and outside of the classroom environment.

Surveys and focus groups were conducted at the end of the second semester, in October 2015 to establish how and what students used their tablets for. The findings were collated and presented at the 2nd symposium in November 2015 (Brown, 2014). Students believed the tablet assisted them with their studies, specifically supported underprivileged students and the programme should continue. Students recommended the provision of a keypad, indicating that it would be easier to type up their assignments using a keyboard as opposed to using the tablet screen and hoped that they could keep the device for their second year of study. At the end of phase one (December 2015), the programme manager agreed that students could keep the device, but that these students should be available to assist new students as Tech Buddies (Brown, 2014).

Year 2: Scaled-up programme

The second phase of the UCT PMD Programme took place during the first semester of 2016, with a bigger cohort of students recruited. Using the information collected in the pilot, the programme was adapted and keyboards were provided to the new cohort of students. More devices with keyboards were then purchased and the implementation of an improved programme took place on a larger scale (C. Brown, personal communication, February 19, 2016).

The course, Language in the Humanities was offered to students in the first semester of 2016. At orientation, the programme coordinator conducted a survey to establish how

many students were eligible to participate in the programme in 2016. Seventy students reported not having access to a laptop or tablet and thus were invited to enrol for the UCT PMD Programme. Students then used their device throughout the course. Throughout the semester, the programme coordinator collected data in the form of focus group interviews with students, class observations and interviews with the lecturers in addition to setting up meetings with academics to establish whether any shifts in their teaching practices had occurred (A. Hunma, personal communication, March 4, 2016).

Year 3: Programme implementation

In 2017, The final year of the UCT PMD Programme expected to see improved programme implementation, with lecturers reviewing advances and shortfalls experienced in the scale up period and implementing improvements. Feedback sessions would be held with students and lecturers and a final report to be submitted for incorporation into the final DHET document submission (C. Brown, personal communication, March 4, 2016).

Over the three-year period, the UCT PMD Programme provided students with access to tablet computers, with the view to enable greater flexibility and effectiveness in learning at UCT, both in and outside the classroom. Given the aims of the UCT PMD Programme, an important evaluation to assess whether the programme enhanced flexibility in learning, was conducted.

In the following chapter, the programme theory of the UCT PMD Programme is presented and analysed to assess if the programme's underlying framework can plausibly yield positive effects.

Chapter 2: Programme Theory of the UCT PMD Programme

This chapter presents the programme theory related to the UCT PMD Programme and the chapter is divided into three sections. The first section presents the programme theory of the UCT PMD Programme. The second section provides an assessment of plausibility of programme theory and the third section presents the evaluation questions that will be addressed.

Programme theory is an important component of any programme. Programme theory is regarded as the set of assumptions upon which the programme is based and shows how the strategies and tactics the programme uses, enables it to achieve its objectives and bring about social benefit. Thus, the programme theory upon which an intervention is based, should represent how the programme activities will bring about desired results and change to the specified condition (Rossi, Lipsey, & Freeman, 2004). A programme's theory of change, presented in a logical framework, represents the programmes inputs, activities, outputs and outcomes and attempts to show the causal links between activities and outcomes (Rossi et al., 2004). Figure 3 represents the Logic Framework for the UCT PMD Programme.

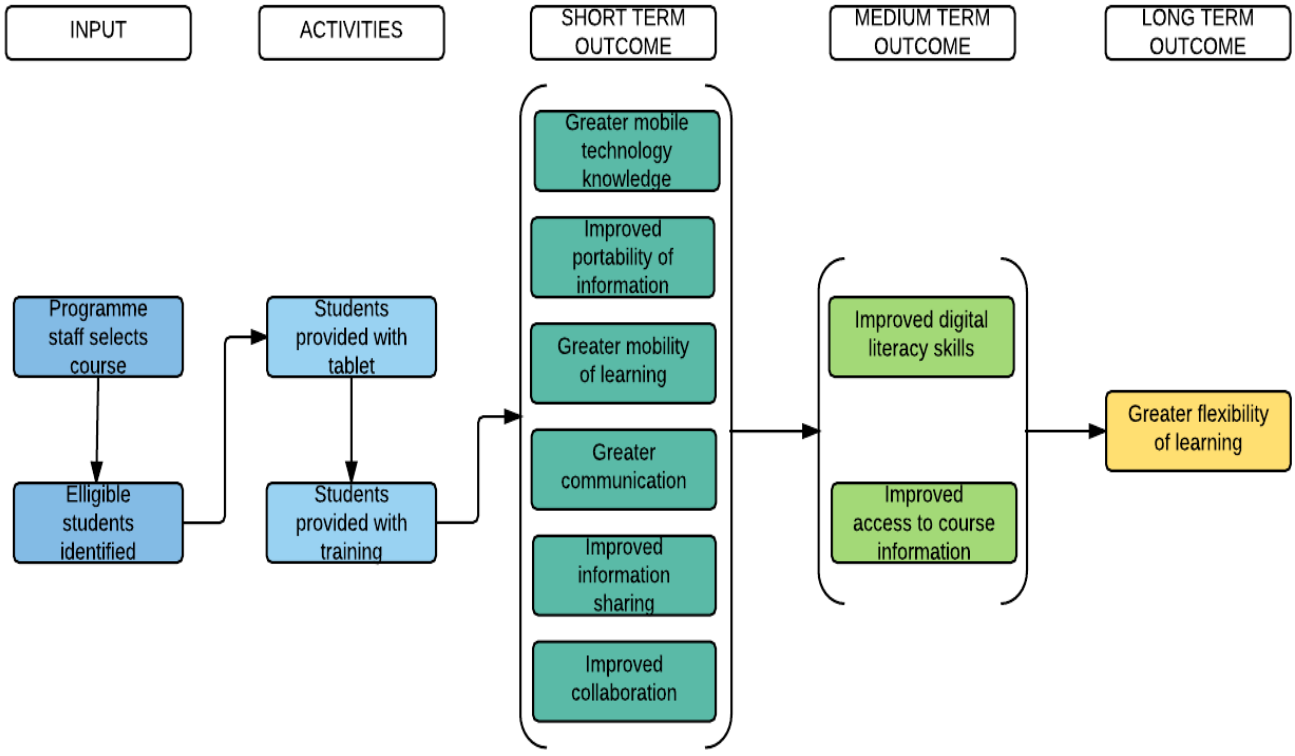


Figure 3: The UCT PMD Programme logical framework model

The UCT PMD Programme did not have an articulated programme theory and thus one was solicited and constructed for the project. The programme theory provided herein was compiled from the DHET proposal document and input provided from meetings with the programme manager and programme coordinator. The programme manager confirmed that the programme theory developed and represented in Figure 3, was an accurate representation of the UCT PMD Programme.

Plausibility of Programme Theory

The UCT PMD Programme is based on a series of causal assumptions. Firstly, through provision of a tablet the programme removes the barrier to access to technology and provides for universal access to PMDs for all students registered for the Language in the Humanities and Texts in the Humanities courses. Although access to PMDs had now been provided, adequate computer and technology literacy cannot be assumed. The programme thus provides students with training related to how to use their tablet, how to access and download appropriate applications for their studies and provided options to students if they required additional assistance. Consequently, as students use their device for their studies it is expected that their mobile technology knowledge increases. In addition, students' portability of information, mobility of learning, communication, information sharing and collaboration with peers are expected to improve. Secondly, students develop stronger digital literacy skills through practice and can access information more effectively and efficiently because of improved knowledge, portability and mobility. Consequently, this would result in improved flexibility of learning, as students are able to access information and learn anywhere, anytime using skills developed through using the tablet.

For the UCT PMD Programme to be effective, the programme should be based on a plausible theory, where sufficient evidence can be provided to substantiate the programme claims. A review of literature provides such evidence to establish whether the UCT PMD Programme can achieve the outcomes proposed. The evaluator conducted a literature review of flexible learning programmes using tablets, IPad, laptops and other PMDs, in higher education institutions. The literature search was done between 1 March and 30 May 2016 using databases such as EBSCOHost, Proquest Theses and Google Scholar, accessed through UCT's online library portal. Key words used in the search were flexible learning, mobile

learning, digital literacy, mobile devices, tablets, university, higher or tertiary education and South Africa. The time frame for papers' publication was set from 2006 to 2016, as technology outdates at a rapid pace. A quick review was also done between December 2016 and March 2017 for more recent publications. Each assumption upon which the UCT PMD Programme was based, will be reviewed against literature obtained from the search and be presented in the following section.

Barriers to accessing mobile technologies and low cost tablets

According to the 2015 General Household Survey of South Africa (Statistics South Africa, 2015), only one fifth of South African households owned one or more computers (including laptops). Further to this, a study conducted by Brown and Czerniewics (2010), reported that out of a group of South African students regarded as 'digital strangers', 52% had no access to computers off campus and 32% made use of public facilities or third parties to gain access. One reason for low ownership and poor access to computers is the high cost of these devices which are not always affordable for a large proposition on the South African population. Thus, affordability remains a barrier to accessing technologies for majority of South African students (Brown & Pallit, 2015). Laptops and high-end tablets such as IPads still present a substantial capital outlay for some students (Brown & Pallit, 2015). Low cost tablets however can offer a cost-effective means of removing the barrier to accessing mobile technologies, resulting in a growing reliance on low cost, mobile, ubiquitous technology solutions (University of Cape Town, 2016; Bozalek et al., 2013, Tagoe, 2012; Beger, Sinha & Pawelczyk, 2012; Wu et al., 2012). There is a fair amount of literature supporting the view that provision of low cost mobile devices can assist students in overcoming this barrier to access either through loan schemes or ownership (University of Cape Town, 2016).

After providing students with a tablet, it cannot be assumed that students would know how to use the device and download applications which could assist students with their studies. Training would need to be provided and will be discussed in the next section.

Training and mobile technology knowledge

In a South African context, students enter university with varied levels of technological skills, some with little or no previous exposure to computers, mobile devices and associated

technologies (Brown & Czerniewics, 2010; Thinyane, 2010). This is commonly referred to as the 'digital divide' and can be loosely defined as unequal access to ICT. Fink and Kenny (2003), interpret the digital divide into four broad categories. One of these categories relate to a gap in the ability to use ICTs and is measured by the skills base and presence of numerous complimentary assets. Therefore, by providing access to technology does not automatically translate to improved ICT skills through osmosis, but rather training, support and practice consolidated use and behaviour toward using mobile technologies (Polat, 2012). The development of adequate ICT skills and mobile technology knowledge is important, as it is regarded as a critical skill requirement for graduates entering the workplace and influences future economic potential (Chatterton & Rebbeck, 2015; Brown & Czerniewics, 2010).

Providing students with training, support and opportunities to improve mobile technology knowledge and digital literacy skills plays an essential part in learning, especially in higher education, as technological proficiency influences students' academic performance (Thinyane, 2010). Skills training and technology-mediated tasks purposefully incorporated into course work plays a critical role in ensuring that students derive maximum benefit from mobile technologies (Meurant, 2010; Tagoe, 2012). In addition, information literacy training has shown to enhance mobility and flexibility in learning (Hanbidge, Sanderson, & Tin, 2015). Therefore, the role ICT and support staff and university ICTS training centres play an important role in providing training and technology support to assist students improve their ICT skills (Tagoe, 2012; Moran, Hawkes & El Gayar, 2010; Drennan, Kennedy & Pisarki, 2005). Thus, there is a fair amount of evidence providing support that training and offering ongoing support will improve students' mobile technology knowledge and skills.

Once students have received training, their knowledge about how to operate the device and how to access applications for their learning is expected to increase. This in turn is expected to lead to improved mobility of learning, improved portability of information, facilitate communication, information sharing and collaboration through using PMDs, specifically tablets and will be discussed further in the following section.

Tablets and portability of information, mobility of learning, communication, information sharing and collaboration

Before presenting the affordances offered by PMDs, I broadly define what is meant by PMDs. As described by van't Hooft (2013), PMDs are characterised by:

1) High mobility, devices are small enough to be carried in one hand.
2) Small form factor devices, are unobtrusive and do not interfere with face-to face interactions.
3) Accessible, devices are relatively cheap, easy to use and can turn on instantly without much lag time.
4) Adaptable, students can adapt the use the device to their needs and learning context.
5) Capabilities to create, collect, access and display information in multiple ways such as text, graphics, audio and video.
6) Supports communication, collaboration and information sharing.
7) Personal, as the device is owned and shared by the user.

PMDs such as tablets have been recognised as an important tool to facilitate teaching and learning in higher education institutions (Mpofu & Gelderblom, 2015; Bozalek et al., 2013; Gikas & Grant, 2013; Gaskell, 2010; Czerniewicz & Brown 2009). The use of PMDs, especially, tablets in teaching and learning practices indicate that students are afforded greater portability of information and mobility in learning approaches (Gikas & Grant, 2013; El-Hussein & Cronje, 2010; Hashemi, Azizinezhad, Najafi & Nesari, 2011; Ozok, Benson, Chakraborty & Norcio, 2008). Mobility of learning affords students the opportunity to learn anytime and anywhere and that students are free to move within and between different environments (e.g. home or campus) (Kinash, Brand & Mathew, 2012; El-Hussein & Cronje, 2010; Hashemi et al., 2011). Due to portable nature of the device, learning is not restricted to the formal classroom environment but extends beyond into informal learning setting and situated in the context the student is placed in (Brand et al., 2012; El-Hussein & Cronje, 2010). In this way, the learning process becomes more student-centred with the possibility of authentic learning taking place (Herrington, Herrington & Olney, 2012; Bozalek et al., 2013). Authentic learning is the process whereby students explore and discuss concepts and

relationships in a context that is relevant to them with real-world problems and projects and once acquired the skill can be applied across courses and across disciplines (Mims, 2003).

Tablets foster communication, information sharing and improve interactions between peers and lecturers regardless of where they are (Shuler, Hutchins & LaShell, 2010; Kukulska-Hulme & Traxler, 2007). The study conducted by Gikas and Grant (2013) found that students were communicating more because of their mobile device and that constant communication was key to students' success in the course. Further to this, constant communication facilitated learning with and from classmates, inside and outside of the classroom environment. Mobile devices foster peer communication as well as student-to-lecturer communication through social networks, wherever they are located while at the same time facilitating prompt feedback to the student by the lecturer (Gikas & Grant, 2013; Mayisela, 2013; Bozalek et al., 2013). As communication and dialogue is regarded as an important aspect of learning, communication using mobile and emerging technologies can bring about enhanced learning, increased student engagement and leverage formal and informal learning (Bozalek et al., 2013; Gikas & Grant, 2013; Mayisela 2013; Rowe, Bozalek, Frantz, 2013).

Effective use of mobile devices, foster collaborative and communicative engagement between students as it promotes discussion and investigation beyond the walls of the classroom (Rossing, Miller, Cecil & Stamper, 2012; Shuler et al., 2010; Cobcroft, Towers, Smith & Bruns, 2006). Al-Emran et al. (2015) reported that through the use of mobile devices, knowledge sharing among students were promoted. It is important to note that incorporating the use of mobile technology within learning activities amplifies the uptake of communicative and collaborative learning (Rossing et al., 2012; Zapatero, Maheshwari & Chen, 2012). Collaboration via real-time responses or instant interactively, not limited to location and time, is provided through mobile device or wireless devices (Motiwalla, 2007; Gikas & Grant, 2013).

The benefits of using tablets in an educational context is well reported and literature provides sufficient evidence in supporting the view that the use of tablets will lead to students experiencing improved portability of information, mobility of learning, communication, information sharing and collaboration. It should however be noted that although the benefits of using tablets are well reported, the device cannot in itself redefine learning and facilitate meaningful learning (van Oostveen, Muirhead & Goodman, 2011). The design of teaching and

learning approaches and activities should incorporate mobile technologies to facilitate flexible approaches to learning (El-Hussein & Cronje, 2010; Kukulska-Hulme & Traxler, 2007).

Tablets, digital literacy and access to information

Digital literacy

Digital literacy is defined by Beetham and Sharpe in Bennet (2014, p. 1) as, "the functional access, skills and practices necessary to become a confident, agile adopter of a range of technologies for personal, academic and professional use" and illustrated in Beetham and Sharpe's digital literacy framework below (Figure 4).

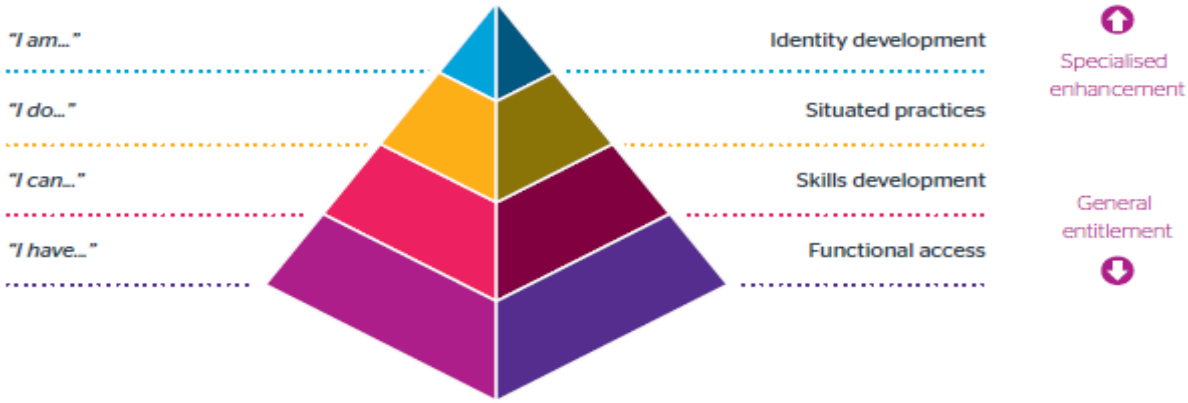


Figure 4: The Beetham and Sharpe's model of student' digital literacy (JISC Report, n.d., p. 1)

Through the use of PMDs, students are able to acquire digital literacy skills, over and above just knowing how to use the device and develop digital literacy skills over time. As students' proficiency increases, digital literacy skills develop further until their digital ability reaches specialised enhancement.

Building on Beetham and Sharpe's model, Rees & Loughlin (2015) developed a digital literacy developmental matrix that presents functional computer and ICT literacy as the centre of the model. Accessing information, creating and sharing information occurs at lower levels of proficiency (Rees & Loughlin, 2015). As proficiency increases, students engage in higher order digital literacy skills such as participatory activities, collaboration and communication by critically using tools and information to actively engage in learning (Rees & Loughlin, 2015). Lastly, Rees and Loughlin (2015) then explain that a level of digital literacy

fluency is achieved when students are able to use resources, tools and practices to lead their own development through self-directed learning as illustrated in Figure 5.

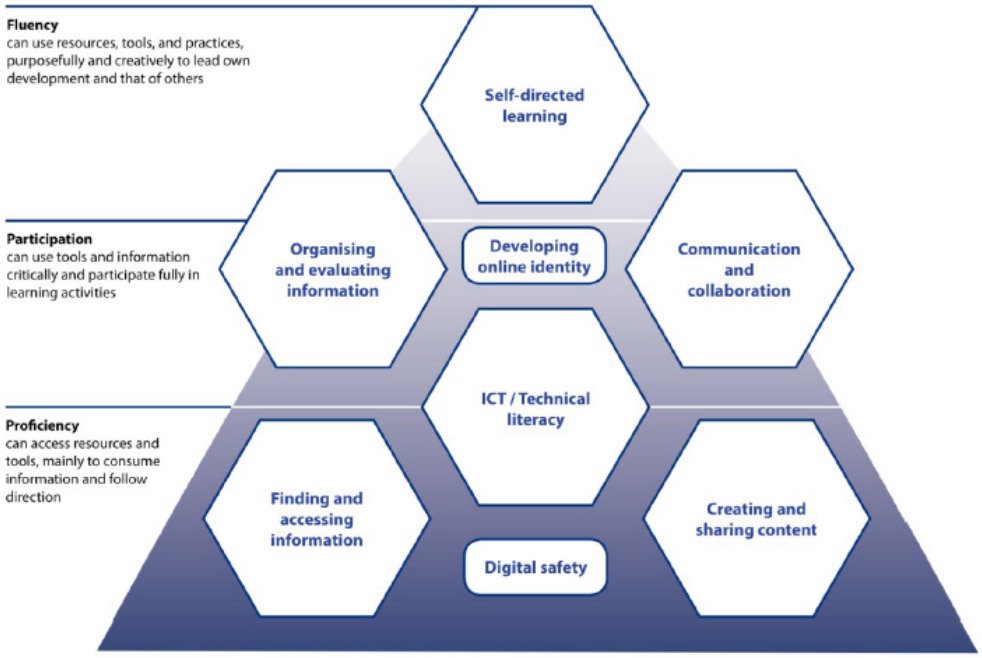


Figure 5: Development matrix of digital literacies (Rees & Loughlin, 2014, p. 2).

Lastly, the JISC Company (formerly known as the Joint Information Systems Committee) provided a model outlining the seven elements of digital literacies. These elements include ICT literacy, learning skills, information literacy, communication and collaboration, media literacy, digital scholarship and career and identity management, and is illustrated in Figure 6 (JISC, n.d., p. 2).

Drawing on JISC model and that of Sharpe & Beetham (2010) and Rees and Loughlin (2014), elements such as ICT literacy (mobile technology knowledge), learning skills (mobility of learning), information literacy (information sharing), communication and collaboration, can be used in this evaluation to explore practices and the relationships between these elements using the tablet, in the UCT PMD Programme.

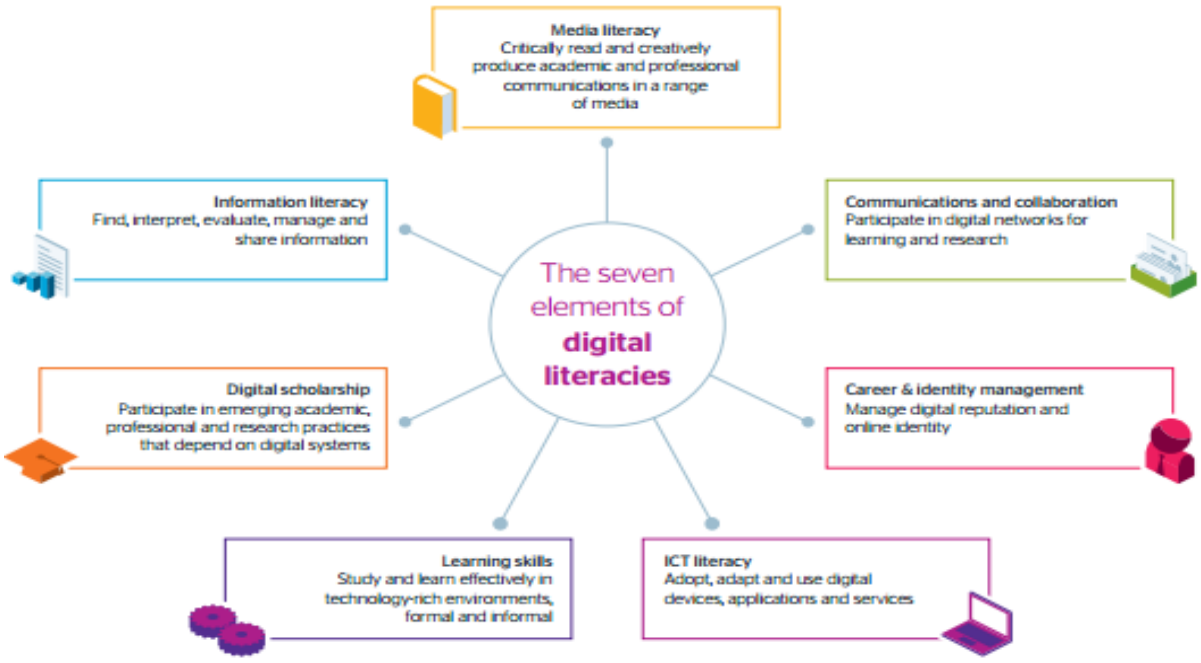


Figure 6: The seven elements of digital literacies (JISC, n.d., p.2)

Digital literacy skills, practices and competencies are required for effective learning and promote academic success. Higher education institutions strive to develop these competencies in students to improve the quality of graduates produced and prepare students with technological skills required for the workplace (Chatterton & Rebbeck, 2015; Johnson, Adams, & Cummins, 2012; Goodfellow, 2011; JISC, n.d). Thus, digital literacy skills developed using mobile devices are able to contribute toward flexible learning and ultimately provide an enhanced learning experience.

Access to information

Using mobile technologies, tablets offer students spontaneous access to information, as opposed to using a desktop in the computer lab or notebook, especially when students are on campus, afforded by the convenience of constant connectivity (Mpofu & Gelderblom, 2015; Gikas & Grant, 2013; Gaskell, 2010; Kukulska-Hulme & Traxler, 2007). Another advantage of owning a PMDs, is that it offers students the flexibility of where to access information (i.e. at a computer lab or using their device) with the added benefit of overcoming the problem of a shortage of computers to access course material and other information (Ng'ambi, Brown, Bozalek, Gachago, Wood, 2016; Mayisela, 2013; Motiwalla, 2007). Thus, access to and use of PMDs in higher education offers the promise of instant access to learning

anytime and anywhere, but reaping the potential benefits is limited to access to the internet and the degree to which lecturers apply it appropriately to pedagogies (Motiwalla, 2007).

Internet access

Internet access for all, especially in South Africa cannot be assumed. Results from the latest General Household Survey 2015 published by Statistics South Africa (2015) reported that only one-tenth of South African households had access to the internet at home and that access varied vastly amongst provinces. Nationally, access to the internet at home was the highest in Western Cape (21,4%) and Gauteng (15,6%). In the Western Cape, only a quarter of households living in the metropolitan area had access to the internet at home, while 14.4% of households living in the greater urban area (i.e. outside of the metro) had access to the internet at home. The findings from the survey also reported that mobile devices such as mobile phones and 3G connections, has made the internet more accessible to households and in the Western Cape alone, had doubled (51.4%) since 2013, but still low uptake of internet at home prevails. Refer to Appendix A for more information presented in the South African General Household surveys. One of the many reasons for low uptake and access to internet at home is due to high data costs. The recent campaign against high cost of data in South Africa, driven by the #DataMustFall campaign to Parliament in Sep 2016, hopes to see the cost of data decreasing and making it more accessible to all. Furthermore, the South African government and regulatory institutions committed to increase efforts to reduce cost of communication including data, to increase access (State of the Nation Address, 2017). Therefore, access to internet at home through mobile technology could influence students' opportunity to learn in a flexible learning environment and facilitate uptake of open education resources (Mayisela, 2013; DHET, 2013a). Moreover, the lack of internet access at one's domicile could limit the ability to hone digital literacy skills and access information and supportive social structures, anywhere, anytime (Mayisela, 2013; Brown, 2012; El Hussein & Cronje, 2010).

Tablets and flexibility of learning

What is meant by flexible learning in the context of the UCT PMD Programme?

The main outcome the UCT PMD Programme is to create an enabling environment for flexibility in learning. Thus, for the purposes of the evaluation, the term flexibility of learning will be used interchangeably with flexible learning. A review of literature reveals that the definition, interpretation and dimensions of flexible learning is broad, the dimensions of flexible learning is complex and is portrayed differently across educational institutions.

Flexible learning is also typically referenced to blended learning, e-learning and more recently with mobile learning or m-learning approaches and thus can be viewed as an incorporation of all these types of learning (Peters, 2007, Drennan et al., 2005; Garrison & Kanuka, 2004). Blended learning is a teaching and learning approach that offers flexibility the manner in which course content is engaged with by the student. It offers flexibility between classroom (face-to-face) learning and online learning, thus taking a 'blended' approach to teaching and learning (Garrison & Kanuka, 2004).

E-learning or electronic learning is generally regarded as learning that takes place using electronic and web-based platforms and generally occurs at a fixed location (Moore, Dickson-Deane & Galyen, 2010). Mobile learning can be viewed as an evolved version of e-leaning and is typically defined as the use of mobile devices and wireless networks to facilitate, support, enhance and extend learning activities that are not fixed to a specific physical location. Thus, learning can take place at any location (classrooms, at home, in transit) and at any time (Wu et al., 2012; Hashemi et al., 2011). The association between flexible learning, e-learning and m-learning can also be illustrated in Figure 7 as suggested by Peters' (2007) 'just enough, just in time, just for me' model of flexible learning. Peters (2007) explains that flexible learning incorporates e-learning and m-learning as subsets of flexible learning and that each form of learning is inter-connected in some way. M-learning is regarded as a subset of e-learning, both using web-based applications to deliver course content for learning, but m-learning is also situated directly within flexible learning due to the affordances of the mobile technologies embedded in the m-learning approaches.

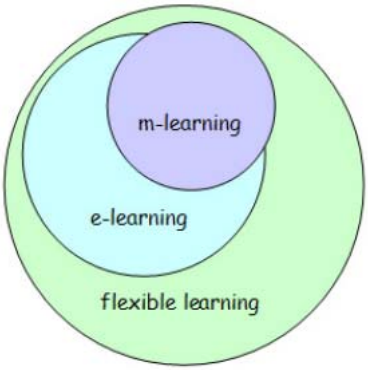


Figure 7: The 'just enough, just in time, just for me' model of flexible learning (Peters, 2007, p.3)

With this in mind, an attempt is made to clarify what flexible learning or flexibility of learning means in the context of the UCT PMD Programme and is explained next. Firstly, flexible learning involves the use of technology and more recently mobile technologies to enhance learning experiences to allow learning to take place anytime, anywhere (Drennan et al., 2005; Ziguras, 2001). The effective integration of traditional face-to-face learning with online learning experiences allows for flexibility, thus learning is not determined by time and location (Garrison & Kanuka, 2004). The main idea is that learning is student focused and that learner choice in relation to their own learning experience be foregrounded (Wade, 1994). Thus, for this evaluation, the term flexibility of learning regarded as an approach whereby students are able to *choose* how, where and when to learn that is suited to their needs and that the learning experience is facilitated by technology, specifically mobile technology (Wade, 1994).

The use of PMDs, such as tablets can support learning that is personalised, situated and authentic as described by Kukulska-Hulme and Traxler (2007). Personalised learning is regarded as learning that recognises diversity, difference and individuality in the ways that learning is developed, delivered and supported. Situated learning is learning that takes place in the course of an activity in appropriate and meaningful contexts. Authentic learning involves learning that uses real-world problems and projects that are relevant and interesting to the learner. Informal learning is deemed it occur spontaneously and independently of formal education and can also be regarded as forms of learning where technology supports a specific activity (Kukulska-Hulme & Traxler, 2007). Further to this, traditional teaching and learning approaches, where students are passive receivers of knowledge, can be transformed

using tablets and educational technologies to engage learners to become active participants in the learning process (Tutty, White & Pascoe, 2013). Thus, from a constructivist learning approach, learning becomes an active, social process where understanding of concepts are developed by students (Tutty et al., 2013). Flexible learning is therefore summarised as the effort to:

1) maximise the affordances offered by PMDs, which in this case is the tablet.
2) maximise opportunities to exploit mobile technologies compatible with the tablet.
3) facilitate learning in a flexible manner suited to student needs and promote student management of learning.
4) support student learning tailored to their needs (student-centred).
5) afford students the flexibility in their learning approaches, promote autonomous learning and the opportunity to choose how, where and when to learn.

Collis and Moonen (2001) explains that flexible learning in higher education is regarded as the interaction between four key components, namely, technology, pedagogy, implementation strategies and institutional frameworks as illustrated in Figure 8. Flexible learning is complex in nature as the interaction between these four components play an important role in implementing flexible learning strategies within higher education institutions. Effective use of technology by the student, educator and at an institutional level (infrastructure and assets) can be regarded as the core to implementing an effective flexible learning framework.

Emerging technologies can transform curriculum design, pedagogy and teaching practice (Bozalek et al., 2013). Various dimensions to be considered when incorporating flexibility into teaching approaches and course design, include time, content of the course, entry requirements, instructional approaches and resources, delivery and logistics (Casey & Wilson, 2005; Collis & Moonen, 2001). Flexibility, when incorporated into the curriculum design allows students the opportunity to learn in a flexible manner and enhance student engagement (Bozalek et al., 2013; Collis & Moonen, 2001).

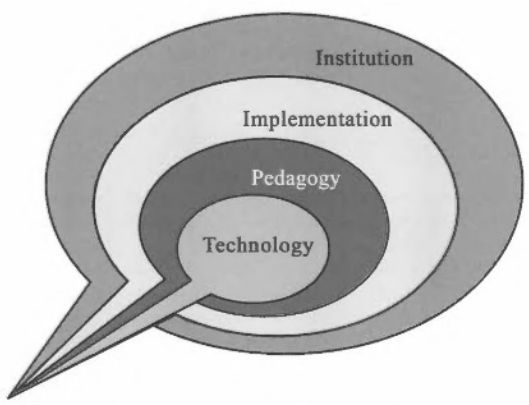


Figure 8: The four key components of flexible learning in higher education (Collis & Moonen, 2001, p. 27)

Implementation of flexible learning strategies however may not be simple. Brown and Pallitt (2015) have reported that lecturers have not fully embraced use of technology, especially PMDs such as tablets in the classroom, with some viewing PMDs as a distraction in class for users and their peers. Another reason for poor adoption could be due to lecturers not being adequately skilled to use these technologies and thus do not adopt the practice (Brown & Pallitt, 2015).

The institution's vision, level of technology use, willingness and commitment to integrate flexible teaching and learning approaches, funding and policy reform, plays a crucial role in integrating all four components of the flexible learning framework (Collis & Moonen, 2001). Bozalek et al. (2013, p. 1) have argued that "institutional leaders need to purposefully create an enabling environment to encourage institutional-wide engagement with emerging technologies". Thus, leaders at an institutional level and national level should be committed and drive change for flexible learning strategies to succeed (Drennan et al., 2005).

In summary, traditional teaching and learning approaches in higher education are moving toward more flexible learning environments, recognising the pervasive nature of mobile technologies and its affordances for transforming teaching and learning (DHET, 2017; UCT, 2016; DHET, 2015; Johnson, Adams Becker, Estrada & Freeman, 2015; DHET, 2013b). PMDs, such as tablets affords students the opportunity to access information instantaneously and facilitate synchronous and asynchronous communication, collaboration and sharing between peers and educators (Gikas & Grant, 2013; Al-Emran et al., 2012; Brand & Kinash, 2010; Shuler et al., 2010). PMDs create an enabling environment for learning in a flexible and mobile manner, suited to the students' needs, where learning can take place at any location

at any time (Rossing et al., 2012; Wu et al., 2012; Brand & Kinash, 2010; Drennan et al., 2005). Thus, by providing tablets and training, the UCT PMD Programme theoretically covers multiple aspects that could enhance flexibility of learning of first year students at UCT.

Thus far, not much research has been conducted on whether and how flexible learning is achieved through PMDs in the South African context, where access to technology and the internet is uneven. This study therefore researches the learning experiences of first year Humanities students on extended degree courses, who were recipients of tablets through the UCT PMD Programme. These students were from 'disadvantaged' backgrounds and may or may not have encountered or afforded to own such devices previously.

The Evaluation Design

Evaluation Questions

The evaluation will assess the programme's main outcome of flexible learning as well as the short- and medium-term outcomes. Taking into account the formative nature of the programme and to establish whether the UCT PMD Programme is optimally designed to achieve its outcomes, a formative evaluation design is proposed. A formative evaluation seeks to improve UCT PMD Programme, while assessing whether the desired outcomes had been achieved (Rossi, Lipsey, & Freeman, 2004). The evaluation questions to be answered are as follow:

1) To what extent does the UCT PMD Programme improve flexible learning of first year extended degree programme students?
2) To what extent is the provision of low cost tablets good enough for achieving flexible learning?

The research framework used to address and answer these evaluations is presented in the next section.

The Research Framework

Figure 9 below represents a model of the variables measured in this evaluation. The model consists of the two independent variables, the first being digital literacy, which for the purposes of this study, consists of mobile technology knowledge, mobility of learning,

communication, portability of information, information sharing and collaboration. The second independent variable is access to information. The dependent variable in this study is flexibility of learning. It is proposed that digital literacy and access to information contribute to flexibility of learning. Furthermore, it is proposed that access to the internet at home has a moderating effect on the relationship between the independent variables and dependent variable. The term home refers to the domicile of students not living at residence. The hypotheses are stipulated and labelled in Figure 9 below.

Hypothesis 1: Digital literacy contributes to flexibility of learning.

Hypothesis 2: Access to information contributes to flexibility of learning.

Hypothesis 3: Internet access at home moderates the relationship between access to information and flexibility of learning

Hypothesis 4: Internet access at home moderates the relationship between digital literacy and flexibility of learning.

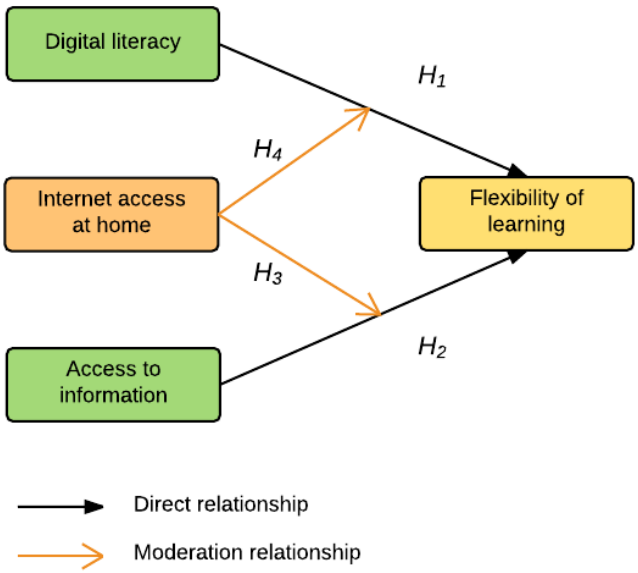


Figure 9: The conceptual model representing the proposed relationship between digital literacy and access to information and the outcome variable, flexibility of learning.

Chapter 3: Method

The UCT PMD Programme formed part of a larger collaborative study, where five South African universities investigated the extent to which low cost PMDs enable a flexible teaching and learning environment. As part of this larger study, a formative evaluation was conducted on the PMD Programme run at UCT.

The purpose of this evaluation is to examine the extent to which digital literacy components and access to information contribute toward improving flexible learning of students in the UCT PMD Programme. In addition, this evaluation aims to assess the extent to which the provision of a low cost tablet is able to facilitate flexible learning.

Multiple sources of data were used to attempt to address the evaluation questions. In so doing, a data triangulated design informed this evaluation (Patton, 2002). This chapter is divided into two sections and will report on data obtained from various sources in discreet sections. The first section will discuss primary data collected by the evaluator. The second section will discuss secondary data obtained and is further divided further into two subsections. The first subsection discusses qualitative secondary data obtained from programme records. The second subsection reports on data obtained from the university's learning management system (LMS) called Vula.

The evaluator collected primary data through an online questionnaire to assess the extent to which the outcomes of the UCT PMD Programme were met. The evaluator obtained access to secondary data from the programme staff and the Centre for Innovation in Learning and Teaching (CILT). As part of the bigger study, the PMD Programme coordinator conducted and collected data through focus groups with students. The evaluator obtained the raw data from these focus groups and analysed the data for the first time to be incorporated into the evaluation. Lastly, Vula log in data, provided by the Operations Manager at CILT at UCT, were obtained to assess actual user trends in terms of what type of device was used to log into Vula, whether students logged into Vula while on or off campus and how often students logged in to Vula. The design, the data providers, the measures, the procedure and analysis for each discreet section will be discussed.

Primary Data

In this subsection, primary data collected by the evaluator will be discussed.

Online Questionnaire

The evaluator collected primary data for this research process in the form of an online questionnaire.

Research design

A quantitative, descriptive framework was utilised to assess the anticipated outcomes of the UCT PMD Programme and to answer the two evaluation questions, 1) to what extent does the UCT PMD Programme improve flexible learning of first-year extended degree programme students and 2) to what extent is the provision of low cost tablets good enough for achieving flexible learning? For the purposes of this evaluation a single group, post-test design was employed (Babbie & Mouton, 1998). It is important to note that a single group, pre-test, post-test design would have been ideal if the evaluation had commenced at the start of the year before students received their device, but given the short time frame for conducting the evaluation, the evaluator was unable to implement this design. Quantitative data were collected by means of an online questionnaire in August 2016, six months after students had received their devices.

Data providers and sampling

Purposive sampling, a non-random sampling technique, was used to recruit participants for the evaluation. Purposive sampling is often used when a particular type of participant is required for a study, who possess knowledge or experience the researcher is interested in (Etikan, Musa, Alkassim, 2016). In this instance, 70 students enrolled in the UCT PMD Programme had access to a tablet and presumably made use of mobile technologies associated with the device and thus their willingness to participate and communicate their experiences and opinions were sought.

Fifty-three students (76.00%) completed the online questionnaire, from potential 70 students enrolled in the programme. Students voluntarily participated in the evaluation and informed consent was obtained from all students except one, thus leaving a final sample of 52 students. The majority of students lived on residence (67.30%) with the remaining students

living at home (32.70%). Most students used their tablet to access the internet while on campus (90.40%). Ninety-one percent of students living on residence used their device to access the internet at the residence, while only 64.71% of students who lived at home could access the internet at home, using their device.

Measures

The scales used in the online questionnaire were developed to measure the variables outlined in the UCT PMD Programme's logic model (Figure 3, p.16) and to answer the two evaluation questions, 1) to what extent does the UCT PMD Programme improve flexible learning of first year extended degree programme students and 2) to what extent is the provision of low cost tablets good enough for achieving flexible learning? After reviewing existing literature, adequate and appropriate scales to measure the constructs relevant to this evaluation could not be found. In this situation, it was necessary to create new scales following some of the guidelines proposed by Hinkin, Tracey and Enz (1997). The development of these scales was based on information found in the plausibility of programme theory and using questions from the 2015 UCT pilot project survey. These survey questions were modified to explicitly measure students' perception of the degree of change in their mobile technology knowledge, mobility of learning, communication, portability, information sharing, collaboration, digital literacy, access to information and ultimately flexibility of learning, through using the tablet. The last construct 'good enough', was framed as fit for purpose and used terms such as sufficient functionality delivered by the device, helpfulness of the device, adequacy and device preference.

Training. Students were asked to rate the perception of training received at the start of the programme, measured on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). An open-ended question was incorporated so that students could provide a reason for their response.

Portability. Portability was measured using a four-item scale. An example of an item from the scale includes, "How often do you bring your tablet to campus?" This measure used a five-point Likert scale from 1 (never) and 5 (daily).

Mobile technology knowledge. Mobile technology knowledge was measured using a four-item scale. An example of an item from the scale includes, "In comparison to the start of

the year, my knowledge about how to use my tablet has increased." The scale was measured using a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

Mobility of learning. Mobility of learning was measured using a four-item scale. A sample item includes, "I am able to research concepts for my studies, anywhere, using my tablet." The scale was measured using a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

Communication. Communication was measured using a five-item scale. The scale was measured using a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). An example of an item from the scale includes, "I use my tablet to send messages to classmates."

Information sharing. Information sharing was measured using a three-item scale. A sample item includes, "How often do you bring your tablet to campus?" This measure also used a five-point Likert scale 1 (never) and 5 (always).

Collaboration with peers. Collaboration was measured using a three-item scale. The scale was measured using a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). A sample item includes, "Using my tablet, has improved my ability to collaborate with classmates."

Access to course information. Access to course information was measured using a five-item scale. The scale was measured using a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). A sample item includes, "Using my tablet during lectures allows me to quickly search for information."

Flexibility of learning. Flexibility of learning was measured using a four-item scale. A sample item includes, "Since receiving my tablet, I get more actively involved in courses that require the use of a mobile device." The scale was measured using a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

Fit for purpose. Fit for purpose was measured using four sets of questions, probing sufficient functionality, helpfulness of the device, adequacy/good enough and student preference. The first question asked students whether the device offered sufficient functionality and was measured using a five-point Likert scale. The second question probed

the concept of how helpful students perceived the tablet to be in relation to their studies and was measured using a ten-point Likert scale. Students were then asked which type of device they preferred for their studies, if afforded the opportunity to choose and to provide reasons for their preferred choice, using one close-ended and one open-ended question. The last question probed adequacy and whether the device was good enough for intended purposes and was measured using a ten-point Likert scale. A sample item includes, "Do you feel the tablet you have been given, was good enough to enhance your in your studies?"

Please refer to Appendix B for full detail relating to the variables and the respective scales used for the online questionnaire.

Procedure

Permission to conduct the evaluation of the UCT PMD Programme was approved by the programme manager. Ethical approval to conduct the research was then sought from the Ethics in Research Committee at the Commerce Faculty. An online application was submitted, with the ethics approval request, on the UCT Ethics in Research website. A proposal was submitted to the Ethics in Research Committee at the Commerce Faculty for ratification and approval subsequently obtained. Additional permission was requested and obtained from the Executive Director, Department of Student Affairs to access UCT students for research purposes. Refer to Appendix C for the permission letter and ethics approval letters.

The online questionnaire was constructed using the online platform, Qualtrics (2015). The questionnaire was reviewed and tested by the programme coordinator and the evaluator's research supervisor. The intention of the review was to verify that the questions compiled were clear, understandable, unambiguous, avoided leading questions and had a logical format. The reviewers recommended minor changes to sentence structure and formatting issues, which was implemented accordingly. Students were emailed the link to the questionnaire via the programme coordinator. Upon opening the link, students observed the cover page, explaining the purpose of the study, informing them that their participation in the study was voluntary and provided contact details if they had any questions. Students were also offered an incentive of 2 x R500 Cavendish vouchers in a bid to increase response rates. Refer to Appendix D for a copy of the questionnaire cover sheet. Thereafter, students could complete the online questionnaire. The questionnaire was live for 3 weeks, from 22 August

2016 to 11 September 2016, during which constant reminders to complete the survey were sent out to students by the programme coordinator.

The data collected from the survey were downloaded into Microsoft Excel and SPSS for further statistical analysis. All data collected was stored onto a Universal Bus Drive (USB) and on the evaluator's Google Drive. As no identifying information was requested (names or student numbers), the Internet Protocol (IP) address of each respondent was used and checked for uniqueness to provide a degree of validation that the respondent only completed the questionnaire once. The survey responses were recoded into numeric values and recorded into a codebook. Please refer to Appendix E for the codebook. Missing data were retained and considered during analyses. The average of each variable was computed based on the number of responses provided by each participant.

Data analysis

Various statistical analyses were run using the IBM Software Package SPSS, version 23. The reliability of scale for each variable was assessed using the Cronbach's alpha and the mean inter-item correlation, which was deemed more appropriate for these evaluation scales as it consists of fewer than 10 items (Pallant, 2011). Descriptive statistics, such as the mean (average) and frequency, were used to analyse the data collected from the online questionnaire (Tredoux & Durrheim, 2002).

A multiple regression analysis was used to assess to what extent digital literacy and access to information contribute to flexibility of learning, using the tablet. The regression model consisted of the dependent variable, flexibility of learning, predicted by two independent variables, digital literacy and access to information. Various analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity were present (Pallant, 2011). The significance threshold, i.e. *p*-value, was set at .05. Lastly, moderation analysis was conducted to test the extent to which the relationship between the predictor variables (digital literacy and access to information) and the outcome variable (flexibility of learning) changes in strength and/or direction as a function of the moderator variable (internet access at home) (Field, 2013).

Secondary Data

This section will discuss secondary data obtained from programme records and university's online learning management system, Vula. The first subsection describes qualitative data collected from focus group sessions. The second subsection reports on actual Vula login data obtained for all students participating in the UCT PMD Programme.

Focus Groups

As explained in the programme description, in 2016, the second phase of the UCT PMD Programme was implemented (p. 14). Thus, as part of the larger researcher project, the programme coordinator and programme manager of the UCT PMD Programme conducted focus group sessions to obtain data for the study. The evaluator was able to obtain secondary data in form of audio recordings and transcripts from these focus group sessions.

Research design

Given that this evaluation formed part of a larger study investigating the extent to which tablets enable a flexible learning environment, focus group data were available for analysis and use in this evaluation. The programme coordinator and manager conducted focus groups to understand how students perceive tablets as adding value to their overall learning experience at University (Brown, 2014). Thus, an exploratory research design was used to collect the qualitative data in an attempt to increase understanding of student perceptions and how it related to the proposed outcomes of the UCT PMD Programme (Babbie & Mouton, 1998). Focus group data were collected during three sessions, two sessions were conducted in May 2016 and one session conducted in November 2016 by the programme coordinator.

Data providers

The programme coordinator conducted two focus group sessions in May 2016 and were attended by 8 to 10 students per session. The programme coordinator and programme manager, held a third focus group session in November 2016 just after student protest action took place at the University. Programme staff were only able to gather information from three students who availed themselves for this session held in November. All data obtained were

anonymised and any identifying information such as names were removed from transcribed data.

Measures

A semi-structured interview protocol was followed by the programme coordinator to keep the interaction focused while allowing flexibility and probing participants when required (Creswell, 2013; Patton, 2002). The focus group interviews were audiotaped by the programme coordinator and transcribed by a transcriber employed by the programme manager. Please refer to Appendix F for the original interview schedule and guide questions used by the programme coordinator. The evaluator assessed the responses to questions posed during focus group sessions in relation to variables measured in the evaluation of the UCT PMD Programme using thematic analysis (Vaismoradi, Turunen & Bondas, 2013; Aronson, 1995; Miles & Huberman, 1994).

Procedure

Programme staff obtained ethics approval for the larger research project investigating the use of PMDs to enhance teaching and learning, as well as obtaining consent from the students to participate in the study. Thus, all secondary data obtained from programme records for this evaluation inherently had ethical approval. All focus group data (audio recordings and transcriptions) were collected by the programme coordinator and manager. The evaluator then analysed the data collected by programme staff, for the purposes of the evaluation.

The evaluator obtained approval to access focus group data (audio recordings and transcriptions) from the programme manager and coordinator. The evaluator accessed this qualitative data via a restricted access Google Drive shared only with programme staff. The evaluator downloaded the audio files (in VLC format) and transcribed data (in Microsoft Word format) to a USB flash drive and password protected these files. A copy of the original transcription was made to maintain the master copy in its original format (Patton, 2002). The copy was then prepared for analysis.

The quality of the transcribed data obtained from programme staff, did not conform to traditional transcription guidelines as proposed by Krueger (2002), as it did not differentiate speakers; interviewer versus interviewees and between interviewees. Thus, an

attempt was made to deconstruct the data and prepare it before further analysis could be conducted. These included listening to audio recordings using Windows Media Player and highlighting the moderator's (interviewer's) statements in bold on the Microsoft Word transcript to differentiate the interviewers' from the interviewees' comments. In addition, an attempt to differentiate interviewees' voices was found to be challenging in that it was not easy to distinguish different male participant voices as their voices sounded similar to the evaluator. Where it was possible to identify distinct voices, the comments were simply referenced as speaker 1, speaker 2, etc. and coded as SP1, SP2, respectively.

Once the evaluator prepared to transcribed data, the prepared data were then imported from Microsoft Word into NVivo Pro 11 for data analysis. A predetermined set of themes were used to fit qualitative data obtained from focus groups to it (Creswell, 2013). These themes relate to the variables measured in the evaluation and include variables such as mobile technology knowledge, portability of information, access to information, flexibility of learning and fit for purpose. Within NVivo Pro 11, the evaluator manually coded data to the predetermined themes. A codebook was established to label and define each theme and to facilitate validation and reliability the qualitative research procedure (Creswell, 2013). Once all relevant data were coded, a word frequency analysis was run to establish which words were used more frequently to guide the theme. The themes were then interrogated and interpreted to obtain meaning from the themes.

To maximise research rigor and validity to findings, peer debriefing was used to enhance the accuracy of the account and to review, question and verify coded data into themes. (Patton, 2002). The peer review was done by the programme coordinator. As no former analysis was done on the focus group data, except that conducted by the evaluator, the evaluator approached the programme coordinator to review, question and verify coding. The programme coordinator found the focus group data suitably coded. Lastly, a code book was generated by the evaluator. Please refer to Appendix G. The code book was used to guide the thematic coding, detailing the nature and description of each theme and how data could be coded into the specific theme was developed, for reproducing the study in a different context, space or time as recommended by Creswell (2013). The code book was also used by the programme coordinator for the peer review.

Data analysis

Patton (2002) describes the process of analysing qualitative data as categorising or coding the raw data followed by distinguishing patterns or themes to draw meaning from the data and subsequently building a logical chain of evidence. Thematic analysis, a qualitative descriptive approach, was used to analyse focus group interview data (Aronson, 1995). "Thematic analysis involves the search for and identification of common threads that extend across the entire interview or set of interviews" (Vaismoradi et al., 2013, pg. 400). Thematic analysis was chosen above the content analysis due to the limitation of transcribed data, as the evaluator was unable to accurately differentiate participants within the focus group and thus cannot provide accurate quantitative counts of codes.

As the first step in analysing the data, the evaluator listened to the audio recordings and made notes of initial ideas emerging from responses. The prepared transcripts imported into QSR International's NVivo Pro 11, a qualitative data analysis Software tool to code, were analysed and examined further. The evaluator manually coded responses and collated it into potential themes or nodes as referred to in NVivo Pro 11. Thereafter, the themes were reviewed at different times to ensure that coded data was appropriately allocating to the respective themes and refined as needed. The context in which these words or phrases were spoken were taken into account when analysing the text and used to generate a thematic map where possible. Finally, a selection of illustrative examples was presented to describe student's stories and draw meaning from the data (Aronson, 1995; Miles & Huberman, 1994).

Vula Session Data

"Vula is UCT's online collaboration and learning environment, used to support UCT courses as well as other UCT-related groups and communities. Vula offers a broad range of features, including tools for administration, assessment, communication, resource sharing and collaborative learning" ("What is Vula?", n.d., p.1). One of the main features of Vula is that it is used as a learning management system between lecturers and students. Students enrolled in UCT courses can access course information such as announcements, the course outlines, tasks, quizzes and tests on the Vula site. Other interactive features include discussion forums and resource directories (VULA, n.d.). The secondary data obtained from the Vula site

relate to the number of times students logged into Vula and as such are referred to Vula session data for this evaluation.

Research design

Vula session data were used to improve this evaluation, by accessing real data on user patterns and statistics. A descriptive research design was used for further examination of the aforementioned variables of the evaluation in lieu of providing objective data for comparing and contrasting against self-reported data from the online questionnaire and focus groups. Babbie and Mouton (1998) reports that descriptive research involves measuring and reporting the characteristics of the phenomenon under study and thus this discreet section will report on the statistics computed and observed.

Data providers

Actual Vula session data were obtained for each student on the UCT PMD Programme for the period February 2016 to August 2016. This data were obtained from the Operations Manager at Vula, housed at the Centre for Innovative Learning and Technology (CILT). All data obtained were anonymised by the Operations Manager at Vula before sending it to the evaluator.

Measures

Vula session activity for each student was assessed in relation what device was used to access Vula, as well as where, when and how often students accessed the Vula site using their device. These were then further assessed in relation to variables measured in the evaluation of the PMD Programme.

Procedure and data analysis

Data for Vula session activity were emailed to the evaluator in Microsoft Excel format by the Operations Manager at CILT and stored on a USB flash drive which was password protected. The evaluator checked the entries for duplicates and cleaned the data before analyses were computed using Microsoft Excel. Descriptive statistics were used to analyse the Vula session data. The Vula session data were used to corroborate or refute results obtained from the online questionnaire and focus groups, in order to assess whether the programme's outcomes have been achieved or not.

Method Limitations of Current Study

The design of the UCT PMD Programme, in that it only offered tablets to first year Humanities students, presents one possible limitation to the current study. As only first year undergraduate students within the Humanities Faculty of UCT were surveyed, the findings may not be representative of the first-year student population at UCT as a whole, much less the entire student population at UCT. Further research may benefit from sampling and studying a wider range of first year students across faculties at UCT.

As mentioned in the previous sub-section, the quality of the transcribed data obtained from programme staff did not follow traditional transcription guidelines. In addition, the focus group session held in November only accessed three participants as opposed to between five to ten participants as recommended by Krueger (2002). The findings obtained from the focus group were thus interpreted with some caution by the evaluator, keeping in mind the quality of data obtained.

As the survey instrument recorded self-reported results, the results can be regarded as a proxy measure of students' perceptions. Thus, multiple sources of data such as the online questionnaire, focus group data and Vula records was used to address threats to internal validity. Precise determination of student activity on Vula, could have added to research rigour. In addition, the possibility that testing effects may have sensitised students in unintentional ways is noted. Although no pre-test was used in this evaluation, students may have felt inclined to respond positively to the programme coordinator during focus groups, for fear of having to return the device if favourable responses were not forthcoming. This could be overcome by using an independent interviewer conducting focus groups and reduce researcher bias.

Summary

In summary of above, Table 3 on the following page demonstrates the triangulated approach to data gathering that informs how the two evaluation questions were addressed in the discussion.

Table 3: Variables and data collection sources used to address evaluation questions

Variables	**Primary data: online questionnaire**	**Secondary data: focus groups**	**Secondary data: VULA session data**
Portability of information	X	X	X
Mobile technology knowledge	X	X	
Mobility of learning	X	X	X
Communication	X	X	
Information sharing	X	X	
Collaboration with peers	X	X	
Digital literacy skills (computed)	X		
Access to course information	X	X	X
Flexibility of learning	X	X	
Functionality / Fit for purpose	X	X	
Preference	X		

Chapter 4: Results

This chapter presents the analyses of data collected to assess the outcomes of the PMD Programme. The chapter is divided into three discreet sections. The first section addresses the reliability of scales used for the evaluation. The second section presents the results of the primary data collected through the online questionnaire and is further divided into two subsections. The first subsection presents the analyses the descriptive properties of the variables used to answer the evaluation questions. The second subsection presents the results of the hypotheses testing, using multiple regression, to assess the extent to which digital literacy and access to information contribute to flexibility of learning. The last discreet section reports the results of secondary data obtained from the PMD Programme and UCT's learning management system and is further divided into two subsections. The first subsection reports the results of the qualitative data obtained from focus group sessions. The second subsection presents the analysis of data collected from the university's learning management system, Vula. The outlay of the results section is illustrated in Figure 10.

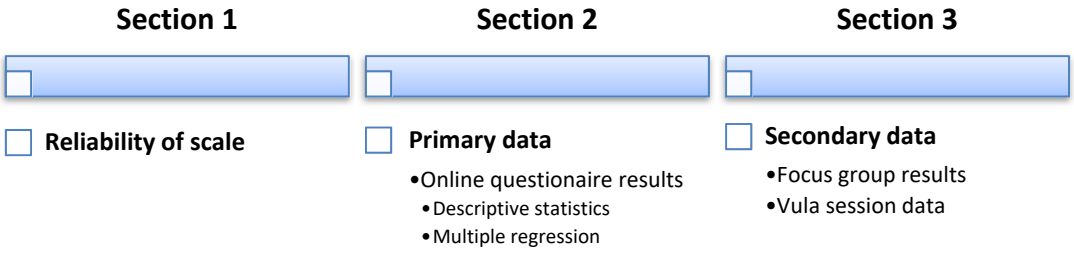


Figure 10: Outline of sections covered in Method Chapter

Reliability of Scale

The reliability of the scales used in the evaluation was assessed in terms of internal consistency using, Cronbach's alpha. Pallant (2010) recommends a minimum level of .70 as an acceptable reliability coefficient, but when there are few items in a scale (less than 10), Cronbach's alpha values may be lower than .70. As reflected in Table 4 below, mobile technology knowledge, communication, information sharing and collaboration variables, obtained reliability coefficients greater than .70. Mobility of learning, portability of information, access to information, flexibility of learning and fit for purpose variables obtained moderate Cronbach's alpha values ranging from .42 to .55. Briggs and Cheek (1986)

proposed reporting the mean inter-item correlation values when there are few items in a scale (i.e. less than 10) and suggested that an optimal inter-item values ranging from .20 to .40. to be used. Thus, the mean inter-item correlation for the variables with moderate Cronbach's alpha values, fall well within this range.

Table 4: Results of reliability analysis

Variable	Cronbach's alpha (α) value	Mean inter-item correlation	Min. inter-item correlation	Max. inter-item correlation
1. Mobile Technology Knowledge	.841	.583	.557	.617
2. Portability of information	.551	.263	.103	.565
3. Mobility of Learning	.423	.170	.050	.351
4. Communication	.756	.376	.236	.938
5. Information sharing	.708	.453	.273	.656
6. Collaboration	.909	.767	.656	.844
7. Access to information	.424	.151	-.049	.616
8. Flexibility of learning	.594	.274	.002	.642
9. Fit for purpose	.466	.261	-.061	.464

Notes. Min. = minimum; max. = maximum.

Results of Primary Data Collected

Online Questionnaire Results

This section is divided into two subsections. The first subsection reports the descriptive statistics of data collected for each variable. The second subsection presents the multiple regression analysis conducted to test the hypotheses and assess the extent to which digital literacy and access to information predicts flexibility of learning.

Descriptive statistics

Training

The majority of students (89%) found the training provided by the UCT PMD Programme helpful. Eight percent of students reported a neutral view, with the remaining 3% of students indicating that the training was not helpful. Following this, students who responded with dissatisfaction to the training, were asked to provide a reason for their dissatisfaction. Only one student provided a reason and indicated that:

A training session explaining every [a]spect of the tablet's usage would be helpful.

Students' responses from the online questionnaire are presented in Figure 1 in Appendix H.

Portability of information

The majority of students brought their device to campus on a daily basis (56%) or at least a few times per week (38%) and used it for their studies while on campus (94%). The majority of students reported using their device for academic purposes on a daily basis (82%) and made use of the device for their studies while at home. Further detail can be found in Table 1, Appendix H.

Mobile technology knowledge

The mean scores for each item indicate that most students perceived an increase in their mobile technology knowledge and were more confident in using their device compared to the start of the year (*M* = 4.71; *SD* = .61). Overall, students reported high levels of mobile technology knowledge when using a mid-point of three on a five-point Likert scale (*M* = 4.77; *SD* = .42). Students' responses from the online questionnaire are presented in Table 5 (p. 48).

Mobility of learning

Students reported high levels of confidence in using their device for learning outside the classroom, than compared to the start of the year (*M* = 4.80; *SD* = .45). Furthermore, students indicated that their ability to research concepts anywhere (*M* = 4.73; *SD* = .53) and anytime (*M* = 4.55; *SD* = .79) had also improved when using their device, in comparison to the start of the year. Students reported a lower mean value, albeit still positive, in their confidence in using their device in class. As presented in Table 5 (p. 48), overall, students reported a high level of mobility of learning in comparison to the start of the year (*M* = 4.57; *SD* = .45).

Table 5: Descriptive statistics - mobile technology knowledge, mobility of learning, communication, information sharing and collaboration

Variable: Mobile technology knowledge	***N***	***M***	***SD***	***SE***	***Skewness***	***Kurtosis***
1. In comparison to the start of the year, my knowledge about how to use my tablet has increased.	*52*	*4.71*	*.605*	*.084*	*-2.540*	*7.589*
2. In comparison to the start of the year, I feel confident using my tablet to connect to VULA.	*52*	*4.77*	*.509*	*.071*	*-2.192*	*4.194*
3. In comparison to the start of the year, I feel confident using my tablet to access course material on VULA.	*51*	*4.82*	*.434*	*.061*	*-2.482*	*5.924*
4. In comparison to the start of the year, I feel confident downloading the appropriate applications.	*51*	*4.78*	*.503*	*.070*	*-2.348*	*4.948*
Composite Score	***52***	***4.77***	***.418***	***.058***	***-2.771***	***8.025***
Variable: Mobility of learning						
1. In comparison to the start of the year, I feel confident in using my tablet during lectures, i.e. inside the classroom.	50	4.22	1.016	.144	-1.194	.315
2. In comparison to the start of the year, I feel confident in using my tablet outside of the classroom venue for my studies.	50	4.80	.452	.064	-2.214	4.473
3. I am able to research concepts for my studies, *anywhere*, using my tablet.	49	4.73	.531	.076	-1.926	3.000
4. I am able to research concepts for my studies, *anytime*, using my tablet	49	4.55	.792	.113	-2.140	4.572
Composite Score	**51**	**4.57**	**.448**	**.063**	**-.940**	**.071**
Variable: Communication						
1. I use my tablet to send messages to lecturers.	52	3.06	1.30	.181	.055	-1.177
2. I use my tablet to receive messages from lecturers.	51	3.84	1.17	.164	-.613	-.826
3. I use my tablet to send messages to classmates.	52	3.21	1.33	.185	-.095	-1.134
4. I use my tablet from receive messages from classmates.	50	3.12	1.41	.199	.098	-1.370
5. My tablet allows me to receive a faster response to my questions from lecturers via email.	52	4.00	1.08	.150	-.959	.066
Composite Score	**52**	**3.45**	**.898**	**.124**	**-.163**	**-.451**
Variable: Information sharing						
1. I use my tablet to share notes with classmates.	51	3.41	1.359	.190	-.453	-1.050
2. I use my tablet to take and share pictures with classmates.	52	2.65	1.545	.214	.346	-1.396
3. I use my tablet to share videos with classmates.	51	2.22	1.286	.180	.814	-.396
Composite Score	***52***	**2.79**	**1.140**	**.158**	**.265**	**-.716**
Variable: Collaboration						
1. Using my tablet, I am able to participate in online group discussion/chats more often.	51	4.22	1.026	.144	-1.264	.979
2. Using my tablet, I am able to work closer with classmates on group assignments.	52	4.00	1.120	.155	-1.044	.401
3. Using my tablet, has improved my ability to collaborate with classmates.	51	4.04	1.058	.148	-1.031	.790
Composite Score	**52**	**4.08**	**.977**	**.135**	**-1.069**	**.622**

Notes. *N* = number of responses; *M* = mean; *SD* = standard deviation; *SE* = standard error of mean.

Communication

Table 5 (p. 48) presents the mean scores of student responses relating to the communication variable. For all items within this scale, students reported average levels of use, when using their device for communication with their lecturers and their peers (*M* = 3.45; *SD* = .90).

Information sharing

Students reported relatively low levels on information sharing when using their tablet (*M* = 2.79; *SD* = 1.14). In general, students did not use their tablet to share notes, pictures or videos with classmates (*M* = 2.79; *SD* = 1.14). Refer to Table 5 (p. 48) for detailed descriptive information.

Collaboration

Students' responses relating to collaboration as presented in Table 5 (p. 48), showed that students agreed that the use of the tablet, facilitated higher levels of participation and collaboration with classmates (*M* = 4.08; *SD* = .98).

Digital literacy

The construct digital literacy represents the medium-term outcome of the UCT PMD Programme (Figure 3, p. 16) and was constructed using the six aforementioned measures as defined as elements of digital literacies (Figure 6: The seven elements of digital literacies (JISC, n.d*., p.2)*As indicated in Table 6, p. 50**,** the mean score for the digital literacy variable represents moderate to high levels of digital literacy obtained through the use of the tablet (*M* = 4.06; *SD* = .50).

Access to course information

The access to information measure represents the medium-term outcome of the UCT PMD Programme (Figure 3, p. 16). While using the tablet, the results show that students agreed that they could easily access to information while on campus (*M* = 4.00; *SD* = 1.24) and off campus (*M* = 3.94; *SD* = 1.30) or at home (*M* = 4.63; *SD* = .68). Students also reported high levels of accessibility to information while using their device during lectures (*M* = 4.35; *SD* = .52), as shown in Table 6, p. 50.

Table 6: Descriptive statistics - digital literacy, access to course information and flexibility of learning

Variable: Digital literacy	***N***	***M***	***SD***	***SE***	***Skewness***	***Kurtosis***
1. Mobile technology knowledge	52	4.77	.418	.058	-2.771	8.025
2. Mobility of learning	51	4.57	.448	.063	-.940	.071
3. Communication	52	3.45	.898	.124	-.163	-.451
4. Portability of information	52	4.53	.444	.062	-1.265	1.848
5. Information sharing	52	2.79	1.140	.158	.265	-.716
6. Collaboration	52	4.08	.977	.135	-1.069	.622
Composite Score	***52***	***4.06***	***0.50***	***.069***	***-.513***	***-.352***
Variable: Access to course information						
1. Using my tablet, I can easily access necessary information for my studies from other places outside campus.	51	3.94	1.302	.182	-1.018	-.103
2. Using my tablet, I can easily access necessary information for my studies from campus.	52	4.00	1.237	.171	-1.100	.153
3. Using my tablet, I can easily access necessary information for my studies from home.	51	4.63	.681	.095	-4.022	19.141
4. Using my tablet during lectures and tutorials gives me access to more information.	51	4.76	.606	.096	-1.260	.623
5. Using my tablet during lectures allows me to quickly search for information.	50	4.60	.662	.093	-1.998	4.348
Composite Score	**52**	**4.35**	**.518**	**.072**	**-.401**	**-.869**
Variable: Flexibility of learning						
1. Since receiving my tablet, I get more actively involved in courses that require the use of a mobile device.	49	4.49	0.739	.106	-1.414	1.618
2. Using my tablet during lectures and tutorials allows me to locate relevant materials, more easily.	49	4.55	0.679	.097	-1.650	3.090
3. Using my tablet during lectures and tutorials allows me to use relevant materials, more easily.	49	4.55	0.765	.109	-2.503	8.713
4. Using my tablet during lectures and tutorials allows me to capture all of the information presented, better.	48	4.48	0.799	.115	-2.152	6.532
Composite Score	***49***	***4.52***	***0.504***	***.072***	***-.884***	***-.331***

Flexibility of learning

Flexibility of learning was assessed as the long-term outcome of the UCT PMD Programme (Figure 3, p. 16). As indicated in Table 6, p. 50, students reported very high levels of agreement on the each of the flexibility of learning items. When using their tablet, students reported being more actively involved in courses (*M* = 4.49; *SD* = .74) and being able to better locate information (*M* = 4.55; *SD* = .68), use information (*M* = 4.55; *SD* = .77) and capture information (*M* = 4.48; *SD* = .80) for their studies.

Fit for purpose

Fit for purpose was measured using four sets of questions, probing sufficient functionality, helpfulness of the device, adequacy/good enough and student preference.

***Sufficient functionality*.** The majority of students reported that their tablet provided sufficient functionality to take notes in class (*M* = 4.24; *SD* = 1.00), conduct research for assignments (*M* = 4.86; *SD* = 0.35), type up their assignments (*M* = 4.64; *SD* = 0.72) as well as read notes and course materials (*M* = 4.84; *SD* = 0.42). All students' responses were lower when probed about functionality to capture information presented in class using the camera function (*M* = 3.79; *SD* = 1.30). Overall, students reported high levels of adequate functionality when using the device for their studies as illustrated in Table 7.

Table 7: Descriptive statistics - fit for purpose

Variable: Fit for Purpose	***N***	***M***	***SD***	***SE***	***Skewness***	***Kurtosis***
My tablet provides me with **sufficient functionality** to:						
1. Take notes in class	50	4.24	1.001	.142	-1.780	3.316
2. Take photographs of information presented in class	52	3.79	1.304	.181	-.750	-.736
3. Conduct research for assignments	51	4.86	.348	.019	-2.173	2.830
4. Type up my assignments	50	4.64	.722	.102	-3.060	12.574
5. Read literature, notes, course material	50	4.84	.422	.060	-2.721	7.535
Composite Score	***52***	***4.47***	***.471***	***.065***	***-.940***	***.504***

Notes. *N* = number of responses; *M* = mean; *SD* = standard deviation; *SE* = standard error of mean.

Helpfulness. All students reported that the tablet had helped them with their studies (*N* = 52) and then rated the degree of helpfulness afforded on a scale from one to ten, which ten indicating the highest degree of helpfulness. See Figure 11 for the response rates. Overall,

students reported a high positive perception that the tablet had helped them with their studies (*M* = 8.46; *SD* = 1.21).

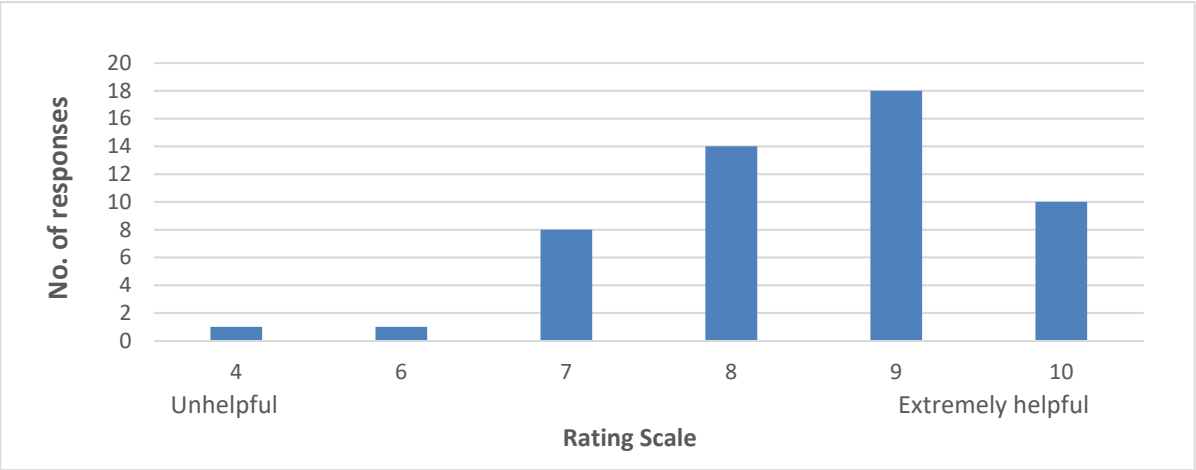


Figure 11: Number of student responses in relation to their perception of the degree of helpfulness the device offered for their studies (*N* = 52)

Adequacy /Good Enough. Ninety-eight percent of students reported that their tablet was good enough to enhance their studies (*N* = 51). Students were then asked to rate their initial response using a 10- point Likert scale, from 1 (extremely inadequate) to 10 (extremely adequate). Students' ratings ranged from 4 to 10, with a score of 8 being rated the most frequently as indicated in Figure 12.

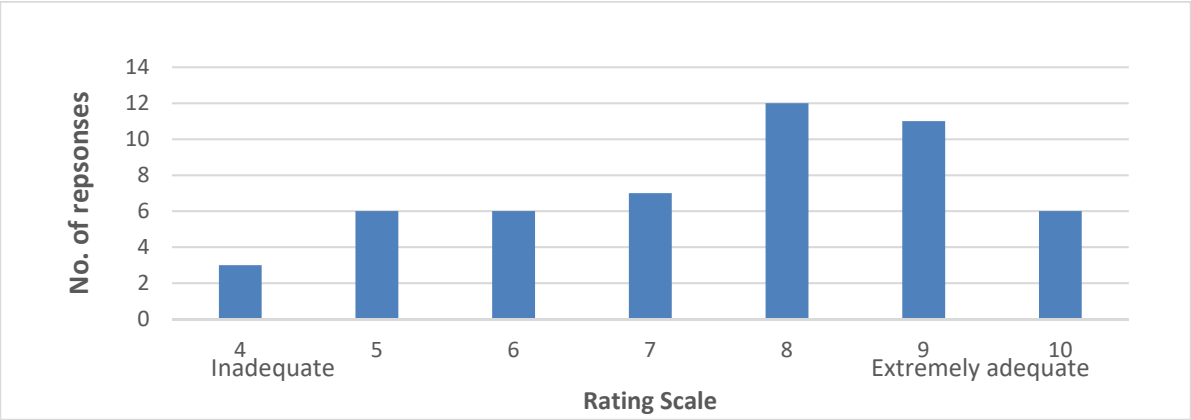


Figure 12: Number of student responses in relation to their perception that the tablet was good enough to enhance their studies (*N* = 51)

Preference. When students were asked about their preferred device for their studies, 73% of students indicated a preference toward the use of a laptop for their studies (*N* = 52).

Open-ended questions were used to allow students to provide reasons for their preference. The main reasons for preferring a laptop is succinctly captured by one student:

> *Laptops operate faster than tablets as they have a larger RAM. Their screens are larger than that of a tablet and smartphone. Laptops have more storage space which means that one doesn't have to constantly delete files every few weeks. Laptops can connect to a phone and/or tablet through a USB cable which would be ideal for sharing information between devices. Basically, laptops have all the perks of a desktop with the added advantage of being portable.*

In contrast, only 10 students (19%) preferred their current tablet, with the remainder stating a preference toward a smartphone (6%) and a different tablet (2%). Responses from open-ended questions provided contextual understanding for students' preferences and selected quotes are presented below:

> *The tablet provide quick and easy access to information and is easier to hide when traveling on public transport.*

> *It also easy to carry around due to its compact size and weight.*

> *The tablet has enough storage space to store course material.*

In summary, Table 8 indicates the composite score for each variable used to assess the outcomes of the UCT PMD Programme in order to answer the evaluation questions.

Table 8: Summary of descriptive statistics for variables used in online questionnaire

Composite score for each variable	***N***	***M***	***SD***	***SE***	***Skewness***	***Kurtosis***
Mobile technology knowledge	52	4.77	.418	.058	-2.771	8.025
Mobility of learning	51	4.57	.448	.063	-.940	.071
Communication	52	3.45	.898	.124	-.163	-.451
Portability of information	52	4.53	.444	.062	-1.265	1.848
Information sharing	52	2.79	1.140	.158	.265	-.716
Collaboration with peers	52	4.08	.977	.135	-1.069	.622
Digital literacy skills	*52*	*4.06*	*0.50*	*.069*	*-.513*	*-.352*
Access to course information	52	4.35	.518	.072	-.401	-.869
Flexibility of learning	49	4.52	0.504	.072	-.884	-.331
Functionality / Fit for purpose	52	4.47	.471	.065	-.940	.504

Multiple regression analysis

Using data obtained from the online questionnaire, a standard multiple regression was conducted to analyse the extent to which digital literacy and access to information contribute to flexibility of learning, through the use of the tablet.

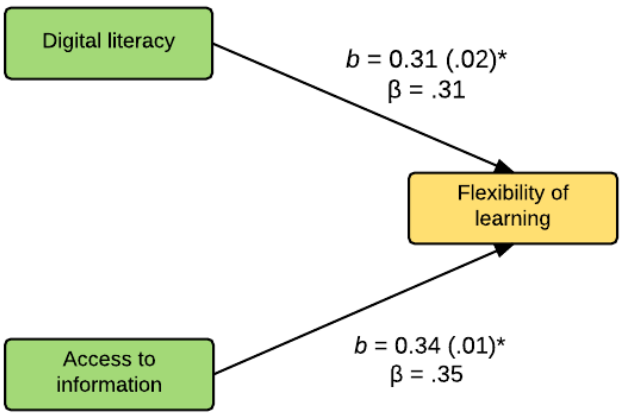
Checking assumptions of multiple regression

Before conducting the multiple regression, various checks were conducted to ensure that assumptions for multiple regression were not violated. An examination of the correlation between the independent variables showed a moderate positive correlation, $r(49) = .30$, $p < .05$. Variance inflation factor (VIF) was also within accepted limits, indicating no multicollinearity. In order to run a regression, correlations should not be .90 or higher, tolerance values should not be less than .10 and the VIF values should not be more than 10, as values outside these thresholds suggest multicollinearity (Pallant, 2010). In checking for influential cases, Cook's distance was measured and reported a maximum value of .32, indicating no influential cases were present. Cook's values greater than 1.00 may indicate that influential cases may be present and would require further investigation before proceeding with running a regression (Field, 2013). Inspection of the histogram, p-p plots and scatterplot revealed that the assumptions of linearity, normality linearity and homoscedasticity were met. Refer to Appendix I for more detail related to the results obtained for the preliminary analyses.

Results of multiple regression analysis

The multiple regression showed significant results, $F(2,48) = 8.94$, $p = .001$. The independent variables, digital literacy and access to information explained 28.00% of the variance in dependent variable, flexibility of learning ($r = .53$). The regression equation to predict flexibility of learning (y) from digital literacy (x_1) and access to information (x_2) is: $y = 1.78 + .31x_1 + .34x_2$. The independent variable, digital literacy significantly predicted flexibility of learning, B = .31, 95% CI [.042, .569], $t = 2.36$, $p = .024$. Furthermore, as students' digital literacy skills increased by one standard deviation, student's flexibility in learning increased by .31 standard deviations.

The second independent variable, access to information, significantly predicted flexibility of learning, B = .34, 95% CI [.084, .599], t = 2.67, p = .010. Furthermore, as students' access to information increased by one standard deviation, student's flexibility of learning increased by .35 standard deviations. Thus, the independent variable, access to information, was marginally better at predicting flexible learning than digital literacy. In conclusion, hypothesis 1 and 2 are supported and is illustrated in Figure 14 below.



*p < .05

Figure 13: The regression model representing the independent variables, digital literacy and access to information, significantly predicting the outcome flexibility of learning

As indicated in the method section, the significance value (p-value) was set at 0.05 and thus p-values marked with an asterisk (*) is regarded as being statistically significant. Please refer to Appendix J for full detail of regression results.

Moderation analysis

The following subsection presents the results of the moderation analyses conducted using internet access at home as moderator.

Internet access at home as a moderator

Moderation analyses were conducted in order to test the following hypotheses:

Hypothesis 3: Internet access at home moderates the relationship between access to information and flexibility of learning.

Hypothesis 4: Internet access at home moderates the relationship between digital literacy and flexibility of learning.

Hypothesis 3 was not supported as no significant moderating effect was present when investigating the interaction between access to information (independent variable) and internet access at home (moderator), *b* = -.32, 95% CI [-1.06, -.41], *t* = -.88, *p* = .38 as indicated in Table 9.

Table 9: Moderation analyses: Internet access at home moderating the relationship between access to information and flexibility of learning

	b	***SE B***	***t***	***p***	**95% CI**
Constant	5.539	.080	57.119	.000*	4.379, 4.670
Internet access at home	-.110	.200	-.549	.586	-.513, .293
Access to course information	.497	.147	3.374	.002*	.200, .794
Internet access x Access to info	-.321	.365	-.879	.384	-1.055, .414

**p* <.05

A moderating effect was present, when investigating the interaction between digital literacy (independent variable) and internet access at home (moderator) on the outcome variable, flexibility of learning, *b* = .50, 95% CI [.05, .95], *t* =2.25, *p* = .03 (where the alpha set at p <0.05). Overall, 47.95% of the variance in the outcome variable, flexibility of learning, was due to the three predictors, digital literacy, internet access at home and their interaction, F(3,45) = 9.78, *p* <.001. The regression equation would be stated as y = 4.50 - 0.04(IntHome) + 0.37(DigLit) + 0.50(IntHome x DigLit). Refer to Table 10 for further breakdown of the moderation results.

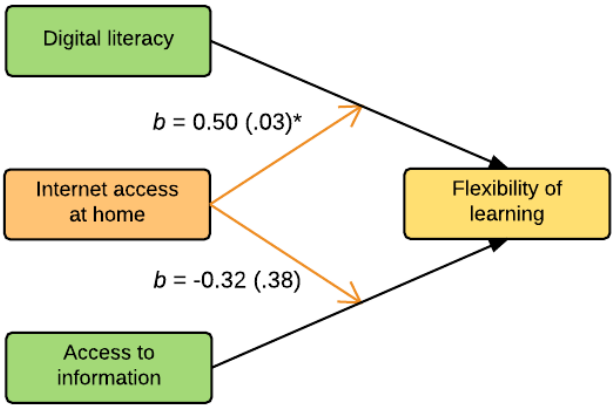
Table 10: Moderation analyses: Internet access at home moderating the relationship between digital literacy and flexibility of learning

	b	***SE B***	***t***	***p***	**95% CI**
Constant	4.502	.678	66.490	.000*	4.366, 4.639
Internet access at home	-.038	.135	-.285	.777	-.310, .233
Access to course information	.366	.123	2.978	.005*	.119, .614
Internet access x Access to info	.502	.223	2.251	.029*	.053, .950

**p* <.05

It is evident from the abovementioned results that having access to the internet at home moderates the relationship between the independent variable digital literacy and the dependent variable, flexibility of learning. When students have no internet access at home, there is a non-significant positive relationship between digital literacy (predictor) and

flexibility of learning (outcome), *b* = .19, 95% CI [-.156, .541], *t* = 1.11, *p* = .27. Students who do not have internet access at home, each additional increment of digital literacy skills is associated with lower predicted flexibility of learning. For students who have internet access at home, there is a significant positive relationship between digital literacy (predictor) and flexibility of learning (outcome), *b* = .69, 95% CI [.411, .977], *t* = 4.94, *p* <.001. Thus, for students living at home and have internet access, each additional increment of digital literacy skills is associated with higher predicted flexibility of learning, as illustrated in the simple slopes graph in Appendix K. Furthermore, Figure 14 presents the results of the moderation analysis.



*$p < .05$

Figure 14: The moderation model representing moderating effect of access to Internet at home on the relationship between the independent variables and flexibility of learning

Results of Secondary Data Collected

Focus Group Interview Results

The next section presents the information obtained from three focus group sessions conducted by the PMD Programme coordinator and manager during May and November 2016. As outlined in the Methods Section (p. 38), the focus group transcripts were analysed by focusing on comments or discussion related to the key variables of this study. A selection of the most illustrative comments and stories from students are presented in each section below.

Mobile technology knowledge

Once students received their tablet through the UCT PMD project, the majority indicated that they found it easy to access the Vula site and download appropriate applications for their studies. In addition, students reported that they were eager to learn and teach themselves how to use their device and often used Google as a key learning resource. Typical responses include:

> *Like getting the Vula app is very easy. It's (tablet) an Android. Android is very easy to get apps (Focus group 1, May 2016).*
>
> *I got Microsoft Word and Vula and all of that on there. So, it was pretty easy for me, yes (Focus group 2, May 2016).*

Two students indicated that they experienced problems connecting to a mobile network with their device, when Wi-Fi was not available and reported:

> *The SIM card is just not working. There's no mobile network at all. It only uses Wi-Fi (Focus group 1, May 2016).*

Portability of information

The main findings related to portability of information, including benefits experienced by students while using their device, are presented in Figure 15 below.

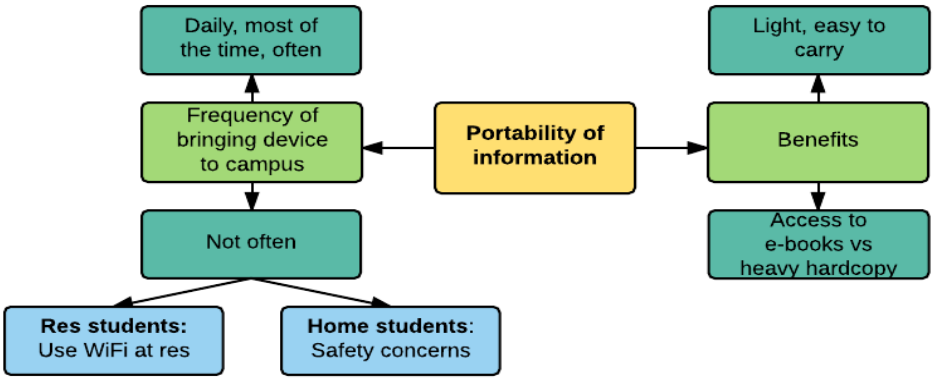


Figure 15: Thematic map representing findings related to portability of information captured from focus groups held in May and November 2016.

Students living at home reported to be less likely to bring the device regularly to campus for safety reasons while travelling on public transport. The device was only brought to campus when required, to avoid potential safety threat, as reported by this student:

> *I feel that way too. Like this morning, so I was at the bus stop, me and my mother, and I had this bag … I do only had my tab with me so I was quite scared you know because there were guys standing there ... I only bring it when it's necessary to bring it, just to prevent that (Focus group 2, May 2016).*

In contrast, students living in residence did not report any safety concerns for not bringing their device to campus. When they were asked about it (as indicated in square brackets below), the student indicated that it was more convenient to use the device at residence as he/she had access to the internet via a Wi-Fi connection:

> [*Why don't you bring it every day?]*
>
> *Because I have like Wi-Fi at res and I mostly use it at res than here (Focus group 2, May 2016).*

Students reported that the tablet was really useful for downloading and storing their information on their device and transporting their information with them. Two students indicated that it saved them from carrying heavy hard copy text books and notes to and from campus as explained below:

> *I think having all my lectures on something, … If I hadn't had the tablet I would basically just have my flash drive and every time like try to store my things on there, and then come home, use my dad's laptop, but instead I had the tab, and I could put my things on there (Focus group 3, November 2016).*

Mobility of learning

Three students reported using the tablet equally on campus and off campus to facilitate various academic activities. Some students would use the device on campus to take notes during lectures and then use it off campus to read course material, type up assignments and prepare for exams. Moreover, students indicated that they were particularly grateful for the device as it allowed them to spend less time on campus, late at night and over weekends. The question asked by the programme coordinator is indicated in square brackets.

[And do you use it more on campus or off campus?]

It's a 50/50 for me because I use it for, like, for my readings. I do it on my tab and then here, like it's to take notes and stuff during lectures (Focus group 2, May 2016).

It's the same with me, like, I would make sure that at the end of day I download my lecturer's slides that I need because all the homework is on there (Focus group 2, May 2016).

A few students indicated that use of their device in the classroom was limited. Only one student reported using Microsoft Office Notepad to take notes, record audio clips and take pictures of lecture slides, as they were not posted on Vula, as illustrated next:

Because I use Notepad during lectures. You can also like do, like, a short like three minutes, like recordings of him while talking. Let's say he's talking on a really, like, important thing, you can record him and then yes, stop it whenever and then just quickly write what you wanted to say (Focus group 2, May 2016).

In contrast, three students narrated using pen and paper to take notes in class, after initially using the tablet. Students reported that typing on the device diverted their attention from what the lecturer was saying and after a while reverted to using pen and paper as explained by this student:

Like in the beginning, like I tried writing my notes like while the lecturer is presenting but I think it's better if I hear them first and then like afterwards, I don't know, so like for me I couldn't write notes down. So it's very difficult to just like… because you are concentrating on typing the words (Focus group 2, May 2016).

Communication

A few students indicated that they used their tablet to communicate with tutors via email. Many students also reported that their tablet was also particularly useful for non-academic purposes such as keeping in contact with family and peers during the shutdown period in 2016, as well as receiving updates via social media.

Information sharing

One student reported that it was faster and more convenient to use the tablet to create their own YouTube channel to share information, but was not indicative of whether this was for academic purposes or not. Many students also posted pictures and videos on

social media sites, but were not related to academics. Another student made use of the VULA forum to pose questions, albeit infrequent.

> *Yes, the tab make it easier. Because like on a phone, let's say you want to upload something, it's going to take super long because it's a phone. A tablet is much quicker and much more convenient (Focus group 2, May 2016).*

Collaboration

A few students narrated that they were aware of online forums or chat rooms available on Vula, but made little use of these sites to collaborate and work with peers and was only used to pose questions, per the example below:

> *I think there's a chat forum on Vula on one of the side bars. I think that helps me a lot as well, because in there you can see what questions other people have, and also like with linguistics they respond very fast. So if you have a question and then I would like put it on (Focus group 3, November 2016).*

Access to information

The findings related to access to information are indicated in Figure 16 below.

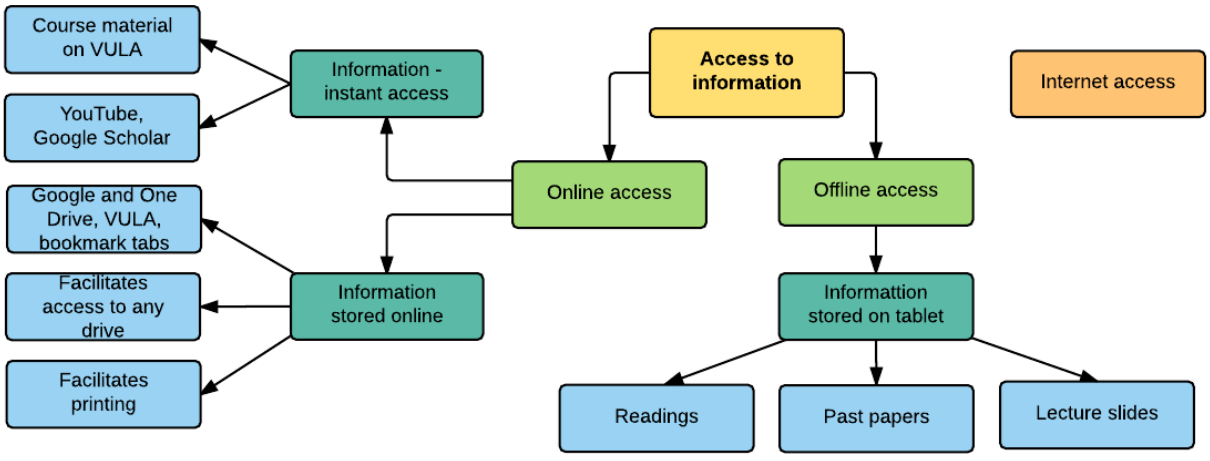


Figure 16: Thematic map representing findings related to access to information captured from focus groups held in May and November 2016.

Students explained how they used their device to access information required for their studies. Some students either accessed information online or offline (when students were not

connected to the internet). In terms of online access to information, the evaluator categorised the type of the information into stored information and instant access information. Five students reported storing information on Google Drive via their device, as it allowed students to store information in the cloud and synchronise it across multiple devices. Two students also used Microsoft OneDrive and another student used Vula to store information. Students also reported that it was convenient to store information online, as it facilitated printing and reduced the need to carry information on a USB flash drive.

> *One Drive or Google Drive is convenient because you can never lose them. You can just simply go to any computer and just access and there you go. I used a flash drive before but now [inaudible], so yes (Focus group 1, May 2016).*

In addition, five students reported using Google Scholar and two reported using YouTube to research concepts and obtain a better understanding of course work as expressed by this student:

> *Yes, I also use it for academic, because with sociology you get people that you have to do research on, so I can just go on YouTube and hear what people say about that person and then I can go and read my book. It makes it easier because now I understand what I'm… Who the person I'm reading about is. Instead of just reading a book (Focus group 1, May 2016).*

Majority of students explained how they would download course material, such as lecture slides and readings from Vula and store it on their tablet. Students also used the device to store past exam papers and would use their tablet access this information required to complete tasks, assignments and prepare for exams.

Internet access is located as a stand-alone concept in the thematic map (Figure 16), as it would influence whether students could access online information using their tablet. Some students would download the information at campus, when they had access to the internet and then continue working on it at home as explained by this student:

> *I don't have internet at home, so I needed the internet, but then also I would download the things I needed onto my tab, and then take it home, yes, so I could work at home (Focus group 1, May 2016).*

Flexibility of learning

Students indicated that their device allowed for greater flexibility in when and how they would learn. In terms of location, the tablet reduced student's dependency to use the computer labs to study and complete assignments. Three students reported that through the device, they could study in their rooms as well as spend less time on campus (especially on weekends) to complete assignments and study as quoted below. They would only need to come to campus to print their assignments.

> *Yes. Because you don't have to take a Jammie [Shuttle] to upper campus. You can just wake up, take a shower and then work in your room or something (Focus group 1, May 2016).*
>
> *[So now it's allowed you to spend less time on campus. Is that what you're saying?]*
>
> *Which is also one of the best parts about it. It's also easier on the weekends (Focus group 1, May 2016).*
>
> *I use my tablet for exams… During exams, because I was so lazy to go to the computer lab. I'm like, no, I've got my tablet, like, and there is a study room in our res, so I will go to the study room and just work, using my tablet (Focus group 3, November 2016).*

In contrast though, six students expressed their preference for using the computer labs. A selection of comments related to this preference are illustrated below:

> *With studying, like for exams, things like MAM [Mathematics course] which run the Excel things, I would go to the labs yes (Focus group 3, November 2016).*
>
> *Mostly I used the computer lab. No, I wanted to be away from my room, because I get easily distracted (Focus group 3, November 2016).*
>
> *So, sometimes I just go to the computer lab and type everything up (Focus group 1, May 2016).*

Students found the device particularly useful during the period when the University of Cape Town as closed, during September and October 2016, due to protest action. It allowed students to continue with their work off campus, albeit limited as reported by this student:

> *And it was hard for me, because all the labs at upper campus they were closed, all of them, they were closed, and then I'm staying at Fuller, there are no like computer labs inside the res, so it would be difficult for me to access lecture slides (Focus group 3, November 2016).*
>
> *And it will be difficult for me because I had an assignment during the shutdown. If there was no tablet then…(Focus group 2, May 2016).*

Although students had access to tablets, some still preferred using the computer labs to type up their assignments, save their information to the local F Drive or on cloud-based storage and to print assignments. A typical response was as follow:

> *Well, the thing is, I can't really, like, do my essays and stuff on it because I have to like email it to myself and then go print. It's a process. So, I would rather just go to the Beattie Labs or whatever (Focus group 2, May 2016).*

A few students reported negative sentiment toward online blended learning when probed about blended learning in the final focus group session, as reported by these students:

> *Blended learning doesn't work (Focus group 3, November 2016).*

> *Because I believe like face to face teaching, like when the lecturers are speaking I'm like, okay, stop there, I don't understand that, that, and that, but now it's difficult because we are not like interacting, so like, it's difficult for me…(Focus group 3, November 2016).*

Fit for Purpose

The main findings related to functionality and fit for purpose are displayed in Figure 17 below.

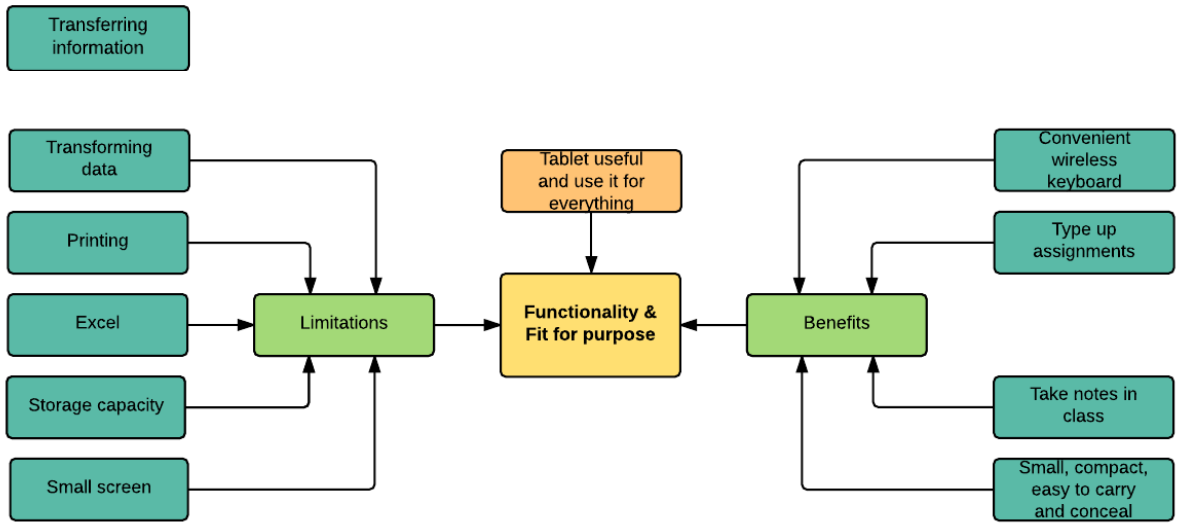


Figure 17: Graphic representation of main themes related to functionality and adequacy captured from focus groups held in May and November 2016

Some students indicated that they found the tablet useful and that they used it for most academic activities. The benefits derived from using the device, included the convenience of typing up assignments and reading course material. In addition, some students were pleased with the convenience of the wireless keyboard and found the tablet to be small, compact, easy to carry and to conceal and were quoted as saying the following:

[Keyboard. Is it working?]

Yes, it is actually. It's more effective, a lot more convenient (Focus group 2, May 2016).

So yes I think the best part about it is the wireless keyboard (Focus group 1, May 2016).

It's light to carry around, so like if you have text books on the tab, then that saves you (Focus group 2, May 2016).

But a laptop is heavy. Because the small ones are expensive. So, like now that I have a tab I don't need a laptop (Focus group 2, May 2016).

However, five students reported challenges in transferring data to and from the device. Because the device has a micro Secure Digital (SD) slot, students were unable to transfer information from one device to another using a standard USB flash drive, especially for printing assignments on campus.

No, like I use a cable like from computer to my tab to [inaudible] so that's my main problem when I want to maybe, I did something on campus and I want to work on it on my tablet, I have to go to someone who has a laptop so that I can transfer the stuff from (Focus group 1, May 2016).

Students furthermore reported small screen size and inability to use Microsoft Excel on the tablet as inhibiting their ability to complete certain tutorials. Students would use the computer labs to complete these tutorials as quoted previously. Limited storage space on the device was also quoted as hindering. Below are some of the student's responses:

I remember I actually ran out of space on my tab also because of… Then I had to delete all my first semester courses I don't do anymore, so, yes, space is a problem after a while (Focus group 3, November 2016).

I don't know because I feel like the computer's much better for academic research because a tab… The thing is, with the tab, I prefer it because it's easier for reading, but not like for researching things online, because like you have more access with a computer, like in my opinion. So that's why I prefer a computer for academics (Focus group 2, May 2016).

The final section in the results chapter will report the data obtained from Vula, UCT's learning management system and is presented next.

Vula Session Data obtained

Vula session data obtained were analysed in relation to evaluation variables such as mobility of learning and access to information. Accessing real data on user patterns from Vula, with the view to compare these results with that obtained from online questionnaire and focus groups results, aided in strengthening the evaluation. Actual Vula session data were collected from the cohort of 70 students enrolled in the PMD Programme, for the period 20 February to 25 August 2016. This data was coded by the Operations Manager at Vula, by using the IP address of each session, to identify which device PMD students used to log into Vula. Vula session was also analysed to assess where and when the PMD students logged into Vula. It should be noted that it was not within the scope and time frame of this Master's study to examine the content students were accessing on Vula. The data indicated that the majority of students enrolled in the PMD Programme, used a mobile phone, laptop or a desktop to access information on Vula, as indicated in Figure 18.

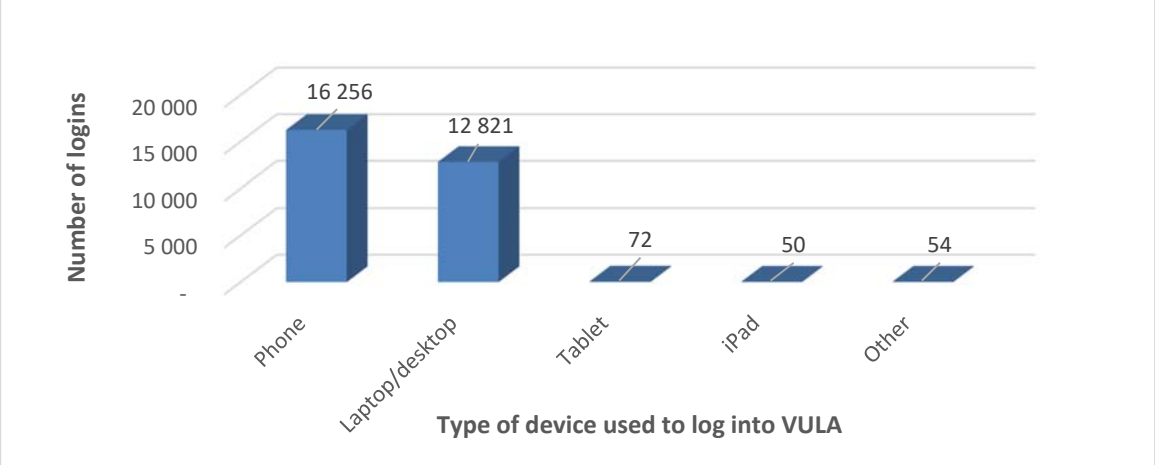


Figure 18: Number of times PMD students logged into Vula using various devices since receiving their tablet in February 2016 to August 2016 (*N* = 70).

Only three students, out of a cohort of 70 students, used an android tablet to access Vula. The data relating the tablet users, were further analysed to assess *where* and *when* students were using their device. The data indicated that these students accessed Vula more frequently while on campus, using the wireless network, at times ranging from 04:49 AM to 11:41 PM, as indicated in Figure 19.

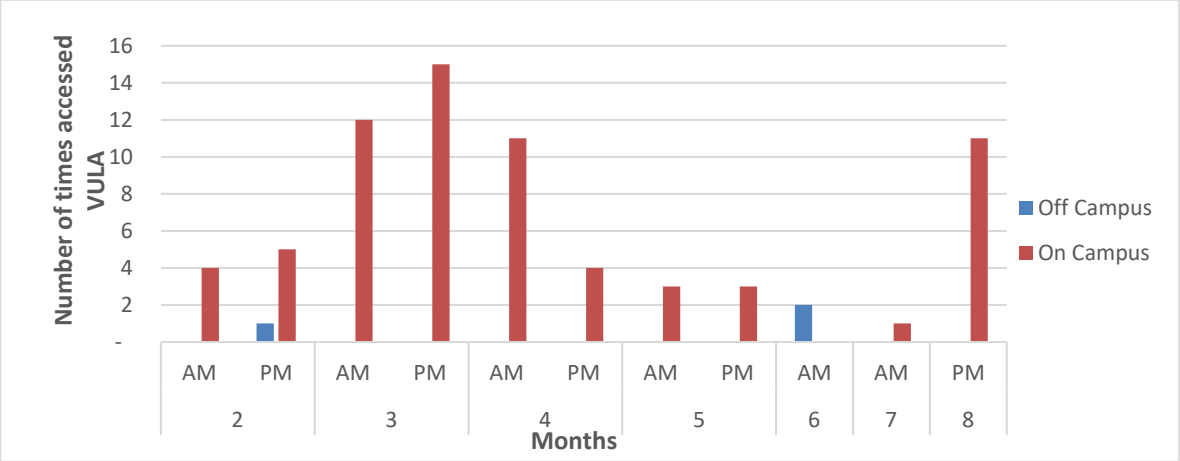


Figure 19: Number of times students logged into VULA on or off campus over a six month period (*N* = 3).

Vula data was further analysed to assess the *frequency* of accessing the Vula site. The data indicated that one student accessed Vula, more than once a week using a tablet, during February, March and April 2016 and less frequently in subsequent months. Two students accessed Vula using a tablet, while on campus, at least twice a month over the six month period.

In summary, results presented in this chapter, specifically data from the online questionnaire and focus group responses, indicate students' positive perceptions toward using the tablet for their studies, as well as highlighting some areas that can be improved upon. Limited Vula login data was also presented in this chapter.

In the following chapter, the results will be discussed in an attempt to answer the two evaluation questions posed, namely, to what extent does the UCT PMD Programme improve flexible learning of first-year extended degree programme students and to what extent is the provision of low cost tablets good enough for achieving flexible learning?

Chapter 5: Discussion

Reflecting on the results obtained from this study, an attempt is made to synthesise the information and address the questions set out at the start of evaluation. The discussion chapter is divided into four sections. The first section discusses the quality of the data collection instrument and properties of the scales, in terms of its reliability and consistency for use in this evaluation. The second section discusses the extent to which the short- and medium-term outcomes of the UCT PMD Programme were achieved. The third section answers the first evaluation question, namely, to what extent does the UCT PMD Programme improve flexible learning of first year extended degree programme students? This section also discusses the findings with respect to the hypotheses proposed in the evaluation, i.e., to what extent does digital literacy and access to information contribute toward improving flexible learning. The last section, answers the second evaluation question, namely, to what extent is the provision of low cost tablets good enough for achieving flexible learning?

Properties of the Scales

Before embarking on answering the evaluation questions, we need to spend some time reflecting on the quality of the data collection instrument used, and to assess and potentially improve upon the reliability of the variables derived from these scales. Given the Cronbach's alpha values were high to moderate, I am confident that scales used for the evaluation were reliable. Cronbach's alpha is a measure of internal consistency and measures how closely items within a scale are related and thus indicate a reliable relationship exists between items (Pallant, 2011). Mobile technology knowledge, communication, information sharing and collaboration scales, obtained a high degree of reliability to measure the constructs and are therefore deemed to be appropriate for use in this evaluation. Scales that obtained moderate alpha values (mobility of learning and access to information) were still regarded appropriate for this evaluation. As these scales were developed for this evaluation, it was expected that the Cronbach's alpha values could be lower than the optimal values proposed by Nunnally (1978).

Discussion of Short-term and Medium-term Outcomes of PMD Programme

As a precursor to answering the two evaluation questions (p. 30), we need to reflect on the extent to which the short-term and medium-term outcomes for the UCT PMD Programme were achieved. Based on the programme's logic model illustrated on page 16, success would result in students expressing a greater sense of mobile technology knowledge, improved portability of information, greater mobility of learning, greater communication with peers, improved information sharing and collaboration after receiving the tablet. Thereafter, students' perceptions of digital literacy skills are expected to improve, as well as improved access to information, then culminating with student experiences of greater flexibility of learning.

Discussion of Short-term Outcomes of the UCT PMD Programme

This section discusses the extent to which the short-term outcomes presented in the logic model (p. 16) have been achieved in this evaluation.

Students perceive improvement in mobile technology knowledge through provision of the tablet and subsequent training

The results from both the online questionnaire and focus group interviews show that the provision of the tablet and training offered by the UCT PMD Programme was perceived to be effective in facilitating greater mobile technology knowledge for students in the programme. The majority of students reported that the training at the start of the programme was helpful. This result is consistent with research that shows how providing training and technology-mediated tasks to encourage practice, play an important role in enhancing students' ICT skills and encouraging use behaviour (Brown & Pallitt, 2015; Meurant, 2010 and Tagoe, 2012; Moran et al., 2010).

In comparison to the start of the year, most students perceived increased mobile technology knowledge and increased confidence in using their device to access Vula, using and/or downloading appropriate applications and finding information to assist with their studies. Thus, this evaluation research found that through ownership, access and practice in using the tablet, students gained greater confidence, familiarity and proficiency over time, which is consistent with similar studies conducted by Traxler (2010) and Drennan et al. (2005).

The results of this evaluation research mirror many of the results of other studies in this field (Chatterton & Rebbeck, 2015; Drennan et al., 2005, Lowther, Ross & Morrison, 2003; Schaumburg, 2001). This evaluation result is specifically aligned with the results generated in studies by Drennan et al. (2005) and Chatterton and Rebbeck (2015), who demonstrate that improved ICT skills go hand in hand with effective flexible learning and are essential skills students require when entering the workplace. The world over these technology skills are becoming increasingly important for improving the quality of graduates and could improve students' employability (DHET, 2013a; Chatterton & Rebbeck, 2015). Through participation in the UCT PMD Programme students increased mobile technology knowledge will assist them in preparing for their future workplaces and is hence contributing toward developing valuable graduate attributes.

Use of the tablet enhances most short-term outcomes (portability, mobility, communication and collaboration)

A review of the results obtained from primary and secondary data, indicate that all the short-term outcomes of the UCT PMD Programme were achieved, with the exception of information sharing.

Increased portability of information for students in the programme was facilitated through the small, compact design of the device and allowed students to carry their information easily from one place to another, without needing to be connected to the internet. These results indicate that the majority of students used the tablet for academic purposes on a daily basis (82%), but only brought the device to campus half the time (56%). Students stored course information, readings and e-books on their device and easily transported their information with them. This reduced students' need to transport hard copies of text books and notes around on campus. Owing to the portable nature of the tablet, the device has therefore afforded students the convenience to develop content, physically own the content produced and carry it with them, which is consistent with the results from similar studies conducted by Hashemi et al. (2011), Rossing et al. (2012) and Kukulska-Hulme & Traxler (2007).

In addition to being portable, the tablet offered students mobility and the possibility of staying connected across different learning contexts when on campus or at residence. Students were more confident in using their device inside and outside of the classroom and could research concepts and access resources for learning purposes anywhere, anytime. Focus group narratives indicate that students used the device equally on and off campus for different purposes. On campus students would use the device in class and access information, while at home, the device would be used to complete tasks and studying for exams. Thus, this evaluation result purports that the portable nature of the tablet supports student learning anywhere and anytime as students can research concepts and complete tasks on their tablet whether on campus or off campus.

Mobility of learning, is regarded as a key aspect of offering students flexibility in their learning approach and is one of three components embedded in mobile learning, the other components representing mobility of technology and mobility of learner (El-Hussein & Cronje, 2010). Accordingly, mobility of learning offers students all the advantages associated with mobile learning, including facilitating student learning regardless of time and location and is supported by evidence found this evaluation and that of other studies conducted in this field (Hashemi et al., 2014; El-Hussein & Cronje, 2010; Kukulska-Hulme & Traxler, 2007).

Interpretation of the results from the questionnaire and focus groups show an improvement in communication between students and lecturers as well as partial improvement in collaboration between peers. Students agreed that using their tablet had a favourable impact on their ability to communicate with classmates, lecturers and tutors and facilitating collaboration with peers. While feedback from focus groups indicate that students corresponded with tutors via email, but made little use of online collaborative tools such as “chat rooms” on Vula and other online forums, there was a general feeling of support for improved communication and collaboration. This evaluation finding related to increased communication and collaboration, is consistent with the findings from previous research conducted using tablets and mobile technologies to promote communication and collaboration (Al-Emran et al., 2016; Gikas & Grant, 2013; Rossing et al., 2012; Enriquez, 2010; Shuler et al., 2010; Tront, 2007). Al-Emran et al. (2016) and Gikas and Grant’s (2013) study found that students perceived mobile devices and mobile technologies as key to promoting

communication with peers and lectures and facilitating learning in formal and informal learning environments. Collaboration mediated by mobile devices enhances engagement levels of students, promotes student-centred learning and improves students' understanding of concepts as found in studies by Rossing et al. (2012) and Zapatero et al. (2012).

While communication and collaboration improved, there is a caveat to the interpretation of the results, as information sharing did not improve significantly. Quantitative results indicate that information sharing facilitated by the tablet did not improve and that the occurrence of information sharing using the device was rare, based on focus group responses. Thus, improved information sharing was not achieved as a short-term outcome of the UCT PMD Programme. This result contrasts to The Beetham and Sharpe's model of student' digital literacy (JISC Report, n.d., p. 1)22, where creating and sharing content is regarded as a lower order digital literacy skill which requires proficiency before higher order skills such as communication and collaboration can be achieved (Rees & Loughlin, 2014; Sharpe & Beetham, 2010). Despite the advantages that mobile devices and mobile technology offer, the appropriate leverage thereof in transforming pedagogy is critical to fostering creativity in how students share information and develop a better understanding of coursework (Rambe & Bere, 2014; Deaton, Deaton, Ivankovic & Norris, 2013).

In this summary, the findings from this evaluation show that most of the short-term outcomes were achieved through the UCT PMD Programme. The descriptive statistics indicate variable levels of success being achieved for each outcome. Attempting to understand why some benefits of using a tablet worked better than others, one potential explanation could be related to the fact that access and ownership of a tablet, the portable nature of the device and facilitating for mobility, is a deeply individual experience (El-Hussein & Cronje, 2010). Learning in this instance is student-centred, situated and based on the student's individual needs (Kukulska-Hulme & Traxler, 2007; Wade, 1994). Perhaps the courses did not promote the need for information sharing which then influenced the extent to which the device was used for this purpose. This is not a failing of the device but rather a comment on how technology for learning was integrated into the pedagogy of the courses involved. The UCT PMD Programme brief to the course conveners was open-ended without explicit instruction on how the device should be used and for what activities.

Although, both qualitative and quantitative results indicate increased communication and collaboration, mean scores for these items were not particularly high when compared with the mean scores for mobility and portability. A possible explanation for this is that the programme did not oblige students and lecturers to use or incorporate technologies in the design and delivery of their courses. Nor modify teaching approaches to actively enhance communication, collaboration and information sharing. These were not explicit programme activities. Previous research in this domain shows that to facilitate collaboration, lecturers should consciously modify traditional teaching formats to include several cooperative learning activities and make changes to spatial class arrangements to facilitate collaborative learning and improve interactions between classmates (Kukulska-Hulme & Traxler, 2007; Corlett & Sharples, 2004). In addition, when the use of communicative and collaborative tools such as Skype, Twitter, Facebook and Google Documents are actively encouraged or formally incorporated into course design there is a greater likelihood that collaborative learning will be fostered (Ng'ambi et al., 2016; Gikas & Grant, 2013; Mayisela, 2013).

Discussion of Medium-term Outcomes of the UCT PMD Programme

This section presents the extent to which the medium-term outcomes presented in the logic model (p. 16) have been achieved.

Enhanced digital literacy skills and increased access to information achieved through use of tablet

Students were afforded the opportunity to develop digital literacy competencies through the UCT PMD Programme and there is sufficient evidence from the quantitative and qualitative results suggesting improved digital literacy skills were experienced by students. Students' functional access and skills development (Sharpe & Beetham, 2010), proficiency and participation (Rees & Loughlin, 2015) were achieved in varying degrees, through using the tablet.

Interpretation of the results across the questionnaire and focus group, provide evidence to support that access to information was achieved. Students agreed that access to information was facilitated using the tablet provided, whether they were on or off campus, at lectures or at home. When students were not connected to the internet, they were still able to access information stored on the device such as readings, lecture slides and past exam

papers. When students were connected, be it at any location, they had instant access to new information (example, course material on Vula or searches done on Google) as well access to information stored online (Google Drive). Thus, students perceived better access to all forms of information, facilitated by the tablet. The results of this evaluation are comparable to results from other similar studies (Gikas & Grant, 2013; Wu et al., 2012; Al-Emran et al., 2012; Gaskell, 2010; Kukulska-Hulme & Traxler, 2007). Gikas and Grant (2013, p. 21) stated that "one advantage mobile computing devices afforded students in their learning was the ability to access information quickly" and this resonated well with students in the UCT PMD Programme.

The Vula session results did not corroborate the results from the quantitative and qualitative data analysis. The Vula results showed three out of 70 students accessing Vula using a tablet. This is a curious finding given the positive perceptions and reports of usage articulated across the other data sources. Vula data obtained indicated that 56% of the time, students used a mobile phone to log into Vula. This could be attributed to the fact that mobile phones are regarded as 'always connected' thus making it easier for students to view, but not process information obtained from Vula. The Vula data suggest that students may have preferred using multiple devices to access information for their course.

The apparent contradiction across the results should be read with some caution given that the evaluator received the Vula data already coded with no mechanism to check the quality of the data. The evaluator had limited access to the Vula session data and had to rely on what was received from the system's staff. The contradiction signals a potential area for further research. Vula session data is a valuable resource for further studies but requires improved methods for extracting, processing, interrogating and interpreting big data to enhance research rigor, reliability and validity of using this data. The limited access to Vula data obtained, does present a limitation to this evaluation study.

Discussion of the First Evaluation Question:

To what extent does the UCT PMD Programme improve flexible learning of first-year extended degree programme students?

After discussing the short-term and medium-term outcomes of the UCT PMD Programme, the next discussion section ascertains whether flexibility of learning was achieved as the long-term outcome and ultimately answer the first evaluation question.

Flexibility of learning

There is a fair amount of evidence presented in the results from the online questionnaire and focus group data to corroborate that the students experienced flexibility of learning using their tablets. Students were more actively involved in courses that required use of the tablet and believed that the device made it easier to locate, capture and use information during lectures and tutorials. This result mirrors that of results from past studies in this domain such as those conducted by Gikas and Grant (2013), Al-Emran et al. (2012), Shuler et al. (2010) and Cobcroft, Towers, Smith and Bruns (2006) which report that through using mobile devices, students are able to engage better with course content, facilitated by cooperative learning and be active participants inside and outside of a classroom setting.

This evaluation revealed that digital literacy and access to information had a significant influence over flexibility of learning. This highlights the importance of training and support for developing students' computer and digital literacy skills as a precursor to achieving flexible learning. This result is in line with results of the study conducted Drennan et al. (2005, p. 338) which found that it was important to "develop student's skills where necessary because these skills influence perceived ease of use and usefulness of flexible learning". To this end studies conducted Rossing et al. (2012) and Corlett and Sharples (2004) highlight the importance of developing students' digital skills and increased access to information aided by PMDs, as these are important factors influencing flexible learning.

The provision of low cost tablets afforded students the opportunity to choose how, where and when to learn, suited to their needs and thus the UCT PMD Programme achieved its aim of enhancing flexibility of learning as defined by Wade (1994). This sentiment was backed up by feedback from focus groups where students confirmed the usefulness of the

device in accessing information and reducing dependency of computer labs on campus. The tablet provided students with the opportunity to continue learning in a range of spaces, especially during the shutdown period in October 2016. The evaluation found that students used a combination of paper and pen and their tablet for learning tasks, inside the classroom, depending on their comfort and confidence in using the device. This observation was similar to a study conducted by Castillo-Manzano, Castro-Nuño, López-Valpuesta, Sanz-Díaz and Yñiguez (2016) and Chao and Chen (2009). Thus, by providing students with tablets, providing training and encouraging the use of the device, inside and outside of the classroom environment, students were able to learn in a flexible manner and thus the objective of the UCT PMD Programme was achieved.

As students' choice of when and where to research concepts and access resources widens, the students' reliance on using computer labs on campus or at residence diminished and was an additional benefit for students to continue learning during the shutdown of UCT during October 2016. Overall, students recognised the change in their learning mobility and flexibility of learning.

Supporting factors for creating an enabling environment for flexible learning

Training remains an important element in developing technology skills. Although students reported an increase in some aspects of mobile technology knowledge, not all aspects of mobile technology literacy improved as two students who participated in focus groups reported some difficulty in getting their device to connect to a mobile network after inserting a SIM card. In the recent 2015 EDUCAUSE Centre for Analysis and Research (ECAR) Study, most students agreed that being better skilled at using their tablet would effectively assist them with their studies (Dahlstrom et al., 2015). Moreover, in a South African context, students enter university with varied levels of technological skills, some with little or no previous exposure to computers, mobile devices and associated technologies, and this issue needs to be foregrounded (Brown & Czerniewics, 2010; Thinyane, 2010) Providing training remains an important activity for the UCT PMD Programme in offering students continued support in enhancing mobile technology knowledge. The role ICT and support staff, university ICTS training centres, tech buddies, sufficiently trained lectures and tutors, will continue to play an important role in improving student's mobile technology knowledge.

Students' digital literacies can be further improved through incorporating authentic activities into course design that offer student's the opportunity to develop and reinforce digital practices and promote the use of mobile technologies to enhance flexible learning further (JISC, n.d.).

Constraining factors for creating an enabling environment for flexible learning

In a South African context, the uptake of benefits afforded by portability of the device is diminished as travelling with the device on public transport poses a real-life threat for theft and safety. According to focus group results of the evaluation study, 50% of students brought the device to campus daily with the other half bringing their device to campus a few times per week. These students commented on their reluctance to bring their device to campus due to safety concerns, although the device was easy to conceal in their backpack. In addition, students living on residence preferred using their device at residence, as they had internet access and thus did not need to download notes on campus from the university's LMS, Vula. To some extent, the same appeared to be true for a few students in the study, in that they were willing to take the risk to bring the device to campus despite safety concerns.

A notable constraint for introducing more flexible learning approaches, are students' resistance or reluctance to adapt to different teaching approaches. During focus group sessions, students reported negative sentiment toward blended learning approaches. A possible reason for this, could be that students may not understand what blended learning means. Students may be accustomed to rote learning. The introduction of student-centred learning approaches and encouraging self-directed learning to create flexible learning environments, may prove challenging to students who are expecting to be spoon-fed (Ziguras, 2001). Added to this, is that flexible approaches are more readily accepted by more senior year students as opposed to first year students and can be viewed as a constraining factor for introducing flexible learning approaches mediated by educational technologies. (Ziguras, 2001). Older students are more matured, independent and have stronger self-regulating capabilities (Tamim et al., 2015).

Internet access at home moderates the relationship between digital literacy skills and flexibility of learning

The results from this evaluation indicated that Hypothesis 4: Internet access at home moderates the relationship between digital literacy and flexibility of learning was supported. This is an important consideration for programme staff in that internet access at home will influence the degree to which the programme is able to achieve its outcome of improving students' digital literacy skills. This finding is consistent with the research conducted by Mayisela (2013), Brown (2012) and El-Hussein and Cronje (2010). The lack of internet access at one's domicile could limit the ability to develop and strengthen digital literacy skills, to obtain support in strengthening these skills through social networks and consequently affect student's ability to learn in a flexible learning environment (Mayisela, 2013; Brown, 2012; El Hussein & Cronje, 2010, Owston (1997). Furthermore, in the study conducted by Brown and Czerniewics (2010), students believed that they were disadvantaged by not having access to internet at home compared to their peers who lived on campus (residence).

In summary, students perceived in increase in their flexibility to learn using the tablet. Students reported positive perceptions toward increased access to information and improved digital literacy skills using the tablet. Students noted improvements in mobile technology knowledge, mobility of learning, communication and collaboration facilitated by the device. No improvement in information sharing was observed by students.

Discussion of the Second Evaluation Question:

To what extent is the provision of low cost tablets good enough for achieving flexible learning?

Given that the answer to the above evaluation question was a resounding yes, one is inclined to say that the low cost tablet was good enough. Upon review of quantitative and qualitative data, students reported that the device offered sufficient functionality to download, store and read course material, research concepts and type up and submit assignments. Students also reported a high positive perception toward the helpfulness of the device for their studies and perceived the device to be good enough for intended purposes. The benefit of having a device that was small, compact, portable, was easy to carry and

conceal if required, was also highlighted. Another highlight, was the introduction of a keypad to accompany the tablet for this year's cohort. Students were grateful for the provision of the keypad as it assisted with typing up assignments. These responses from students were similar to those found in previous studies (Gikas & Grant, 2013; van Oostveen et al., 2011; However, some data from the online questionnaire and focus groups, show that the affordances offered by the tablet and associated technologies were not fully capitalised on by students.

When students were probed about which device they would prefer to use for their studies, majority (73%) of students indicated their preference toward a laptop. This result highlighted certain limitations students experienced when using the tablet. These include slow processing speed, small screen of tablet, low on-board storage capacity and no USB connection functionality and similar limitations were also found in a study conducted by Corlett and Sharples (2004). PMD students also experienced limited application usage, such as the inability to use the full functionality of Microsoft Excel in order to complete tutorials. Students would need to use the computers in the computer labs and thus experienced limited flexibility in their learning approach. Although students welcomed the introduction of the wireless keyboard, which was not provided to students in the previous year, some students still experienced trouble connecting the Bluetooth keyboard to the tablet and experienced slow response times. Students indicated that they preferred a keyboard that was attached to the tablet, as opposed to a wireless device. This result compares to a study conducted by Ozok et al. (2008) that found students preferred using a laptop for their everyday computing needs as it had a keyboard attached. Although the tablet offered greater mobility, it came at the compromise of functionality. Student responses from focus groups, attributed some drawback of the tablet to limited storage capacity and difficulty in transferring information to and from the tablet and thus highlights an area that could possibly be improved upon.

It may not be fair to conduct a direct comparison between a laptop and tablet, as each has merit and strength in their own right. Laptops may have bigger screens, more storage and faster processing power as well as portability traits, whereas low cost tablets may have smaller screens and slower operating speeds, but afford students greater mobility and portability. Indeed, rapid changes in the technology will most certainly experience advances in the functionality, performance, portability, mobility and lower cost of both devices

converge to form 2-in-1 notebooks, a perfect blend of laptop and tablet functionality, that would be more accessible to all.

Overall, students found the basic computing capabilities, portability and mobility of the low cost tablet good enough for their studies, and thus answers the second evaluation question with a definite yes. As mobile devices become more ubiquitous and inexpensive, more opportunities to improve functionality and performance of the device will become available to enable students to derive much greater value in terms of promoting flexible learning, while still keeping the capital investment low.

Conclusion

This evaluation concludes that the UCT PMD Programme plays a crucial role in providing students with access to affordable mobile technologies in the form of low cost tablets and has demonstrated enhancement of students' ability to learn in a flexible manner. The UCT PMD Programme facilitated improvement in students' mobile technology knowledge, mobility of learning and portability of information immensely. Improved communication and collaboration between peers and lecturers were noted although through active changes in course design, could enhance this further. Information sharing was not enhanced through the use of the device and requires further research into why this occurred. Students' digital literacy skills increased through using the device, although moderated by internet access at home for those students not living at residence. Access to information improved immensely and was not constrained by internet access. Overall, through the use of the tablet, improvement in students' flexibility of learning had been achieved.

The changing landscape of higher education in South Africa, seen through student activism for free decolonised higher education for all and student movements such #RhodesMustFall and #FeesMustFall movements (2015, 2016) highlights the importance and perhaps urgency of higher education institutions to move toward flexible teaching and learning approaches. Furthermore, the implementation of the new University Capacity Development Programme (DHET, 2017) and UCT's Online Education Framework (University of Cape Town, 2016) further highlight the drive to integrate flexible learning environments in higher education toward "transforming teaching, learning, researching and leading towards enhanced quality, success and equity in universities" (DHET, 2017). With the seemingly limitless educational possibilities afforded through mobile and wireless technologies, a higher reliance on low cost, mobile, flexible and ubiquitous technology should be foregrounded. Thus, with further refinement of the UCT PMD Programme resources and activities, the programme could be perfectly positioned to address the current challenges facing higher education institution.

Contributions of the Present Study

This study contributes to flexibility of learning literature by showing that using low cost tablets, improved digital literacy skills and increased access to information and consequently improved first year university student's ability to learn in a flexible manner, at a South African university. Taking cognisance of the South African context, the study provides unique insights into some of the challenges facing first year students such as crime, poverty, technological and literacy challenges and barriers to access and how some of these challenges can be overcome through the provision and use of low cost tablets.

As this evaluation formed part of a larger, collaborative study with five universities within South Africa, the findings reported in this evaluation can be shared with other universities to guide practices and assist other universities with further research specific to their institution.

It is hoped that the evaluation will contribute toward informing policy at an institutional level and national level for the development of a flexible learning framework and provide some support for implementation of the University Capacity Development Programme at UCT (DHET, 2017). As stated by Ashwin, Boud, Coate, Hallett, Keane, Krause and McArthur (2015, p.61), 'Policies should be designed to create effective and equitable learning environments for all students to benefit socially and economically" and it is hoped that the findings from this evaluation will assist in facilitating design along these lines.

Recommendations

This evaluation has highlighted several directions for future research, for both the UCT PMD Programme and for further research studies.

Recommendations for the UCT PMD Programme

A recommendation would be to develop and implement a monitoring plan to monitor student perceptions on a regular basis. An example could take the form of administering regular student polls throughout the course or periodically requesting students to complete short online surveys.

The role of training and support for students form an important part of the UCT PMD Programme and it is suggested that training be actively and periodically incorporated into the programme, to enhance students' technological skills further. While students may be proficient in specific aspects of mobile technology such as downloading course information, students do not always possess knowledge about other technologies that could enhance different forms of learning such as collaborative learning. Training related to using collaborative learning tools, information sharing tools and creating content and may prove valuable in creating awareness to different learning approaches. In addition, further support for PMD students could be facilitated through re-visiting the active use of Tech Buddies which was conceptualise by programme staff.

Training and support for lecturers has been reported to encourage more lecturers to adopt and incorporated mobile technologies within their courses (Tront, 2007). Creating a greater awareness of available educational technologies and perhaps incentivising use of these technologies can perhaps foster greater uptake by lecturers. The use of innovative software such as that used by Tront (2007), allows lecturers to deliver dynamic presentations and increase student activity. Lecturers can pose questions and students respond using their tablet. The lecturer then selects and displays a solution anonymously and in this way, accommodates for different student personalities (shy vs. outspoken).

Being mindful that flexible learning spaces will vary according to contexts, disciplines and subject choices, there are opportunities to take advantage of the mobile technologies and incorporate them into teaching and learning activities. The work done by Kukulska-Hulme and Traxler (2007), provides an important resource in 1) designing for learning, by harnessing the strengths of mobile technologies (e.g. social media networks), 2) design aspects of learning such as content and activities for foster stronger engagement, communication and participation and 3) spatial layout of classrooms to facilitate interactive sessions, collaboration and information sharing between peers and educators. Lecturers using PMDs in classes must be committed to using the devices effectively inside and outside the classroom to facilitate flexible learning.

Opportunity exists to address some of the limitations of tablet use reported by students to improve the programme for the following cohort. Students commented on

limited storage capacity, small screen size and inability to easily transfer information to and from the tablet to other devices. With the rapid advancement in technology, tablets may become less expensive with improved functionality, such as 2-in-1 devices or notebooks. It is proposed that new products on the market be investigated on an annual basis. Current 2-in-1 tablet/notebooks offer larger screen size (11' or 13'), increased storage capacity as well as standard USB ports and a fixed keyboard. Advances in these types of devices will undoubtedly change in the immediate future. Alternatively, increased memory capacity could be facilitated through providing students with microSD cards. Furthermore, through providing students with a USB Drive that has a Micro USB on one end and standard USB on the other end, while still allowing storage of information on the USB drive (16GB or 32GB), could also provide an alternative to addressing some of the limitations. The above device specific recommendations are proposed with the view of providing students with at least three to four years of use for the duration of their studies.

In terms of data collection, analysing students' and educators' perspectives using blogs and online polls could be used to provide easy to acquire, rich data for further analysis. In addition, opportunity exists in using Vula data more efficiently in future research studies. Through data mining, a wealth of knowledge may exist in actual Vula activity, such as frequency of logins and pages viewed by students on the Vula site.

Recommendations for future research

Students' perceptions and attitudes toward flexible learning (including m-learning, blended learning, online learning, etc.) need to be investigated before implementing new, innovative teaching and learning approaches. Student narratives from focus groups portrayed negative perceptions toward blended learning. This could be as a result of self-directed study and student autonomy not prioritised in schooling in South Africa, but rather traditional approaches used that are structured and teacher-directed and are often referred to as rote learning. Further research is therefore important to validate the integration and acceptance of mobile technologies among students, especially first years, to facilitate successful integration of mobile technologies within curricula at higher education institutions in South Africa.

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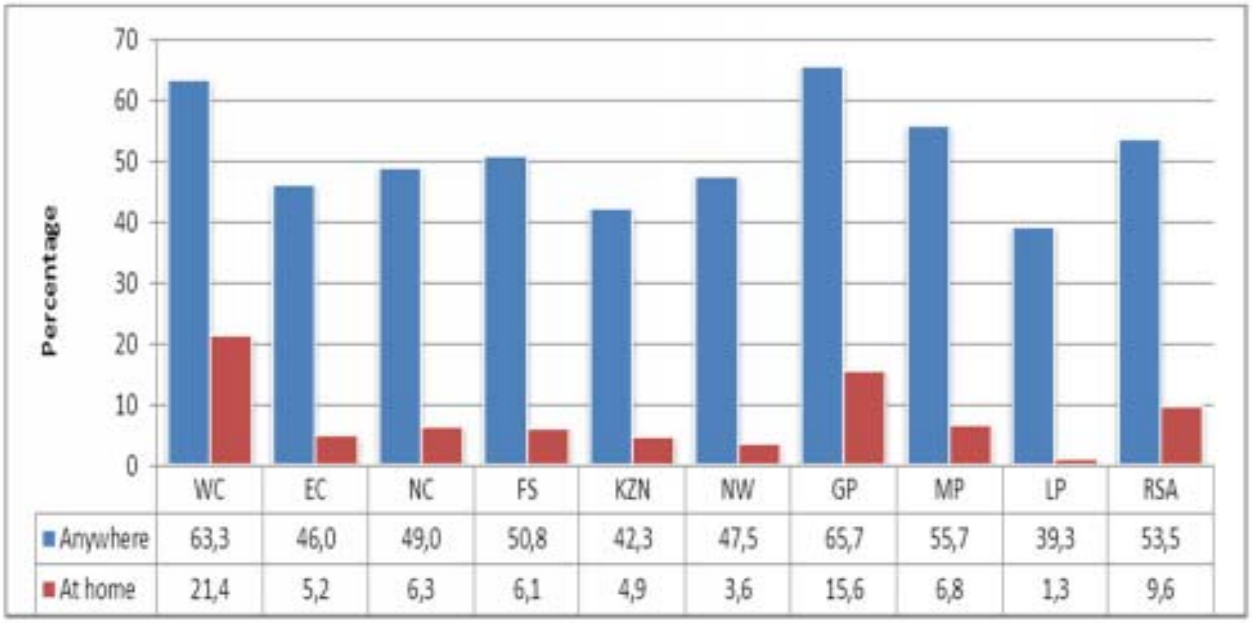
Appendix A

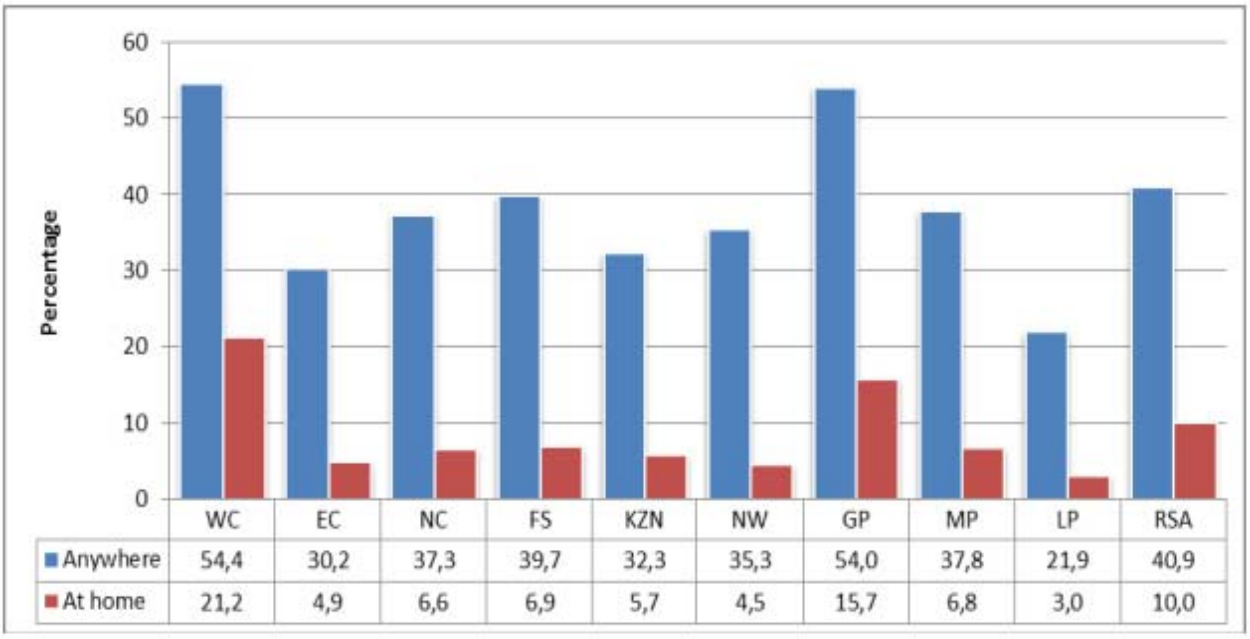
South African General Household Survey information for 2015 & 2013

Table 1: 2015 - Percentage of households with access to the internet at home, or for which at least one member has access to or used the internet by province (Source: Statistics South Africa General Household Survey 2015).



	WC	EC	NC	FS	KZN	NW	GP	MP	LP	RSA
Anywhere	63,3	46,0	49,0	50,8	42,3	47,5	65,7	55,7	39,3	53,5
At home	21,4	5,2	6,3	6,1	4,9	3,6	15,6	6,8	1,3	9,6

Table 2: 2013 - Percentage of households with access to the internet at home, or for which at least one member has access to or used the internet by province (Source: Statistics South Africa General Household Survey 2013)



	WC	EC	NC	FS	KZN	NW	GP	MP	LP	RSA
Anywhere	54,4	30,2	37,3	39,7	32,3	35,3	54,0	37,8	21,9	40,9
At home	21,2	4,9	6,6	6,9	5,7	4,5	15,7	6,8	3,0	10,0

Table 3: 2015 – Households' access to internet by place of access, geotype and province (Source: Statistics South Africa General Household Survey 2015)

Place Internets accessed	Geotype	Province (per cent)									
		WC	EC	NC	FS	KZN	NW	GP	MP	LP	RSA
At home	Metro	25,2	10,8	NA	10,1	8,2	NA	16,4	NA	NA	16,0
	Urban	14,4	4,9	7,0	4,5	6,0	6,5	10,6	7,9	3,7	7,5
	Rural	12,0	1,2	4,5	4,1	1,1	0,9	10,2	0,0	0,5	2,1
	Total	**21,4**	**5,2**	**6,3**	**6,1**	**4,9**	**3,6**	**15,6**	**6,8**	**1,3**	**9,6**
At work	Metro	22,7	19,9	NA	13,9	21,7	NA	24,5	NA	NA	23,1
	Urban	13,9	12,2	11,6	9,7	20,7	12,5	14,6	15,5	15,7	14,4
	Rural	4,7	1,1	4,9	3,8	4,7	4,1	11,7	5,7	2,8	3,7
	Total	**19,1**	**9,8**	**9,7**	**10,0**	**14,7**	**8,2**	**23,1**	**9,9**	**5,8**	**15,0**
Using mobile devices	Metro	63,7	53,1	NA	56,7	36,3	NA	56,9	NA	NA	54,7
	Urban	39,4	50,3	51,6	45,2	48,8	50,6	58,7	63,1	50,5	51,1
	Rural	12,3	29,5	33,4	36,1	28,8	39,9	54,7	45,5	31,9	33,7
	Total	**53,6**	**41,9**	**46,4**	**47,1**	**36,2**	**45,1**	**57,1**	**53,2**	**36,3**	**47,6**
At Internet Cafes or education al facilities	Metro	15,5	13,6	NA	6,8	9,5	NA	16,7	NA	NA	14,9
	Urban	9,5	8,1	2,2	7,0	9,5	6,3	6,9	7,1	2,4	7,0
	Rural	0,8	1,3	2,6	6,6	4,2	5,3	1,2	5,0	0,9	3,1
	Total	**12,9**	**6,9**	**2,3**	**6,9**	**7,4**	**5,8**	**15,3**	**5,9**	**1,2**	**9,3**

Table 4: 2013 – Households' access to internet by place of access, geotype and province (Source: Statistics South Africa General Household Survey 2013).

Place Internets accessed	Geotype	Province (per cent)									
		WC	EC	NC	FS	KZN	NW	GP	MP	LP	RSA
At home	Metro	24,3	10,2	NA	NA	9,5	NA	16,3	NA	NA	16,4
	Urban	14,8	7,7	8,0	7,4	7,0	7,6	11,0	11,1	9,8	9,2
	Rural	10,6	1,2	1,8	4,3	1,0	1,7	7,7	3,3	1,7	2,0
	Total	**21,0**	**4,8**	**6,6**	**6,9**	**5,7**	**4,4**	**15,6**	**6,8**	**3,0**	**10,0**
At work	Metro	27,6	16,4	NA	NA	16,9	NA	29,5	NA	NA	26,5
	Urban	18,5	18,4	12,5	11,6	16,8	14,1	13,8	13,5	18,6	15,1
	Rural	14,6	1,6	2,0	4,5	2,9	3,8	9,4	4,5	2,2	3,2
	Total	**24,4**	**9,5**	**10,2**	**10,4**	**11,5**	**8,6**	**27,5**	**8,5**	**4,9**	**16,1**
Using mobile devices	Metro	41,3	42,3	NA	NA	28,7	NA	37,9	NA	NA	37,2
	Urban	25,6	29,9	37,2	37,7	32,9	38,0	42,1	42,5	27,7	35,3
	Rural	11,5	14,7	15,9	17,7	17,4	24,8	29,1	23,5	14,3	17,9
	Total	**35,4**	**24,4**	**32,5**	**34,3**	**25,3**	**30,9**	**38,3**	**31,9**	**16,5**	**30,8**
At Internet Cafes or educational facilities	Metro	20,1	11,0	NA	NA	8,8	NA	16,1	NA	NA	15,4
	Urban	10,9	7,5	3,8	11,6	10,8	8,8	8,5	6,5	5,2	8,8
	Rural	3,5	1,6	0,6	2,3	3,2	5,6	3,4	3,5	0,9	2,6
	Total	**16,7**	**5,1**	**3,1**	**10,0**	**7,1**	**7,1**	**15,1**	**4,8**	**1,6**	**9,6**

Appendix B

Measurement Scales

A. Training	Strongly Disagree	Disagree	Un-certain	Agree	Strongly Agree
1. The training I received at the start of the year was helpful? (i.e. training received when you received your tablet).	①	②	③	④	⑤

2. If you disagreed or strongly disagreed with the above statement, how could the training be improved?

1. Mobile technology knowledge	Strongly Disagree	Disagree	Un-certain	Agree	Strongly Agree
1. In comparison to the start of the year, my knowledge about how to use my tablet has increased.	①	②	③	④	⑤
2. In comparison to the start of the year, I feel confident using my tablet to connect to VULA.	①	②	③	④	⑤
3. In comparison to the start of the year, I feel confident using my tablet to access course material on VULA.	①	②	③	④	⑤
4. In comparison to the start of the year, feel confident downloading the appropriate applications.	①	②	③	④	⑤

2. Portability of information	Never	Few times a month	Once a month	Once a week	Daily
1. How often do you bring your tablet to campus?	①	②	③	④	⑤
2. How often do you use your tablet on campus for your studies?	①	②	③	④	⑤
3. How often do you use your tablet at home for your studies?	①	②	③	④	⑤
4. How often do you use your tablet for academic purposes?	①	②	③	④	⑤

3. Mobility of learning	Strongly Disagree	Disagree	Un-certain	Agree	Strongly Agree
1. In comparison to the start of the year, I feel confident in using my tablet during lectures and tutorials. i.e. inside the classroom	①	②	③	④	⑤
2. In comparison to the start of the year, I feel confident in using my tablet outside of the classroom venue for my studies.	①	②	③	④	⑤
3. I am able to research concepts for my studies, anywhere, using my tablet.	①	②	③	④	⑤
4. I am able to research concepts for my studies, anytime, using my tablet.	①	②	③	④	⑤

4. Communication	Strongly Disagree	Disagree	Un-certain	Agree	Strongly Agree
1. I use my tablet to send messages to lecturers.	①	②	③	④	⑤
2. I use my tablet to receive messages from lecturers.	①	②	③	④	⑤

3. I use my tablet to send messages to classmates.	①	②	③	④	⑤
4. I use my tablet from receive messages from classmates.	①	②	③	④	⑤
5. My tablet has allowed me to receive a faster response to my questions from lecturers via email.	①	②	③	④	⑤

5. Information sharing	**Never**	**Hardly Ever**	**Some-times**	**Most of the time**	**Always**
1. I use my tablet to share notes with classmates.	①	②	③	④	⑤
2. I use my tablet to take and share pictures with classmates.	①	②	③	④	⑤
3. I use my tablet to share videos with classmates.	①	②	③	④	⑤

6. Collaboration	**Strongly Disagree**	**Disagree**	**Un-certain**	**Agree**	**Strongly Agree**
1. Using my tablet, I am able to participate in online group discussion/chats.	①	②	③	④	⑤
2. My tablet has assisted me in working closer with classmates on group assignments.	①	②	③	④	⑤
3. Using my tablet, has improved my ability to collaborate with classmates.	①	②	③	④	⑤

8. Access to information	**Strongly Disagree**	**Disagree**	**Un-certain**	**Agree**	**Strongly Agree**
1. Using my tablet, I can easily access necessary information for my studies from home or residence.	①	②	③	④	⑤
2. Using my tablet, I can easily access necessary information for my studies from other places outside campus.	①	②	③	④	⑤
3. Using my tablet, I can easily access necessary information for my studies from campus.	①	②	③	④	⑤
4. Using my tablet during lectures and tutorials gives me access to more information.	①	②	③	④	⑤
5. Using my tablet during lectures allows me to quickly search for information.	①	②	③	④	⑤

9. Flexibility of learning	**Strongly Disagree**	**Disagree**	**Un-certain**	**Agree**	**Strongly Agree**
1. Since receiving my tablet, I get more actively involved in courses that require the use of a mobile device.	①	②	③	④	⑤
2. Using my tablet during lectures and tutorials allows me to more easily locate relevant materials.	①	②	③	④	⑤
3. Using my tablet during lectures and tutorials allows me to more easily use relevant materials.	①	②	③	④	⑤
4. Using my tablet during lectures and tutorials allows me to better capture all of the information presented.	①	②	③	④	⑤

10.1 Fit for purpose 1 - Overall, has your tablet helped you with your studies?

○ Yes ○ No

If yes, please rate how well your tablet has helped you with your studies.

1	2	3	4	5	6	7	8	9	10

Not helpful ⟷ Extremely helpful

10.2 Fit for purpose 2

My tablet provides me with sufficient functionality to:	**Strongly Disagree**	**Disagree**	**Un-certain**	**Agree**	**Strongly Agree**
1. Take notes in class	①	②	③	④	⑤
2. Take photographs of information presented in class	①	②	③	④	⑤
3. Conduct research for assignments	①	②	③	④	⑤
4. Type up my assignments	①	②	③	④	⑤
5. Read literature, notes, course material	①	②	③	④	⑤

10.3. Fit for purpose 3 - Do you feel the tablet you have been given, was good enough to enhance your in your studies?

○ Yes ○ No

If yes, please rate how well the tablet enhanced your studies.

1	2	3	4	5	6	7	8	9	10

Not useful ⟷ Extremely useful

Appendix C

Permission Letters

Faculty of Commerce
Private Bag X3, Rondebosch, 7701
2.26 Leslie Commerce Building, Upper Campus
Tel: +27 (0) 21 650 4375/ 5748 Fax: +27 (0) 21 650 4369
E-mail: com-faculty@uct.ac.za
Internet: www.uct.ac.za
@Commerce_UCT **UCT Commerce Faculty Office**

01 August 2016 Ref:0306201601

Ilhaam Velloo

Project title: An Outcome Evaluation of the UCT Personal Mobile Device Programme Dear

Researcher,

This letter serves to confirm that this project as described in your submitted protocol has been approved. You will need to obtain permission from the Executive Director, Department of student Affairs before commencing data collection.

Please note that if you make any substantial change in your research procedure that could affect the experiences of the participants, you must submit a revised protocol to the Committee for approval.

Regards,
Ms. Samantha Alexander
Administrative Assistant
University of Cape Town
Commerce Faculty Office
Room 2.24 | Leslie Commerce Building

UNIVERSITY OF CAPE TOWN

School of Management Studies
University of Cape Town. Private Bag.
Rondebosch 7701
Telephone: +27 21 650-5218
Fax: +27 21 689-7570
8 February 2016

TO WHOM IT MAY CONCERN

Thank you very much for your willingness to enable one of our Master's students to work with a programme from your organization. I appreciate your contribution to the education of our students.

The student will need programme information from you and we request that you or a designated person meet with them regularly to provide access to this information. Your cooperation in this regard will ensure that the student meets deadlines and provides you with a high quality evaluation. In order to keep track of the student's interactions with your organization, we request that you copy the supervisor on all correspondence to the student.

Please note that our students are required to work within the ethical framework of the Faculty of Commerce when collecting information from programme documents or programme recipients. This framework deals with anonymity of data sources, sensitivity when requesting information from people and responsible reporting of results.

We also undertake and ensure you that the student will display professional behaviour at all times while working in your organization or on your programme. At the end of the process, you will receive a useful report which will enable you to make informed decisions regarding your programme.

In order to comply with the rules of the Faculty of Commerce, we request you to sign below to indicate that the student will have access to programme data and records and where applicable, to programme recipients.

Thank you very much.

Yours sincerely
Signed by candidate

PROF J LOUW-POTGIETER
CONVENER: MPHIL PROGRAMME EVALUATION

AGREEMENT TO ACCESS PROGRAMME RECORDS AND/OR RECIPIENTS:

Signed by candidate	CILT	Feb 2016
AUTHORISED PERSON	ORGANISATION	DATE

	RESEARCH ACCESS TO STUDENTS	DSA 100

NOTES

1. This form must be **FULLY** completed by all applicants who want to access UCT students for the purpose of research or surveys.
2. Return the fully completed **(a) DSA 100** application form **by email, in the same word format,** together with **your: (b) research proposal inclusive of your survey, (c) copy of your ethics approval letter / proof (d) informed consent letter** to: Moonira.Khan@uct.ac.za. You application will be attended to by the Executive Director, Department of Student Affairs (DSA), UCT.
3. The turnaround time for a reply is **approximately 10 working days.**
4. NB: It is the responsibility of the researcher/s to apply for and to obtain **ethics approval and to comply with amendments that may be requested;** as well as **to obtain** approval to access UCT staff and/or UCT students, from the following, at UCT, respectively: (a) **Ethics**: Chairperson, Faculty Research Ethics Committee' (FREC) for ethics approval, (b) **Staff access:** Executive Director: HR for approval to access UCT staff, and (c) **Student access:** Executive Director: Student Affairs for approval to access UCT students.
5. **Note:** UCT Senate Research Protocols requires compliance to the above, **even if prior approval has been obtained from any other institution/agency. UCT's research protocol requirements applies to *all* persons, institutions and agencies from UCT and external to UCT who want to conduct research on human subjects for academic, marketing or service related reasons at UCT.**
6. **Should approval be granted to access UCT students for this research study, such approval is effective for a period of one year from the date of approval (as stated in Section D of this form), and the approval expires automatically on the last day.**
7. **The approving authority reserves the right to revoke an approval based on reasonable grounds and/or new information.**

SECTION A: RESEARCH APPLICANT/S DETAILS

Position	Staff / Student No	Title and Name	Contact Details (Email / Cell / land line)
A.1 Student Number	VLLILH01	Mrs Ilhaam Velloo	Ilhaam.velloo@uct.ac.za 021 650 5911
A.2 Academic / PASS Staff No.	01443783 01449987 01377556	Mrs Tabisa Mayisela Ms Genevieve Haupt Dr Cheryl Brown	Tabisa.mayisela@uct.ac.za 021 650 1774 Genevieve.haupt@uct.ac.za Cheryl.brown@uct.ac.za 021 650 5035
A.3 Visitor/ Researcher ID No.			
A.4 University at which a student or employee	UCT	Address if *not* UCT:	
A.5 Faculty/ Department/School	Commerce and CHED		
A.6 APPLICANTS DETAILS If different from above	Title and Name	Tel.	Email

SECTION B: RESEARCHER/S SUPERVISOR/S DETAILS

Position	Title and Name	Tel.	Email
B.1 Supervisor	Dr Suki Goodman	021 6500 2472	Suki.goodman@uct.ac.za
B.2 Co-Supervisor/s			

SECTION C: APPLICANT'S RESEARCH STUDY FIELD AND APPROVAL STATUS

C.1 Degree – if applicable	Masters
C.2 Research Project Title	An outcome evaluation of the UCT Personal Mobile Device (PMD) Programme
C.3 Research Proposal	Attached: Yes [x] No [ ]
C.4 Target population	Undergraduate students
C.5 Lead Researcher details	If different from applicant:
C6. Will use research assistant/s	Yes [ ] No [x] yes- provide a list of names, contact details and ID no.
C.7 Research Methodology and Informed consent:	**Research methodology**: Questionnaires, surveys, interviews and focus groups **Informed consent:** Yes, informed consent will be requested from each voluntary participant
C.8 Ethics clearance status from UCT's Faculty Ethics in [redacted] (EiRC)	Approved by the UCT EiRC: Yes [ ] With amendments: Yes [ ] No [ ] (a) Attach copy of your UCT ethics approval. Attached: Yes [ ] No [ ] (b) State date / Ref. No / Faculty of your UCT ethics approval: 1st August 2016 Ref.: COM 0306201601

SECTION D: APPLICANT/S APPROVAL STATUS FOR ACCESS TO STUDENTS FOR RESEARCH PURPOSE

(To be completed by the UCT - ED, DSA or Nominee)

D.1 APPROVAL STATUS	Approved / With Terms / Not (i) Approved [redacted] (ii) ~~With terms~~ (iii) ~~Not approved~~	* Conditional approval with terms (a) Access to students for this research study must only be undertaken after written ethics approval has been obtained. (b) In event any ethics conditions are attached, these must be complied with before access to students.		Applicant/s Ref. No.: VLLILH01/ Mrs Ilhaam Velloo
D.2 APPROVED BY:	Designation Executive Director Department of Student Affairs	Name *Dr Moonira Khan*	Signature Signed by candidate	Date of Approval *10 August 2016*

Appendix D

Online questionnaire cover sheet

Dear Student

My name is Ilhaam Velloo and I am a student at UCT studying towards an MPhil in Programme Evaluation. I will be conducting research related to student experiences in the Personal Mobile Device (PMD) Programme.

The PMD Programme's aim is to better understand how access to tablets has helped you with your studies.

Participation in this survey is voluntary and you may choose to withdraw from the project at any time. Whether you participate or not will not affect your marks.

This study has been approved by the Commerce Faculty's Ethics in Research Committee. The questionnaire contains 15 sets of questions. It will take approximately 15 minutes to complete. For each listed statement below, please tick the option that best represents the extent to which you agree or disagree with that statement.

If you are interested in participating in a lucky draw, please provide your contact number or email. Your details will go into a lucky draw to win one of two R500 Cavendish vouchers. Your number or email will only be used to contact you for your prize and will not be linked to your responses.

Thank you for your participation and assisting me with my study. Please contact my supervisor, Associate Professor Suki Goodman via email at suki.goodman@uct.ac.za if you have any questions regarding the research.

Informed Consent Section

Please indicate your informed consent below.

- ○ I AGREE to participate in this survey and understand that my participation is voluntary
- ○ I DO NOT AGREE to participate in this survey and understand that my participation is voluntary

Appendix E

Online questionnaire code book

Measures (Variables)	SPSS Variable Name	Coding Instructions
Participant ID	ID	No. assigned to each anonymous participant
Do u live in Res or at home?	ResHome	On Campus(Res) = 1; Off Campus (Home) = 2
Where do you connect to internet? Residence	IntRes	No = 0; Yes = 1
Where do you connect to internet? Campus	IntCam	No = 0; Yes = 1
Where do you connect to internet? Home	IntHom	No = 0; Yes = 1
Where do you connect to internet? Work	IntWor	No = 0; Yes = 1
Where do you connect to internet? Other	IntOth	No = 0; Yes = 1
Was the training helpful	Training	Strongly agree = 5; Strongly disagree = 1
Mobile technology knowledge 1-4	Knowledge1	Strongly agree = 5; Strongly disagree = 1
	Knowledge2	Strongly agree = 5; Strongly disagree = 1
	Knowledge3	Strongly agree = 5; Strongly disagree = 1
	Knowledge4	Strongly agree = 5; Strongly disagree = 1
	Knowledge5	Strongly agree = 1; Strongly disagree = 5 (reverse)
Mobility of learning 1-4	Mobile1	Strongly agree = 5; Strongly disagree = 1
	Mobile2	Strongly agree = 5; Strongly disagree = 1
	Mobile3	Strongly agree = 5; Strongly disagree = 1
	Mobile4	Strongly agree = 5; Strongly disagree = 1
Communication 1-5	Comm1	Always=5; Most of the time=4; About half the time=3; Sometimes=2; Never=1
	Comm2	Always=5; Most of the time=4; About half the time=3; Sometimes=2; Never=1
	Comm3	Always=5; Most of the time=4; About half the time=3; Sometimes=2; Never=1
	Comm4	Always=5; Most of the time=4; About half the time=3; Sometimes=2; Never=1
	Comm5	Always=5; Most of the time=4; About half the time=3; Sometimes=2; Never=1
Portability 1-4	Port1	Daily=5; Few times a week=4; Once a week=3; Once a month=2; Never=1

	Port2	Daily=5; Few times a week=4; Once a week=3; Once a month=2; Never=1
	Port3	Daily=5; Few times a week=4; Once a week=3; Once a month=2; Never=1
	Port4	Daily=5; Few times a week=4; Once a week=3; Once a month=2; Never=1
Information sharing 1-3	Info1	Always=5; Most of the time=4; About half the time=3; Sometimes=2; Never=1
	Info2	Always=5; Most of the time=4; About half the time=3; Sometimes=2; Never=1
	Info3	Always=5; Most of the time=4; About half the time=3; Sometimes=2; Never=1
Collaboration 1-3	Collab1	Strongly agree = 5; Strongly disagree = 1
	Collab2	Strongly agree = 5; Strongly disagree = 1
	Collab3	Strongly agree = 5; Strongly disagree = 1
Accessibility 1-6	Access1	Strongly agree = 5; Strongly disagree = 1
	Access2	Strongly agree = 5; Strongly disagree = 1
	Access3	Strongly agree = 5; Strongly disagree = 1
	Access4	Strongly agree = 5; Strongly disagree = 1
	Access5	Strongly agree = 5; Strongly disagree = 1
	Access6	Strongly agree = 5; Strongly disagree = 1
Flexibility of learning 1-4	FlexLearn1	Strongly agree = 5; Strongly disagree = 1
	FlexLearn2	Strongly agree = 5; Strongly disagree = 1
	FlexLearn3	Strongly agree = 5; Strongly disagree = 1
	FlexLearn4	Strongly agree = 5; Strongly disagree = 1
Fit for purpose 1-5	FitPup1	Strongly agree = 5; Strongly disagree = 1
	FitPup2	Strongly agree = 5; Strongly disagree = 1
	FitPup3	Strongly agree = 5; Strongly disagree = 1
	FitPup4	Strongly agree = 5; Strongly disagree = 1
	FitPup5	Strongly agree = 5; Strongly disagree = 1
Overall, has the tablet helped you with your studies?	Helpstud	Yes= 1; No = 2
Rate how well it helped with studies.	Helpstudrate	Extremely helpful = 10; Not helpful at all = 1
Was the tablet good enough to enhance your studies?	Goodenuf	Yes= 1; No = 2
Please rate how well the tablet enhanced your studies	Goodenuf_rate	10 = very well; 1 = not very well

Appendix F

Original focus group interview schedule

Focus Group Guide Questions

Thank you for coming today to discuss your Tablet use with me.

Just to give you some background-you were a part of a pilot study. In other words, you were a part of a trail run of how students use Personal Mobile Devices and this discussion can assist in improving our Project in the future.

---

1. ***SO BEFORE WE GET INTO DISCUSSING THE TABLET YOU RECEIVED FROM US, I WOULD LIKE TO KNOW ABOUT YOUR PREVIOUS EXPERIENCE WITH PERSONAL MOBILE DEVICES (THIS COULD INCLUDE LAPTOPS, CELL PHONES, OR OTHER TABLETS), YOURS OR BORROWED. (MAX:10MINS)***

Probe questions:

-What was your access to mobile devices before receiving your Tablet?

-How often did you use your PMD

- What types of devices did you use?
- And for what?

TABISA

---

2. **TABLET USE**

- Now I would like to know more about your use of the Tablet that you received as part of our project.

Probe questions:

-how often do you use your Tablet?

-what do you use it for?

-where do you use it, on campus or off campus?

TABISA

-other devices/other technologies

-gathering information/resources

(GEN!!!how to you gather information? For assignments or for your own interests)

-Tell me about your social media use?

TABISA-More specific questions

---

3. **ABILITY**

-When you first got your Tablet what was some of the first things you did? For example, did you put the screen guard on; did you charge your Tablet?

-Did you find it easy to use (navigate) your Tablet? Explain…

-Have you personalised your Tablet? How?

---

4. **ADVANTAGES (could collapse these two sections)**

-How has your Tablet helped you?

-With your studies?

-With your day-to-day lift?

---

5. **CHALLENGES**

-Tell me about some of the issues you had when trying to use your Tablet?

-How did you overcome these issues?

-Did you ask for assistance?

-What would have made your Tablet use easier? How could we have assisted with making things easier?

Thank you for coming today and for sharing your experiences with us. Good luck with the rest of your exams.

Appendix G

Codebook developed for coding themes from focus group data

PMD Programme Evaluation - Qualitative Data Code Book	
Variable / Theme Label	**Description**
Mobile technology knowledge	Refers to students' IT literacy. Are they comfortable using the device? Do they know how to download apps? Do they know how to connect to internet with their device? How do they learn new IT skills? What kind of support do they need?
Mobility of learning	Do they feel confident using the device during lectures and tuts? Inside the classroom. Do they feel comfortable using the device outside of a classroom environment? Are they able to research concepts anywhere and anytime? How often do they use it on or off campus?
Communication	How do students use the device to communicate with peers, lecturers and tutors? Email, WhatsApp, etc.? Communicate is different to information sharing. It's the dialogue we are interested in here. Students may ask lecturers or peers questions.
Portability of information	How often do students bring their device to campus? How often do they use their device on campus for studies? How often do they use their device at home for studies? How often do they use it for academic purposes? What are the reasons for brining or not bringing it to campus?
Information sharing	How often do students share notes, pictures, videos, books or any other information related to their studies with classmates? How often do they use the device to take and share pictures? Relates to dissemination of information.
Collaboration	How often do students work together on projects using their device? How often do they participate in online group discussions? Has the device facilitated closer collaboration with peers? Did they use skype to chat from different locations? Did they share the device during a contact group session to discuss concepts, etc.
Access to information	How has the tablet facilitated access to information for students? Was it easy to download info of Vula, research concepts online? Can they access their information (stored on the device or online) from residence, home on campus, outside of campus?
Flexibility of learning	Did the device, allow students to choose where and when they wanted to learn. Where students more actively involved in courses through using the tablet? Did it facilitate access to information during lectures and tuts and the effective use of the info during classes? Did it facilitate effective capturing information presented?
Functionality	What worked well on the tablet? What functions were students pleased with? What were the limitations of using the device?
Preference	Why do students prefer one device over another?

Appendix H

Descriptive Statistics for Online Questionnaire Responses

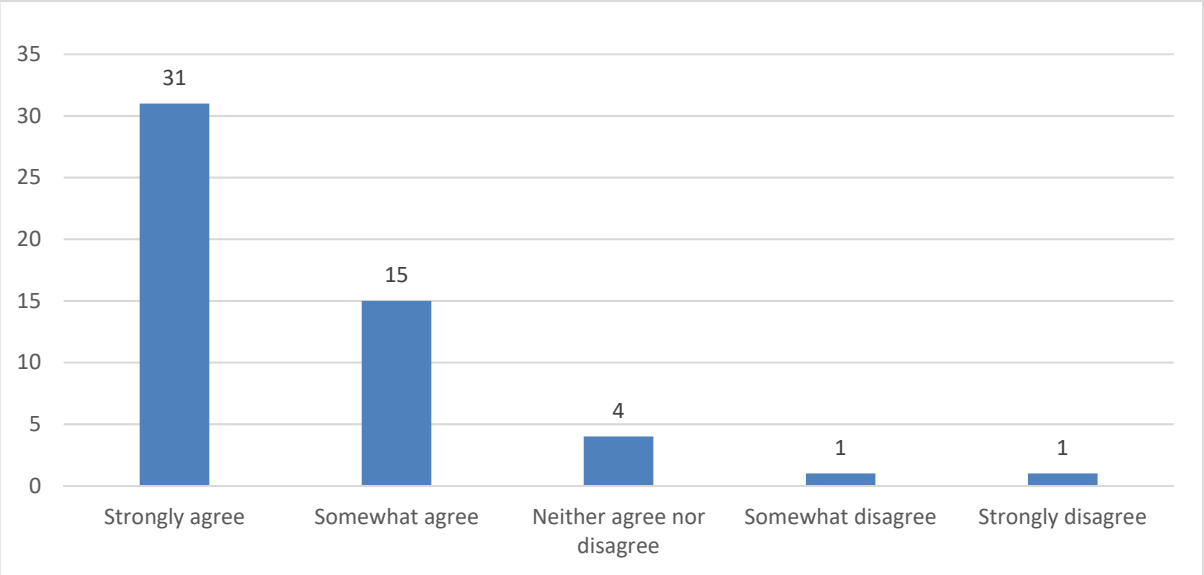


Figure 1: Student perceptions of training received in the programme

Table 1: Portability of Information - Percentage Reported Frequency of Use of Tablet (n = 52)

Frequency	Daily	Few times a week	Once a week	Once a month	Never
1. How often do you bring your tablet to campus?	56%	38%	4%	2%	0%
2. How often do you use your tablet on campus for your studies?	52%	42%	6%	0%	0%
3. How often do you use your tablet at home for your studies?	58%	31%	8%	2%	2%
4. How often do you use your tablet for academic purposes?	82%	14%	4%	0%	0%

Appendix I

Results of testing that multivariate assumptions are met

Table 1: Descriptive statistics for Independent Variables, Digital Literacy and Access to Information

	Mean	Std. Deviation	N
FlexMean	4.5153	.50365	49
DigLitMean	4.0341	.50401	49
AccessMean	4.3847	.51581	49

Table 2: Correlations for Independent Variables, Digital Literacy and Access to Information

		FlexMean	DigLitMean	AccessMean
Pearson Correlation	FlexMean	1.000	.410	.441
	DigLitMean	.410	1.000	.297
	AccessMean	.441	.297	1.000
Sig. (1-tailed)	FlexMean	.	.002	.001
	DigLitMean	.002	.	.019
	AccessMean	.001	.019	.
N	FlexMean	49	49	49
	DigLitMean	49	49	49
	AccessMean	49	49	49

Table 3: Residual statistics Independent Variables

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.9195	5.0087	4.5153	.26641	49
Std. Predicted Value	-2.236	1.852	.000	1.000	49
Standard Error of Predicted Value	.065	.191	.104	.028	49
Adjusted Predicted Value	3.8837	5.0097	4.5183	.26892	49
Residual	-1.20884	.94182	.00000	.42742	49
Std. Residual	-2.769	2.157	.000	.979	49
Stud. Residual	-2.799	2.270	-.003	1.014	49
Deleted Residual	-1.23582	1.04343	-.00299	.45884	49
Stud. Deleted Residual	-3.040	2.383	-.009	1.041	49
Mahal. Distance	.068	8.223	1.959	1.648	49
Cook's Distance	.000	.320	.025	.054	49
Centered Leverage Value	.001	.171	.041	.034	49

a. Dependent Variable: FlexMean

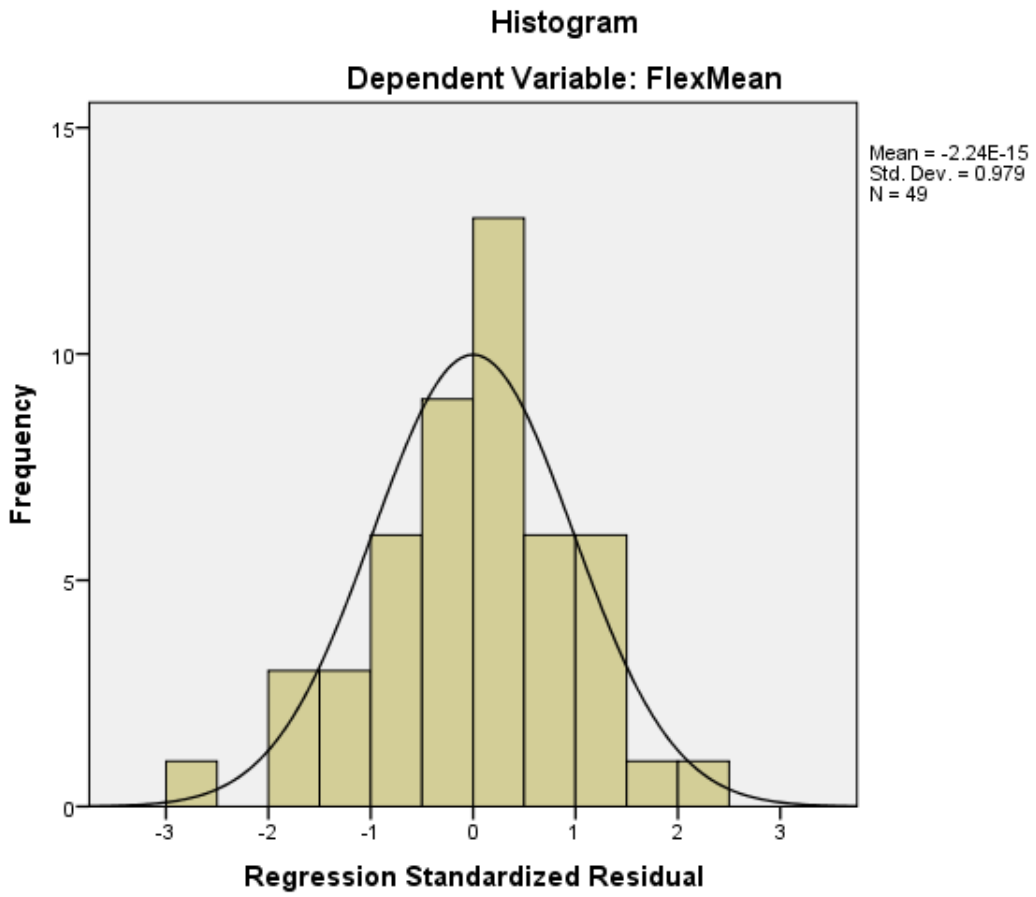


Figure 1: Histogram of distribution of standardised residuals

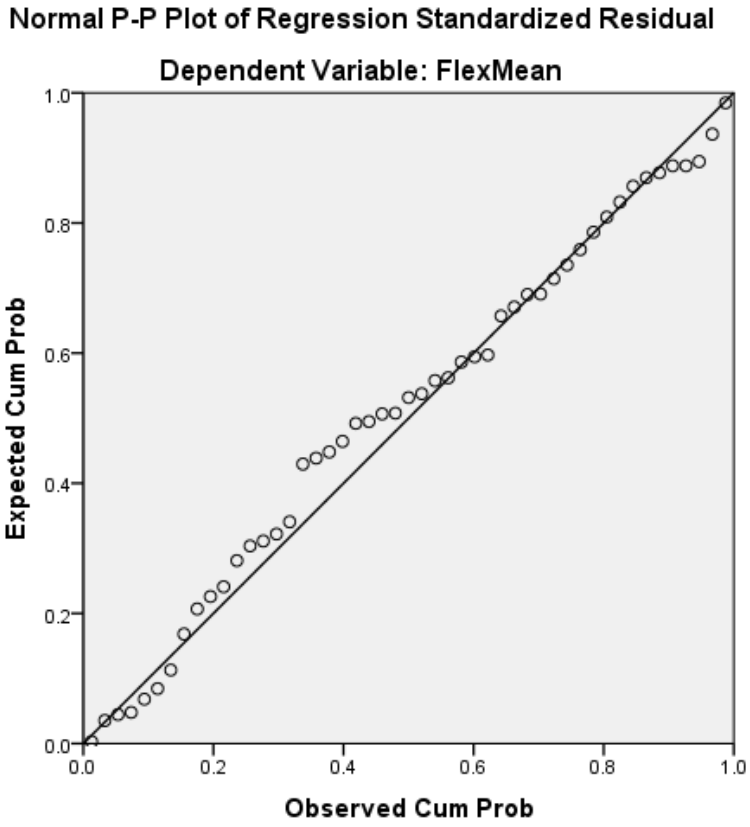


Figure 2: P-P plot of standardised residuals

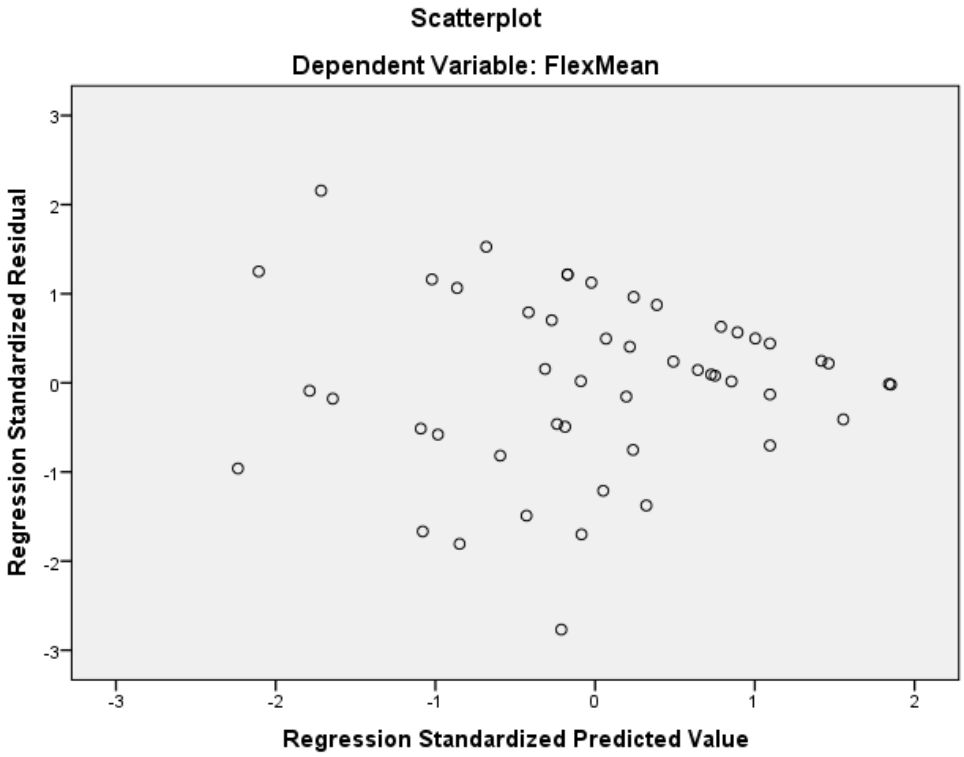


Figure 3: Scatterplot of standardised residuals

Appendix J

Results of regression analysis

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.529[a]	.280	.248	.43662	.280	8.936	2	46	.001	2.238

a. Predictors: (Constant), AccessMean, DigLitMean

b. Dependent Variable: FlexMean

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.407	2	1.703	8.936	.001[b]
	Residual	8.769	46	.191		
	Total	12.176	48			

a. Dependent Variable: FlexMean

b. Predictors: (Constant), AccessMean, DigLitMean

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	1.783	.649		2.746	.009	.476	3.090					
	DigLitMean	.306	.131	.306	2.335	.024	.042	.569	.410	.325	.292	.912	1.097
	AccessMean	.342	.128	.350	2.672	.010	.084	.599	.441	.367	.334	.912	1.097

a. Dependent Variable: FlexMean

Figure 1. Regression analysis results

Appendix K

Simple slopes graph representing the moderating effect of internet access at home

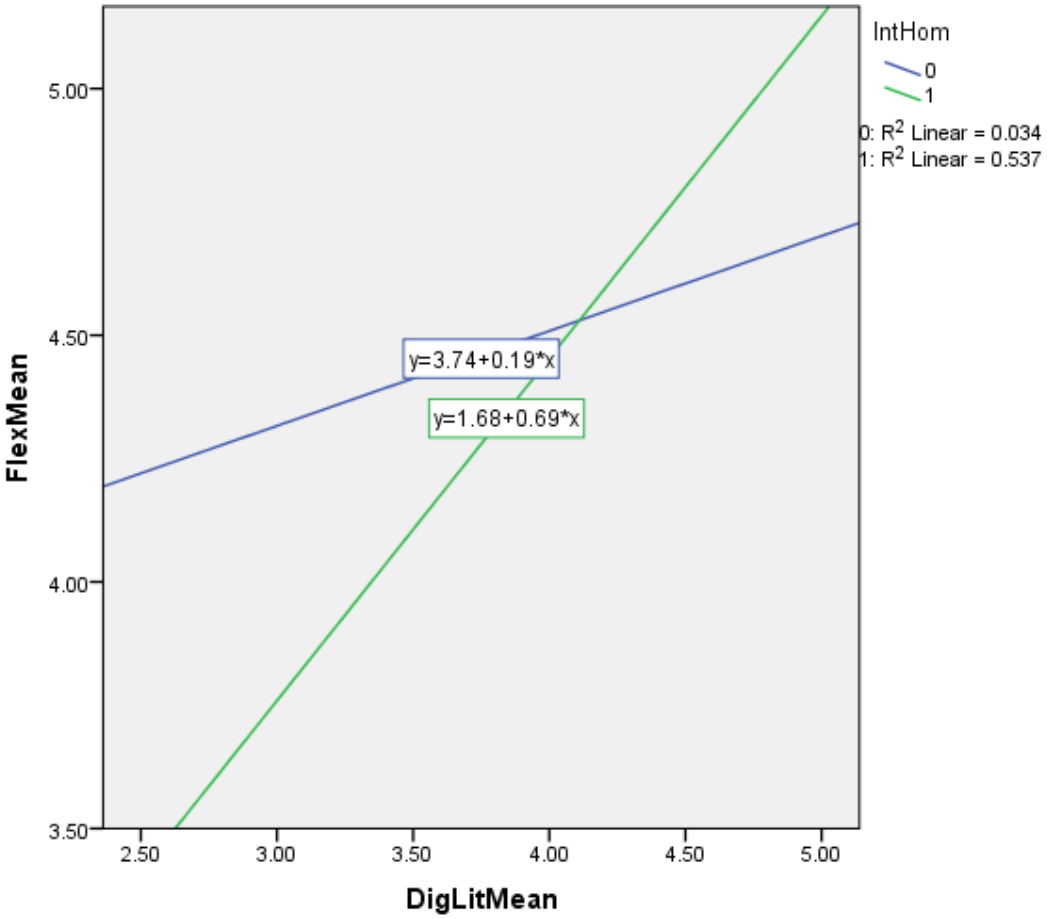


Figure 1. Simple slopes graph representing the moderating effect of internet access at home of the independent variable, digital literacy and the outcome variable, flexibility of learning.