Open distance electronic learning students with disabilities' mobile learning use and psychological factors inherent in the Technology Acceptance Model influencing mobile learning use

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I declare that the above dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.

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SIGNATURE

29th February 2024

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Abstract

This study aimed to gain insight into the psychological factors that influence m-learning usage among students with disability (SwD) enrolled at an open distance and e-learning (ODeL) institution (UNISA) during the year of 2023. An unexplored area in the literature regarding m-learning use amongst SwD hinders this HE institution in effectively designing both educational material and technological solutions for SwD. This highlights a challenge in UNISA's ability to support SwD and presents a problem in developing effective e-learning tools which include these students. This study aimed to contribute knowledge in this area in order to promote educational equity for SwD. Using an adapted TAM, a quantitative research method was applied, which made use of an online, non-experimental cross-sectional survey to investigate m-learning use, the prevalence of m-learning and to examine the relationship between m-learning use and the psychological constructs of perceived usefulness (PU), perceived ease of use (PEOU), perceived behavioural control (PBC) and attitude. Given the prolific nature of TAM, its use in educational settings and its flexibility, it was chosen as the basis of the theoretical framework of this study. In order to answer the research questions, data from the research instrument was analysed in SPSS using two frequency analyses, a Spearman's Rho correlation, and two Kruskal-Wallis tests. Although TAM is widely used to understand technology use, its application in m-learning contexts, especially among SwD in ODeL, remains largely unexplored. Results indicate the majority of respondents reported using m-learning either daily or weekly (90.5%; n = 199). Further results revealed no significant relationship between m-learning use and PBC, PEOU or attitude. A significant correlation was, however, found between m-learning use and PU. These results bring to the fore the importance of emphasising the benefits of m-learning in educational settings to enhance SwD's perception of its usefulness, thereby encouraging greater adoption and integration into their learning routines. Furthermore, the significance of PU indicates that this psychological construct is of the utmost importance for this population of students and that future technology acceptance models would do well to use PU as a basis, excluding PEOU, PBC and attitude. Additionally, results revealed no significant difference between m-learning use and type of disability or m-learning device used. This implies that educational institutions and policymakers can adopt a versatile approach to m-learning implementation for SwD, accommodating a variety of devices to students with various types of disabilities.

Key terms: students with disabilities (SwD); higher education (HE); open distance and e-learning (ODeL); mobile learning (m-learning); technology acceptance model (TAM); psychological constructs; perceived usefulness (PU); perceived ease of use (PEOU); perceived behavioural control (PBC); attitude

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List of Abbreviations

ANOVA	Analysis of Variance
App	Application
ARCSWiD	Advocacy and Resource Centre for SwD
AT	Assistive Technology
AVE	Average Variance Extracted
BI	Behavioural Intention
DE	Distance-Education
EFA	Exploratory Factor Analysis
e-Learning	Electronic Learning
GPS	Global positioning satellite
HE	Higher Education
ICT	Information and Communication Technology
IS	Information Systems
IT	Information Technology
KMO	Kaiser-Meyer-Olkin
K-S	Kolmogorov-Smirnov
LMS	Learning Management System
m-Learning	Mobile Learning
ODeL	Open Distance and Electronic Learning
PBC	Perceived Behavioural Control
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
RPSC	Research Permission Subcommittee
SE	Standard errors
SMS	Short Messaging System
SPSS	Statistical Package for the Social Sciences
SwD	Students with disability
TAM	Technology Acceptance Model
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UNISA	University of South Africa

USSD	unstructured supplementary service data
UTAUT	Unified Theory of Acceptance and Use of Technology
WHO	World Health Organization

Chapter 1: Introduction

This study examined the psychological factors (inherent in the technology acceptance model, TAM; Davis, 1986) that influence m-learning usage among students with disability (SwD) at the University of South Africa (UNISA), a dedicated open distance e-learning (ODeL) institution. The psychological factors of particular importance include perceived usefulness (PU), perceived ease of use (PEOU), perceived behavioural control (PBC), and attitude. It was envisioned that such a study could provide ODeL practitioners with much-needed insight into the influence of these constructs on SwD's m-learning use, thereby potentially informing the design of accessible educational materials on mobile devices. To commence, this chapter provides an overview of ODeL in South Africa, followed by an introduction to m-learning at UNISA. Attention then shifts to the prevalence of m-learning at UNISA. Next, the research problem is highlighted, as is the research aim, objectives and questions. This chapter also provides the reader with a brief overview of the research design, including the data collection process and analysis techniques. Lastly, an outline of the following chapters is provided.

1.1 ODeL in South Africa

The demand for tertiary education has increased as many South Africans see it as a means of overcoming poverty and unemployment. However, the high costs and admission criteria of most universities have made it difficult for students from disadvantaged backgrounds to access higher education (HE; Harrison, 2020). ODeL systems have emerged as viable options in this regard, as well as for those who were previously excluded from traditional forms of education due to Apartheid policies (Letseka & Pitsoe, 2012). What is more, ODeL has gained popularity in many African universities, including those in South Africa, due to its ability to assist students from diverse and remote locations, its adaptable learning processes, and its strong focus on student-centred education (Letseka & Ngubane, 2023).

ODeL is a mode of education that allows learners to study remotely without being physically present at a traditional educational institution. It makes use of contemporary technology for the assessment and instruction of students for educational purposes (Wheeler, 2012). UNISA policy defines ODeL as a form of learning that integrates the use of current and emerging digital technologies with a focus on bridging time, geographical, economic, social, educational, and communication gaps between students and institution, educators, course

materials, and peers. It aims to remove barriers to accessing education, offering flexible, student-centred learning opportunities. ODeL supports learners by designing programmes with the expectation that all students can succeed, emphasising inclusivity and flexibility in both the resources and delivery methods (UNISA, 2008). Given the nature of m-learning, for the purposes of this current study ODeL is defined as the provision of accessible, student-centred and flexible learning through the use of current digital teaching resources, tools, and delivery methods, thereby fostering independent learning from a distance (Keane, 2012; UNISA, 2008).

UNISA plays a pivotal role in ODeL in South Africa and is known for being one of the world's oldest and largest ODeL institutions, and the largest in Africa (Madge et al., 2019; Venturino & Hsu, 2022). It has been a pioneer in ODeL, offering a wide range of undergraduate and postgraduate programmes across various fields, catering to the needs of working professionals, part-time students, those in remote areas, and SwD[1] (Letseka et al., 2018). A notable aspect of UNISA's ODeL approach is its inclusive stance towards SwD. UNISA offers various accommodations and support services, such as tuition fee reductions for SwD, alternative course material formats, and access to assistive technologies (UNISA, 2023b). These initiatives aim to ensure that SwD can participate in HE.

1.2 m-Learning at UNISA

m-Learning has been defined in numerous ways in the literature. Goksu (2021) described m-learning as a form of education that allows individuals to gain experiences through both personal and collaborative learning activities, which involve accessing, generating, and managing information via digital interactions on mobile devices. Similarly, Crompton (2013) characterises m-learning as education that occurs in various contexts, facilitated by social interactions and the use of personal electronic devices. This definition emphasises the role of mobile devices, including smartphones and tablets, in learning across different settings, involving diverse participants and content. Additionally, Keegan (2005) defines mobile learning as the use of portable computers, PDAs, and mobile phones for educational purposes. Based on an analysis of the literature and the context of this study, m-learning will be defined as the use of mobile devices for educational purposes. Furthermore, a mobile device will be

[1] According to UNISA, SwD include those who have physical, sensory, or cognitive impairments that substantially limit their ability to perform major life activities.

defined as a smartphone or any other cell phone, tablet, laptop, smart watch, e-reader, handheld gaming console, or mp3 player.

As indicated by Shandu-Phetla (2017), UNISA leverages various e-learning and m-learning tools to enhance its educational experience. Regarding e-learning, the learning management system (LMS; *my*Unisa, 2022), hosted on Moodle, is UNISA's official online teaching, learning, and collaboration platform, supporting fully online and blended courses, as well as facilitating various UNISA-related research, groups, and communities (UNISA, 2022). It is also a key component utilised for course administration and is a vital conduit connecting students with their peers, lecturers, and the university itself. In addition to *my*Unisa, UNISA makes use of Microsoft Teams, Facebook, X (formerly known as Twitter), LinkedIn, YouTube, Tippy Tube, Telegram, WhatsApp, and the UNISA radio for student support, teaching, communication and engagement (UNISA, 2023a). UNISA also has a mobile application (i.e. *my*Modules Mobile App) which is used to further support students wishing to access their teaching and learning materials without having to use a computer. In addition, this app provides a platform for administrative support (see https://www.unisa.ac.za/sites/myunisa/default/Announcements/Download-our-new-myModules-Mobile-App).

In terms of m-learning, it is employed for application purposes and registration once a student's acceptance to the university has been confirmed. This encompasses communication via SMSs and *my*Unisa communications, streamlining the onboarding process. SMS communication also plays an essential role in facilitating assessment administration, as indicated by the dissemination of essential information, such as due dates and examination timetables. UNISA has also implemented a mobile application (app) to facilitate the submission of multiple-choice question assignments, enhancing the efficiency of the assessment process. This mobile app allows students to submit their assignments conveniently and efficiently. Additionally, the app enables the delivery of memorandums to students after the assignment due date, providing them with feedback and guidance (Shandu-Phetla, 2017). In addition to this mobile app, UNISA offers a mobile version of the library catalogue system, known as m-oasis, enabling access to UNISA library resources (UNISA, 2021). This mobile library service provides students with convenient access to a wide range of resources, enhancing their learning experience.

Overall, UNISA's m-learning initiatives, including the mobile app for assignment submission, the mobile library catalogue system, and the integration of mobile devices into teaching practices and student support services (Shandu-Phetla, 2017), contribute to a more efficient and effective learning environment for students. These initiatives leverage the convenience and accessibility of mobile technology to enhance the educational experience of students at UNISA (Shandu-Phetla, 2017).

1.2.1 Prevalence of m-Learning Adoption at UNISA

An exploration of literature on SwD and their use of m-learning at UNISA revealed a noticeable void in the research. Although Makoe (2012), Brown and Mbati (2015), and Shandu-Phetla (2017) provide valuable insight into m-learning at UNISA, none of these studies have an exclusive focus on SwD. It is against this deficit that the current study sought to explore m-learning among SwD, and its association with the psychological constructs of PU, PEOU and PBC. This study contributes to the body of knowledge regarding m-learning use in HE (specifically amongst SwD) and provides evidence-based recommendations for the promotion of and enhancement of m-learning practices at the university. A careful consideration of the relevant literature and the noted void therein revealed the research problem. The identified problem is discussed next.

1.3 Problem Statement

While ODeL possesses the capacity to support students across a breadth of remote geographical areas, employ flexible pedagogical approaches, and prioritise student-centred instruction, the prevailing body of knowledge concerning the influence of ODeL on the expansion of educational prospects in South Africa has predominantly centred on students without disabilities (Letseka & Ngubane, 2023). The insufficiency of existing literature addressing the incorporation of SwD into ODeL is highlighted as a significant concern in Letseka and Ngubane (2023). Despite the growing prevalence of m-learning, a significant lack of awareness concerning how SwD engage with m-learning at UNISA remains. This problem hinders this HE institutions' ability to effectively design educational initiatives and technological solutions tailored to the needs of these students. The limited understanding of m-learning's effectiveness for South African SwD poses a critical challenge to enhancing their educational experiences and outcomes. Without a comprehensive grasp of SwD's m-learning

use and the psychological factors influencing m-learning use, educational stakeholders are unable to implement strategies that truly support the academic success of these students.

Furthermore, although TAM is widely used to understand technology use, its application in m-learning contexts, especially among SwD in ODeL, remains largely unexplored. The existing TAM framework may not adequately capture the psychological factors that influence m-learning adoption among SwD, particularly when considering PBC. While m-learning holds significant potential for improving educational access for SwD in ODeL, gaining insight into m-learning and the psychological factors influencing m-learning use is crucial for developing m-learning tools that are both accessible and appropriate for SwD, ultimately promoting educational inclusivity and making higher education qualifications more attainable. As TAM has not been applied in this context, there is a risk that this theoretical framework might be inadequate in explaining SwD's m-learning use, presenting a problem of the theory possibly excluding SwD. The current study was prompted by this deficit in research results pertaining to m-learning use amongst SwD at UNISA and the problems associated with this deficit. The large size of UNISA's population of SwD in 2023 (N = 2,808; Fynn, 2023) makes it an ideal target population for exploring the use of m-learning amongst SwD at South African ODeL institutions. The research aim, objectives, questions and research design used for this study's exploration of this population are discussed next.

1.4 Aim, Objectives and Research Questions

Prompted by the void noted above, the overall aim of this study was to explore m-learning at UNISA amongst SwD and the psychological factors (inherent in the TAM) affecting m-learning use. Based on this overall aim, the research objectives were as follows:

1. Determine the prevalence of m-learning use amongst SwD enrolled at UNISA;
2. Examine the relationship between m-learning usage and key constructs in the TAM (i.e. PU, PEOU, PBC and attitude);
3. Establish whether these key constructs; PU, PEOU, PBC and attitude differ significantly by m-learning device; and
4. Determine whether these key constructs; PU, PEOU, PBC and attitude differ significantly by disability.

Aligned with the research objectives above, the research questions were as follows:

1. What is the prevalence of m-learning use at UNISA amongst SwD?
2. What is the relationship between m-learning usage and key constructs in the TAM (i.e. PU, PEOU, PBC and attitude)?
3. Does PU, PEOU, PBC and attitude differ significantly by m-learning device? And lastly,
4. Does PU, PEOU, PBC and attitude differ significantly by disability?

1.5 Research Design

A non-experimental research design was chosen to illustrate the connection between variables without any intent to manipulate them. Notably, this approach did not endeavour to establish causality (Gravetter & Forzano, 2018). Within this overarching framework, the study employed a cross-sectional design, wherein data were gathered from respondents at a singular moment in time through an online survey. In the context of the nature of this investigation, surveys have been deemed highly suitable due to their efficiency in accumulating substantial data (Gravetter & Forzano, 2018) and allowed for the collection of data without disturbing SwD's educational processes. The study thus took the first step towards exploring the prevalence of m-learning use amongst SwD at UNISA, and its relation to PU, PEOU, PBC and attitude. The survey design allowed the researcher to investigate the use of m-learning amongst SwD without directly observing the use of m-learning. In addition, this design is a good fit for this study as it is non-threatening to respondents, as well as convenient and anonymous (Gravetter & Forzano, 2018).

1.5.1 Benefits and Limitations of the Research Design

In research, non-experimental survey designs present a dual nature characterised by their advantages and limitations. The benefits are that non-experimental surveys offer cost-effectiveness, making them an attractive option in comparison to more elaborate experimental methods, which require complex manipulations or interventions (O'Connor, 2022). Moreover, these surveys are lauded for their real-world applicability, enabling researchers to amass data within authentic settings, endowing the results with a high degree of relevance to practical scenarios, thus exhibiting higher degrees of external validity (Ingle et al., 2021). The setting SwD found themselves in was of their own choosing, similar to their ODeL environment. Furthermore, surveys exhibit ethical considerations, proving less intrusive and thus suitable for

examining sensitive or ethically challenging subjects, aligning with the principles of ethical research. Additionally, non-experimental surveys are prized for their capacity for broad data collection, as they aim to procure information from a sizable and diverse sample (such as the population of SwD), yielding valuable insights into population trends and attitudes (Ingle et al., 2021).

However, these advantages must be viewed alongside the design limitations. Non-experimental surveys, for all their merits, fall short in establishing causality (Ingle et al., 2021). This design can discern correlations between variables but lack the capacity to unveil causation, as they do not engage in variable manipulation. Furthermore, response bias looms as a potential drawback, as respondents may not consistently offer accurate or honest responses, potentially undermining the reliability of the gathered data (Sharma et al., 2021). Non-experimental surveys may also struggle with sampling issues, as their samples may not be fully representative of the broader population, thereby limiting the generalisability of results (Sharma et al., 2021). Lastly, these surveys bestow limited control upon researchers regarding external factors that could influence the results, such as environmental fluctuations.

In summary, non-experimental survey designs constitute a valuable means of collecting real-world data efficiently. However, they remain incapable of establishing causation and are susceptible to biases and sampling issues.

1.5.2 Data Collection

This study made use a census (non-random) approach for data collection purposes which involves attempting to collect data from the entire population of interest (Aruleba & Adediran, 2021). This is distinct from standard (random vs non-random) sampling which is the process of collecting data from a subset of a population. This strategy entailed giving all SwD enrolled at UNISA during 2023 the opportunity to be surveyed. The use of a census provides a comprehensive and accurate representation of the population, as it eliminates sampling variability (Aruleba & Adediran, 2021). This method is particularly useful when studying small populations as it ensures that all individuals are accounted for and can lead to more accurate results (Kariuki et al., 2022). In terms of quantitative research, the target population was not large. As mentioned, an online questionnaire was used to gather data from the target population. This study made use of an online survey which comprised section A, gathering demographic

information, and section B, which aimed to measure m-learning prevalence and the psychological constructs of PU, PEOU, PBC, and attitude. Likert scale items were used to measure these items with response categories ranging from *'strongly disagree'* to *'strongly agree'.* The data collection procedures of this study are discussed further in Chapter 4.

1.5.3 Data Analysis

A statistical program designed for the social sciences (SPSS) was used for analysis. To commence, a frequency analysis was conducted to explore the prevalence of m-learning among the sample of SwD. Another frequency analysis was applied to report how often SwD use m-learning. These two frequency analyses were used to answer the first research question: What is the prevalence of m-learning at UNISA amongst SwD? To answer the second research question: What is the relationship between m-learning usage, PU, PEOU, PBC and attitude?, a Pearson's Correlation (or Spearman's Rho or Kendall's Tau-B in the event of a non-normal distribution) was conducted to assess the strength and direction of the relationship between m-learning usage and the psychological constructs of interest (i.e. PU, PEOU, PBC, and attitude).

For the purpose of answering the third research question: Does PU, PEOU, PBC and attitude significantly differ by m-learning device?, an independent measures analysis of variance (ANOVA) (or Kruskal-Wallis in the event of a non-normal distribution) was conducted to determine whether there are statistically significant differences between the independent groups. Similarly, an independent measures ANOVA (or Kruskal-Wallis in the event of a non-normal distribution) was conducted to answer the fourth research question: Does PU, PEOU, PBC and attitude significantly differ by disability?

1.6 Outline of Chapters

This dissertation is divided into six chapters: The study's background context, and educational environment are presented in Chapter 1. Chapter 1 is inclusive of the study's justification and research problem, as well as the study's aim, objectives, and research questions. In order to contextualise this study, a review of relevant literature on ODeL, m-learning, psychological factors influencing m-learning adoption, a discussion of SwD and ODeL and a consideration of assistive technology are presented in Chapter 2. The third chapter introduces the theoretical framework used in this study and delves into each of the psychological constructs included in the model, explaining its relevance to the current study.

Chapter 4 explains the research design and methodology used, as well as the ethical procedures followed throughout this study. Chapter 5 presents the results of the data analysis, while Chapter 6 provides an interpretation and discussion of the results, along with implications for practice.

1.7 Conclusion

The landscape of online learning has evolved significantly, driven by the proliferation of cost-effective mobile devices and the rapid advancements in mobile technology. This transformation has opened new avenues for SwD and students without disabilities, granting them expanded opportunities to access HE through ODeL institutions. However, it has been made clear that SwD have difficulties with inclusion as the present understanding of inclusion groups all SwD together with students without disabilities. The potential benefits of m-learning in playing a role in addressing some of these challenges due to its high level of flexibility and functionality as AT hold promise. However, although m-learning use in HE has been studied within the South African ODeL context, research pertaining to the prevalence and the psychological factors influencing m-learning use among SwD needs further attention.

The outcomes of this research carry implications for the design of educational infrastructure, curricula, content, and assessment strategies tailored to m-learning audiences within DE institutions, particularly SwD. This knowledge could contribute to developing effective support to SwD who utilise mobile devices for educational purposes. The ripple effect of these results extends to the enhancement of accessibility to HE, culminating in the creation of a more m-learning-friendly educational ecosystem. In summary, this research holds the promise of not only advancing our understanding of SwD's engagement with m-learning, but also paving the way for tangible improvements in the HE sectors through the development of inclusive, mobile-enabled educational infrastructure and support for SwD.

Chapter 2: Literature Review

The following review of existing literature first considers the progression of DE from correspondence learning to e-learning, and then to m-learning, in order to contextualise this study. Next, the benefits of m-learning (defined in Chapter 1) and the psychological factors influencing m-learning are highlighted. The chapter continues with a discussion of the barriers to participation for SwD in HE and challenges experienced by SwD at UNISA. The chapter then describes the student support available at UNISA for SwD and then concludes by mentioning AT smartphone applications and its impact on the PU of mobile devices for SwD.

2.1 The Five Generations of Distance Education

The growth of DE has been described as 'generations of technologies' used by ODeL institutions with the aim of supporting the teaching and learning process (Fozdar & Kumar, 2007). According to this description, the growth of DE is characterised by five generations, with each generation using a different teaching-learning model based on different delivery technologies.

The first generation of DE started with the invention of the printing press. The printing press revolutionised knowledge dissemination and allowed correspondence DE to start, which it did in Europe (Anderson & Simpson, 2012). By 1920, new inventions such as sound recording, photography, film, and telegraphy provided new ways to communicate, capture and transmit content. The mail system was used for enrolment, course selection and receiving course materials. The enrolled students would complete the assignments and examinations and send them back to the institution for grading. The mail system was also used for communication such as feedback and support, although some communication took place by telephone. New technologies, such as the lanternslide and motion picture, later emerged to provide additional options for supporting correspondence studies (Heydenrych & Prinsloo, 2010).

During the second generation of DE there was little change as far as curriculum development, content ownership or pedagogies were concerned (Heydenrych & Prinsloo, 2010). Rather, technological development and increased reach defined this generation (Sisman-Ugur & Kurubacak, 2019). The introduction of new mass media technologies, such as radio and television, allowed content to be delivered more widely (Anderson & Dron, 2011). The quality of the content also improved due to the implementation of these technologies.

The third generation of DE consisted of the introduction of electronic computer systems as a medium for teaching and learning. Computer-assisted instruction or computer-based instruction led to early computer systems being accepted as a means of transmitting knowledge to students studying at a distance (Sisman-Ugur & Kurubacak, 2019). The introduction of electronic computers did not change the curriculum or pedagogy of the previous generations, but facilitated access to specific content areas (Aisha, 2020). The curricula were not interactive but primarily consisted of institutions and lecturers transmitting content to the students.

Although dated, Lauzon and Moore (1989), as well as Taylor (1995), classified the emergence of online group communication and the sharing of resources as the fourth generation of DE. Two-way communication technologies allowed for direct interaction between lecturers and remote students, and among the students themselves. This provided a more equal distribution of communication and assisted in forming relationships which, in turn, fostered collective development (Aisha, 2020).

Taylor (2001) proposed the fifth generation of DE, the Intelligent Flexible Learning Model, which is based on intelligent technologies that are capable of recording conversations. This allowed for reusability through automated response systems. These technologies (e.g. campus portals, LMS) allowed institutions to make educational resources available to students with minimal face-to-face interaction (Aisha, 2020). This further allowed for educational resources to be provided at a larger scale and at a reduction of the costs. This is the DE generation UNISA's population of SwD find themselves in.

2.2 Contextualising m-Learning

Keegan (2002) describes the evolution of DE as a move from DE to e-learning, to m-learning, where he views this evolution as corresponding to the Industrial Revolution, the Electronics Revolution of the 1980s and the Mobile Revolution during the end of the 20th century, respectively. Towards the end of the 20th century, in 1984, mobile technologies appeared with the introduction of the first generation (1G) analogue cellular phones. In 1992, mobile phones transitioned to the second generation (2G) of digital cellular technology. Both 1G and 2G mobile phones were essentially used for voice communication. Since the launch of third-generation (3G) multimedia cellular, mobile devices converged to include phone, camera,

and music-video display in a single device (Sharples et al., 2010). Since then, the introduction of mobile communication devices has enabled convergence between mobile and internet broadband technologies (Mann, 2008).

The use of mobile devices in the teaching-learning process has gained significant attention, with studies indicating its effectiveness in language learning (Sung et al., 2015). Furthermore, the implementation of mobile learning in science education has shown exponential growth, driven by innovative mobile learning technologies and their applications in improving academic achievement in scientific disciplines (Saphira, 2022).

Research has also highlighted the increasing trend of mobile learning studies, with a focus on areas such as mathematics, language teaching, and specific purposes (Crompton & Burke, 2014; Patmawati et al., 2019; Rafiq et al., 2021). The prevalence of mobile learning in the classroom has also been noted, and appears to be on the rise, reflecting its increasing adoption in educational institutions at all levels (Turmuzi et al., 2023).

The potential for mobile learning to facilitate personalised, spontaneous, informal, and ubiquitous learning experiences has been recognised as a key characteristic of this educational approach (Miangah, 2012; Rahman et al., 2021). Additionally, the integration of mobile learning with cloud computing has been identified as a significant development in educational institutions, providing students with access to mobile learning systems based on cloud computing (Noor et al., 2019).

The impact of mobile learning on various aspects, such as self-management of learning, continuance intention, and performance has been explored, indicating the need for further research in understanding the association between personal learning initiative, mobile learning continuance intention, and performance (Huang & Yu, 2019). Moreover, the use of mobile technologies in education has been linked to innovative applications for educational and entertainment purposes, emphasising the importance of instructional design and the influences of these techniques (Chang & Hwang, 2019).

The challenges and opportunities associated with evaluating mobile learning have been addressed through proposed frameworks, focusing on usability, learning experience, and integration within existing educational and organisational contexts (Al-Hunaiyyan et al., 2017).

Furthermore, the role of perceived flexibility advantages in mobile learning continuance intention has been explored, highlighting the attractiveness of flexibility advantages in managing work, learning, and personal activities (Huang et al., 2014). The evolution of mobile learning has been characterised by its increasing adoption in various educational domains, the integration of mobile technologies with cloud computing, and the exploration of its impact on language learning, science education, and mathematics. The potential for personalised and ubiquitous learning experiences, along with the challenges and opportunities in evaluating mobile learning, has been a focus of recent research (Huang et al., 2014).

Although technology-facilitated DE poses challenges to SwD (Paramasivam et al., 2022), the rapid development of information and communication technology (ICT) has allowed ODeL institutions to deliver educational courses consisting of a wide variety of media to students in different locations in an effort to meet the educational needs of growing populations and increasing number of SwD (Tanyanyiwa & Madobi, 2021). This rapid growth of ICT has reshaped teaching and learning methods, and allowed ODeL programmes to be more efficient and more productive by providing specialised courses to SwD, with increasing interactivity between students and educators (Tanyanyiwa & Madobi, 2021). Throughout this growth, the separation of geographic and pedagogical distance between student and distance institution has driven many changes in DE as stakeholders are constantly looking for solutions to bridge the divides associated with DE (Shandu-Phetla, 2017).

Additionally, mobile devices can serve the purpose of alleviating the isolation linked to the remoteness of DE. Makoe (2012) outlines several scholars who have examined the interaction challenges in DE and have reached a consensus that students require dual support, cognitive and affective, achieved through the integration of mediated technologies and in-person interventions. In the absence of in-person communication, engaging in communication through technology becomes crucial.

In spite of the documented successes associated with the utilisation of m-learning, educators in emerging economies remain sceptical about the capacity of m-learning to foster innovative approaches to education (Makoe, 2012). The effectiveness of integrating mobile devices into education is contingent upon the attitudes of educators and their ability to incorporate this technology into the educational process. Only when educators comprehend the educational principles that underpin its utilisation and are equipped with the requisite

competencies, will they be able to harness the capabilities of mobile devices to engage and assist students effectively in the learning process (Makoe, 2012).

2.3 The Benefits of m-Learning

In order to understand the benefits of m-learning, one needs to examine previous literature concerning studies involving the use of mobile devices by able-bodied students and SwD in HE. This section aims to provide context of how these devices and their associated applications are used, and what the notable effects and benefits have been identified in previous studies.

Firstly, mobile devices can act as tools that help to create more diverse curricula with a wider variety of educational material presented to students (Clarke & Abbott, 2016; Fernández-López et al., 2013; Tunney & Ryan, 2012). Students are able to learn at their own pace and to spend as much time as they need on individualised tasks (Bouck et al., 2014; Ciampa, 2014; Douglas et al., 2015; Dunn, 2015; Smith et al., 2016; Stephenson, 2016). In group work settings, mobile devices help to provide clarity on the students' goals, allowing the students to know what questions to ask each other. A study by Engel and Green (2011) showed that students with and without disabilities were more active learners when using mobile devices as they were able to actively find information by researching at their own convenience. In this regard, students played a more active role in gathering information related to their task instead of relying on information being given to them.

Secondly, a number of studies showed that combining direct instructions with independent studies using mobile devices has been shown to be an effective strategy for developing students' vocabulary and reading skills, math skills, and writing skills (Chelkowski et al., 2019; Engel & Green, 2011; Haydon et al., 2012; Skiada et al., 2014). One such example is a study which found that an app helped to improve students with dyslexia's word recognition, reading ability, phonological decoding and ability to focus (Skiada et al., 2014). A similar study by Engel and Green (2011) found that with the allowance of extra time, a pre-calculus student with a learning disability was able to complete tasks using a mobile phone at the same level as students without disabilities. In a different study, students with emotional behavioural disorders were found to gain math skills at a faster pace when using mobile devices compared to using worksheets (Haydon et al., 2012). The use of mobile devices in an educational setting has also

proven to help students make a stronger connection between academic writing practices and writing in their everyday lives. This was demonstrated by Vue et al. (2016) in a focus group study, using 41 respondents, including students without disabilities, with learning disabilities, and students who struggle with writing. This study showed how students characterise their writing. Collectively, these studies show that mobile applications are effective across a range of instructional fields.

Thirdly, mobile devices were shown to improve the management of students with different needs and behaviours (Chelkowski et al., 2019). For example, SwD were able to increase their independence when educators and students used a notice or text feature to inform students of their educational expectations regarding tasks (Bedesem, 2012; Bouck et al., 2014; DePompei et al., 2008; Mechling & Savidge, 2011; Tunney & Ryan, 2012; Yakubova & Zeleke, 2016). Additionally, mobile devices loaded with specialised software can function as speech-generating devices. This allows SwD, particularly those with autism spectrum disorder (ASD) and intellectual disabilities, to ask questions and to express their needs, fostering independence and improving communication capabilities (Mancil et al., 2016).

Fourthly, according to Shah et al. (2021), students can make use of all these features anytime and anywhere due to mobile phones' flexibility and accessibility. This level of accessibility which m-learning offers means that SwD can engage in learning at a location of their choice, such as their homes, and they would thus not need to face the challenges associated with travelling to an educational institution to make use of educational technologies. Nichter (2021) also recognises m-learning's anytime-anywhere characteristic which allows students to study in locations of their choice and that the use of mobile learning has been found to improve students' time management skills, as they become more aware of how much time they are spending on learning activities.

The benefits of m-learning for HE students in South Africa have been a subject of interest in recent research. Brown and Mbati (2015) outline the many instructional opportunities and capabilities offered by m-learning and the various features that make it suitable for designing effective learning environments across different contexts. These capabilities include administrative support and motivational messages through SMS, quizzes on basic phones, audio-visual functionalities, audio-rich language learning, location awareness through global positioning satellite (GPS), contextual and situated learning, simulations and

serious games, augmented reality and immersive presence, and the integration of formal and informal learning. Additionally, m-learning allows for personalised learning and the development of personal learning environments, as well as personal publishing and sharing through social media and related applications.

Administrative support and motivational messages through SMS enable easy and just-in-time communication with learners, both individually and in large groups, providing a simple yet powerful tool for educational institutions (Rotar, 2022). Quizzes on basic phones, including the use of unstructured supplementary service data (USSD) systems, have proven effective in teaching and learning, encouraging continuous engagement with the material, and reducing test anxiety. The audio-visual functionalities of smartphones and tablets allow for the capture, display, and sharing of high-resolution images, audio, and video, providing a wealth of tools for educators and learners to incorporate audiovisual materials into teaching and learning activities.

Furthermore, m-learning facilitates audio-rich language learning through the recording and playback functionalities of mobile devices, enabling learners to practise pronunciation and reduce anxiety among second-language speakers (Celestini, 2021). Location awareness and GPS functionalities support personalised and interactive learning environments at any suitable location, while contextual and situated learning environments link mobile applications to the current location of the learner, allowing for the recording of learning-related activities and interaction with the surroundings (Brown & Mbati, 2015).

Simulations and serious games in m-learning provide opportunities to engage learners in meaningful and competitive educational activities, facilitating collaborative and problem-based learning while increasing learner motivation and performance (Brown & Mbati, 2015). Augmented reality and immersive presence allow learners to explore and experience digital objects in real-life environments, providing interactive and collaborative experiences with digital objects and tools. An example of this in the context of anatomy education is the use of a 3D image overlay with mid-air AR interaction demonstrating a real-time visualisation of virtual soft tissues found in the human body (Huang et al., 2022). Additionally, m-learning integrates formal and informal learning processes, allowing learners to personalise their learning based on their characteristics and preferences, as well as to create personal and authentic communities of learning using web-based applications and social media.

Finally, m-learning enables personal publishing and sharing of various media types, providing learners with the ability to measure, analyse, capture, publish, organise, evaluate, and communicate from anywhere, at any time, and on the go (Naveed et al., 2023). These instructional opportunities and capabilities of m-learning offer a wide range of possibilities for designing effective and engaging learning environments across diverse learning contexts.

These studies collectively underscore the potential benefits of m-learning for HE students in South Africa, particularly in terms of enhancing access to educational resources, promoting learner participation, and facilitating collaborative learning experiences.

2.4 Psychological Factors influencing m-Learning Adoption (or the intention thereof)

Contemporary literature underscores several psychological factors that influence m-learning usage among HE students. For instance, Sulaymani et al. (2022) emphasise that students' prior experiences and self-efficacy are crucial in determining their acceptance of e-learning platforms, suggesting that mobile-friendly designs can enhance engagement among younger, tech-savvy learners. Similarly, Mailizar et al. (2021) extend the TAM by integrating external factors such as prior e-learning experiences, which further elucidates how these experiences shape students' BI to utilise e-learning during the COVID-19 pandemic.

Moreover, Huang and Li, (2022) indicates that self-efficacy and PEOU significantly affect interactive behaviours in m-learning, underscoring the importance of these psychological constructs in facilitating effective learning experiences. The role of attitude is also highlighted in the context of motivation and cognitive load. Wu et al. (2022) found that motivational factors positively influence attitude towards learning, which in turn affect continuous learning intentions amongst HE students.

These results collectively suggest that psychological factors are integral to understanding the dynamics of m-learning usage and that extending the TAM to include additional psychological constructs not only enriches the model but also enhances its predictive power regarding technology use.

In choosing TAM as the framework for this study, it is essential to recognise its robustness in explaining technology adoption in educational contexts. TAM's key constructs (PU, PEOU) have been consistently validated across various studies as critical determinants of technology acceptance (Rosli et al., 2022). For example, Alshurideh et al. (2021) and Yin and She (2021) both affirm that PEOU is a primary factor influencing students' willingness to engage with m-learning platforms. Furthermore, the adaptability of TAM allows for the incorporation of external factors such as other psychological constructs, e.g. self-efficacy and prior experiences (Mo et al., 2021).

The decision to utilise TAM over other psychological frameworks is further supported by its empirical foundation in educational research. Studies have shown that TAM effectively captures the nuances of user attitudes and beliefs towards technology, making it a suitable choice for investigating the psychological factors influencing m-learning use among SwD (AlDreabi et al., 2023; Rosita & Fatmasari, 2023). The model's emphasis on user perceptions aligns well with the psychological constructs identified in recent literature, thereby providing a comprehensive lens through which to examine the interplay between these factors and m-learning use. The psychological constructs as well as the theoretical framework underpinning them are further elaborated upon in Chapter 3.

2.5 Challenges experienced by SwD in HE

Fernández-Batanero et al. (2022) conducted a systematic literature review of studies focusing on barriers and participation of SwD in HE. This literature review was conducted using four databases (Web of Science, Scopus, Education Resources Information Centre, and Google Scholar) with 20 studies meeting the selection criteria for the systematic review. The results suggest that SwD encounter a multitude of obstacles while attempting to obtain HE at the university level (Fernández-Batanero et al., 2022). The obstacles hindering the entry and engagement of SwD were mostly centred around three key domains: infrastructure, the teaching and learning process, and institutional management. These are discussed next.

2.5.1 Infrastructure

SwD have specific educational needs that necessitate attention to ensure their effective engagement with learning. Failure to address these challenges can hinder their access to education and create difficulties for these individuals (Braun & Naami, 2019; Huenul et al.,

2016). According to Paz-Maldonado (2020), the predominant obstacles that impede accessibility for SwD are typically related to architecture and infrastructure. This predominance might stem from the prevalence of older university buildings whose configurations do not cater for the necessities of students, consequently impacting on their freedom of movement (Paz-Maldonado, 2020).

2.5.2 The Teaching and Learning Process

A number of studies have identified obstacles to the teaching and learning process (Alsalem & Doush, 2018; Dreyer, 2021; Fernández-Batanero et al., 2020; Heiman et al., 2017; Nīmante et al., 2021). The lack of preparation of teachers to use a methodology that promotes inclusion based on their students' requirements is evident (Heiman et al., 2017). These results are consistent with those of other studies (Fernández-Batanero et al., 2020; Nīmante et al., 2021) that have been conducted on the lack of teacher training to accommodate these pupils in HE. Another study also indicated the difficulty of gaining access to material resources, which in the majority of cases are either inadequate or unsuitable (Alsalem & Doush, 2018; Dreyer, 2021).

2.5.3 Institutional Management

Regarding institutional management, students emphasise that there is limited availability of services aimed at addressing the inquiries and requirements of SwD (Björnsdóttir, 2017; Yusof et al., 2019). Additionally, a lack of funding for programmes designed to support SwD is also noted (Ryan, 2011). The results of this systematic review also revealed numerous obstacles that constrained the entry of SwD into HE, such as a lack of support in transitioning from secondary to HE, a culture of stigma towards disability, as well as the absence of clear educational policies and protocols of good practices facilitating inclusion (Heiman et al., 2017; Kendall, 2016). Overall, the review by Fernández-Batanero et al. (2022) demonstrated that over the past 10 years, there has been a focus on investigating the challenges related to HE access for SwD. However, despite a substantial rise in the enrolment of SwD in university settings (Majoko, 2018), it is evident that complete integration and inclusion of these individuals have not been realised.

2.6 Challenges experienced by SwD at UNISA

A number of challenges faced by SwD in accessing quality HE at UNISA have been identified through a single case study research design involving nine interviews with lecturers from seven teaching colleges at UNISA (Zongozzi, 2020). The results of this study have been grouped into four themes, namely a lack of awareness and processes of identifying SwD, inaccessible learning material for SwD, a lack of capacity to support SwD by university staff, and poor implementation of disability policies and strategies.

One of the primary challenges identified is the lack of awareness and clear processes for identifying SwD at UNISA (Zongozzi, 2020). This lack of awareness and identification procedures among lecturers and university authorities can lead to some SwD going unidentified and subsequently not receiving the necessary support. As a result, these students may be unfairly perceived as slow, behind, incapable, or failures if they do not perform well academically. In addition to the lack of awareness, the study by Zongozzi (2020) also highlights the issue of inaccessible learning material for SwD. On this note, for SwD to fully participate in their learning, it is essential that the study material and learning environment are conducive and accessible. Furthermore, individualised learning strategies and instructional media need to be considered to accommodate the diverse needs of SwD.

Furthermore, the lack of capacity to support SwD by university staff, particularly lecturers, poses a significant challenge (Zongozzi, 2020). The ability of lecturers to teach and communicate effectively with SwD is crucial for these students to receive quality education. However, the study reveals that lecturers at UNISA may not feel adequately prepared or inducted to understand and teach SwD, indicating a discrepancy in their capacity to support these students. Finally, the poor implementation of disability policies at UNISA further compounds the challenges faced by SwD (Zongozzi, 2020). While the university may have well-formulated disability policies, the study suggests that the problems stem from the inadequate implementation of these policies. This may be attributed to the unwillingness or inability of individuals responsible for implementing the policies, as well as the lack of clear policy objectives and resources (Zongozzi, 2020).

2.6.1 UNISA's Support for SwD

At the cornerstone of UNISA's disability landscape is the Advocacy and Resource Centre for SwD (ARCSWiD). ARCSWiD reports to the Dean of Students and is part of the Learner Support and Student Affairs portfolio (UNISA, 2019). ARCSWiD's sole purpose rests on providing (e)support for UNISA's disabled student body and creating an enabling teaching and learning environment.

ARCSWiD has two focus areas, namely 1) student support and administration, and 2) advocacy and training. The first division deals with student registrations, the provision of academic support and study material in alternative formats (i.e. Braille, large-print, electronic, or audio format), transcribing assignments and exam scripts, and providing sign language interpretation services (UNISA, 2019; UNISA, 2023a). The advocacy and training area of focus, on the other hand, serves by implementing facilitation of learning training programmes, commissioning or conducting research and implementing community outreach programmes (ARCSWiD, 2019).

ARCSWiD also plays a pivotal role in supporting students by assisting with various aspects of their academic journey. This encompassing-support includes aiding students in navigating the intricacies of application forms during registration, providing guidance on fee reduction applications, advocating for assistive devices and access technology equipment, while also offering advice on these technologies (UNISA, 2023c). The ARCSWiD centre also takes proactive steps by engaging with academic departments to ensure that students' needs are met and also assists SwD by referring them to pertinent service providers and civil society organisations that can further enhance their academic experience. Lastly, ARCSWiD collaborates closely with the Library Disability Workgroup to ensure that students have access to prescribed and recommended textbooks in electronic formats (upon request from publishers), thereby fostering an inclusive and supportive learning environment (UNISA, 2023c).

2.7 AT for SwD

The rapid development of ICT within the HE context has allowed ODeL institutions to deliver educational courses in a wide variety of media in an effort to meet the educational needs of growing populations of SwD (Lembani et al., 2020; Mncube et al., 2021). This fast growth

of ICT has reshaped teaching and learning methods and allows ODeL programmes to be more efficient and more productive by providing specialised courses to these students, with a focus on increasing interactivity between students and educators (Mncube et al., 2021). In particular, instructional technologies, such as AT, have greatly contributed towards making education more accessible for SwD (McNicholl et al., 2019).

AT systems, as defined by the World Health Organization's (WHO) Global Cooperation on Assistive Technology (WHO, 2023) encompass the development and application of systematic knowledge, skills, procedures, and policies that pertain to the supply, utilisation, and evaluation of assistive products (WHO, 2023). Assistive products encompass a broad range of items (including devices, equipment, instruments, and software) and play a crucial role in enhancing the engagement of SwD. Some products can be specifically tailored and manufactured whereas others are commonly available. Their primary objective is to uphold or enhance a student's functioning and autonomy, ultimately contributing to their overall well-being (Khasnabis et al., 2015).

A variety of devices are commonly used as assistive devices. For students with mobility challenges, these include wheelchairs, prosthetics, and orthotic devices. Those with visual impairments benefit from items like white canes and specific software designed for computer screen magnification or reading assistance. Students with hearing impairments find utility in hearing aids and cochlear implants. For students with speech impediments, speech synthesizers and communication boards prove invaluable. Lastly, individuals with cognitive impairments benefit from audio players and recorders, timers and alternative keyboards.

The role of AT in improving instructional methods, encouraging student involvement, and encouraging interaction between students and educators is particularly significant. This is especially beneficial for students with learning disabilities who must deal with rigid educational structures, teaching methods, evaluation systems, and objectives, while also navigating demanding physical and emotional environments. The underlying premise is that learning disabilities have the potential to limit students' academic abilities, necessitating the provision of supportive mechanisms to increase their capabilities (Manase, 2023).

These perspectives on disability and AT are approached from both medical and social standpoints, emphasising the significance of both the individual's physical capabilities and the

external surroundings in constraining their involvement. Consequently, this conceptual approach underscores the notion that when procuring AT, attention must be directed not solely towards the limitations or challenges posed by the individual's body, but also towards understanding the impact of the external environment on the individual's capabilities (Manase, 2023).

2.7.1 AT at UNISA

Although ATs are available to UNISA's disabled student population (UNISA, 2023c), these technologies are campus-based and therefore require students not only to travel to and from the main campus, but navigate the large campus itself in order to make use of these devices. Crucially, evidence suggests that, due to a lack of access to these ATs, access to quality education can be denied or hindered (Seale et al., 2015). Against this background, mobile devices and m-learning may provide alternative solutions to AT by providing similar support to that received by AT for SwD by means of mobile applications and downloadable software (Ismaili & Ibrahimi, 2017), thus providing further justification for the exploration of m-learning among SwD at the institution in the current study.

2.7.2 Smartphones: An AT for SwD?

Smartphones are increasingly being recognised as potential ATs for SwD. For example, smartphones have been identified as ATs that aid in the learning of hearing-impaired students (Nasir et al., 2021). Furthermore, smartphones are considered advanced forms of digital technology that can serve as AT for individuals with visual impairments as they offer accessible features and applications that aid in vision rehabilitation (Senjam, 2022). To illustrate, the experience of a visually impaired learner using 'Audible' on a smartphone during the COVID-19 pandemic showcased the usefulness of smartphones for academic purposes, emphasising their role in addressing the diverse needs of SwD (Ramli et al., 2021). In addition to the support offered to hearing and visually-impaired students, smartphones have been used as digital interventions for students with learning and intellectual disabilities, demonstrating their potential to support diverse learning needs (Alanazi, 2020; Muhibbin, 2020).

AT supports the inclusive education model at UNISA by ensuring that SwD are able to engage with m-learning platforms on an equitable basis. The above discussion regarding AT available at UNISA, emphasises how these tools provide essential support for SwD,

contributing to a more comprehensive understanding of how educational accessibility is facilitated through technology. AT acts as a critical enabler of m-learning for SwD by making m-learning accessible to them, thereby reinforcing the practical and psychological relevance of PU this study's theoretical framework.

The use of smartphones as UNISA SwD's main AT ties directly into the context and purpose of this study, given that the current research focuses on how SwD adopt and engage with m-learning platforms, assistive technology plays an integral role as it enhances accessibility, independence, and functionality (Muhibbin, 2020). AT, particularly through smartphones, provides SwD with vital tools and applications that enable them to fully participate in m-learning environments. As most SwD use their smartphones as their primary assistive device, the role of AT is directly linked to PU, a central construct in TAM. These devices and applications often bridge the gap between SwD and the educational content they need, making m-learning not only accessible but highly useful. The availability of AT enhances the perceived benefits of m-learning, thus directly contributing to higher engagement and adoption rates, which aligns with the current study's focus on understanding the psychological factors influencing m-learning use.

2.8 Summary

The chapter has traced the evolution of DE from its origins in correspondence learning to the current era of m-learning. This journey highlights the transformative impact of technology on education and highlights the educational context UNISA SwD find themselves in. The benefits of m-learning were then explored, showcasing its potential to enhance the educational experience of SwD and its ability to open new avenues for these students to achieve HE milestones. The discussion moved on to a brief discussion of the prominent psychological determinants influencing m-learning adoption, followed by challenges faced by SwD in HE, first generally, then specifically at UNISA. Barriers to participation and challenges experienced shed light on the need for more inclusive practices and awareness of SwD's needs. ATs were introduced into the discussion as were smartphones, which were then positioned as an AT for SwD. The next chapter offers an examination of the theoretical framework used in this study and describes the psychological constructs under investigation.

Chapter 3: Theoretical Framework

This chapter provides an overview of three psychological theories that are commonly used to explain human behaviour and decision-making in relation to technology acceptance: the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), and the Technology Acceptance Model (TAM). Although only TAM was adopted for this study (with an adaptation), this chapter discusses the three theories in detail with their applicability to the study of m-learning use among SwD at UNISA. The adapted TAM model is then positioned as the underlying theoretical framework and its critiques discussed.

3.1 TRA

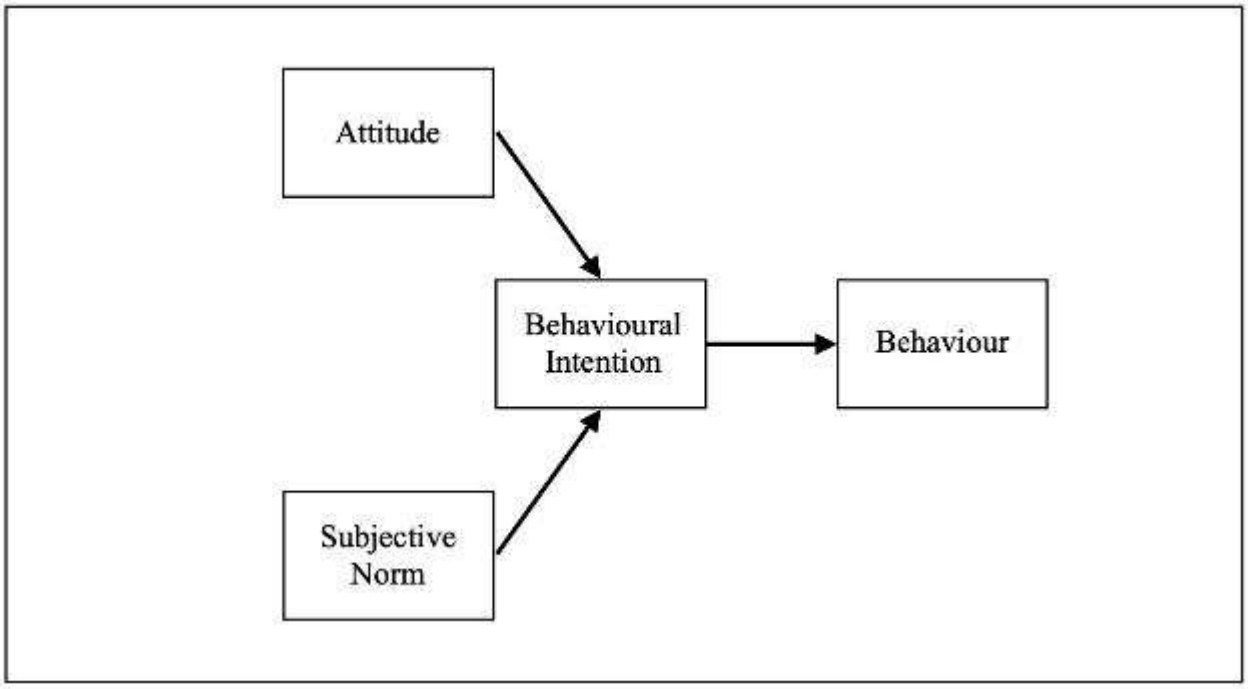
The TRA is a psychological theory which has been widely used to predict behavioural intention (BI) and actual behaviour (Madden et al., 1992). The TRA posits that salient beliefs, particularly attitudes and subjective norms, affect an individual's intention and subsequent behaviour. Subjective norms are defined as societal pressure resulting from an individual's perception of the degree to which other people (important to that individual) support the performance of a particular behaviour (Cheon et al., 2012). An individual's attitude, on the other hand, is defined as a positive or negative feeling towards the performance of a certain behaviour. It is important to note that for the purpose of this study, attitude refers to the SwD's attitude towards their use of m-learning and not their attitude towards m-learning devices themselves. This is in line with the recommendation by McGill and Klobas (2009) which suggests measuring attitudes toward the use of the object (m-learning) rather than the object itself (mobile devices). The reason is that Ajzen and Fishbein (1977) discovered that attitudes toward objects do not strongly predict specific behaviours toward the objects; rather, attitudes toward the specific behaviour determine whether the behaviour is performed. As a result, rather than studying the attitude toward the technology itself, this study was interested in the attitude towards m-learning.

According to the TRA, behaviour is preceded by BI in order to perform a given behaviour. In this regard, BI is defined as resulting from salient information (or beliefs) about the probability that performing a particular behaviour will result in a specific outcome. The prominent information and beliefs that precede BI are divided into two broad concepts: behavioural and normative beliefs (Madden et al., 1992). The behavioural beliefs influence an individual's attitude towards performing the behaviour, while the normative beliefs influence

the individual's subjective norm about performing the behaviour (Madden et al., 1992). Resultantly, according to the TRA, these beliefs affect BI and subsequent behaviour (Sheppard et al., 1988).[2] This is shown in Figure 1.

Figure 1

TRA Model



Source: Madden et al. (1992)

Three boundary conditions exist for the TRA that may affect the magnitude of the relationship between BI and behaviour (Madden et al., 1992). These conditions are as follows: the extent to which the specificity of the measures of BI and behaviour align, the stability of intentions between the measurement time and behavioural performance, and the degree to which the behavioural performance of the intention is under the individual's volitional control (Sheppard et al., 1988).

Recent studies have demonstrated the continued relevance and applicability of the TRA in understanding technology adoption, educational practices, and psychological factors among HE students. A practical example of how the TRA functions is shown by Ebardo and Suarez

[2] The TRA was developed with the assumption that the behaviours being studied were fully volitional (Sheppard et al., 1988).

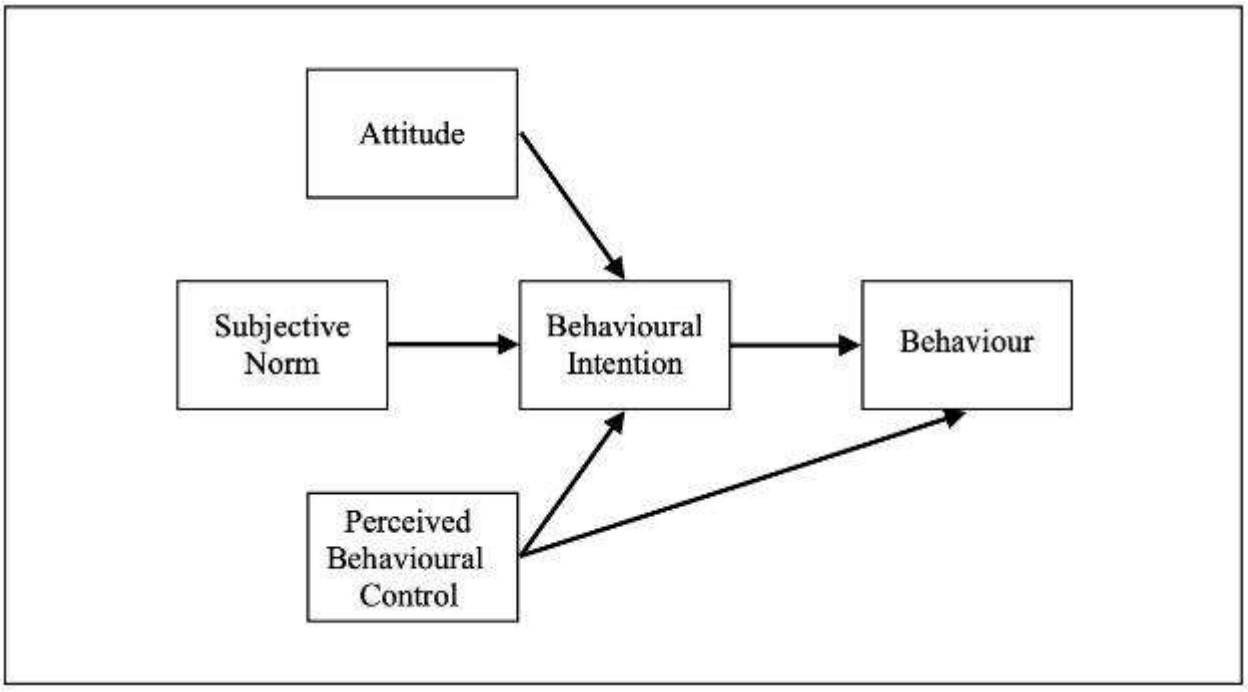
(2022), where the TRA is used to understand the adoption of educational practices and approaches. Ebardo and Suarez (2022) investigated the influence of cognitive, affective, and social needs on the adoption of mobile learning in emergency remote teaching. This study found that students' attitudes and subjective norms significantly influenced their intention to adopt mobile learning in emergency remote teaching situations (Ebardo & Suarez, 2022).

3.2 TPB

Ajzen (1985) extended the TRA by integrating Perceived Behavioural Control (PBC) as preceding and affecting both BI and behaviour. This extended model is known as the theory of planned behaviour (TPB). The addition of PBC extends the TRA's boundary conditions of volitional control (Sheppard et al., 1988). This is done by adding beliefs regarding the possession of the required resources and opportunities for performing a behaviour (Sheppard et al., 1988). Individuals with higher PBC believe that they possess more resources and opportunities (Sheppard et al., 1988). These beliefs are separated and treated as partially independent determinants of behaviour (Ajzen, 1991).

Figure 2

TPB Model



Source: Madden et al. (1992)

As seen in Figure 2, PBC acts as an external variable that directly affects BI and behaviour (Madden et al., 1992). The TPB assumes that PBC has motivational consequences for BI (Madden et al., 1992). This means that if an individual lacks the required resources and opportunities to perform a behaviour, and subsequently believes that they have little control over performing the behaviour, this may result in a low intention to perform the behaviour regardless of favourable attitudes or subjective norms (Sheppard et al., 1988).

Although slightly out of context but relevant as an example, Shmueli (2021) provides a recent example of a study which demonstrates the workings of these psychological constructs. This study utilised the TPB to explore the intentions, motivators, and barriers of the general public to vaccinate against COVID-19. Shmueli (2021) made use of an online survey conducted among Israeli adults to assess their intention to receive a COVID-19 vaccine. The survey included questions related to TPB dimensions, such as attitudes toward the vaccine, subjective norms (social pressure to get vaccinated), and self-efficacy or perceived behavioural control (confidence in the ability to get vaccinated). The results of the study showed that respondents who reported higher levels of subjective norms, indicating that they perceived social pressure to get vaccinated, were more likely to have the intention to receive the COVID-19 vaccine (Shmueli, 2021). Additionally, higher levels of self-efficacy, indicating confidence in getting vaccinated, were associated with a higher intention to receive the vaccine. This article clearly demonstrates how the TPB can be applied to understand and predict individuals' intentions towards a behaviour, in this case being vaccination against COVID-19. Similarly, the current study investigated SwD's attitude and PBC in order to explore these students' use of m-learning.

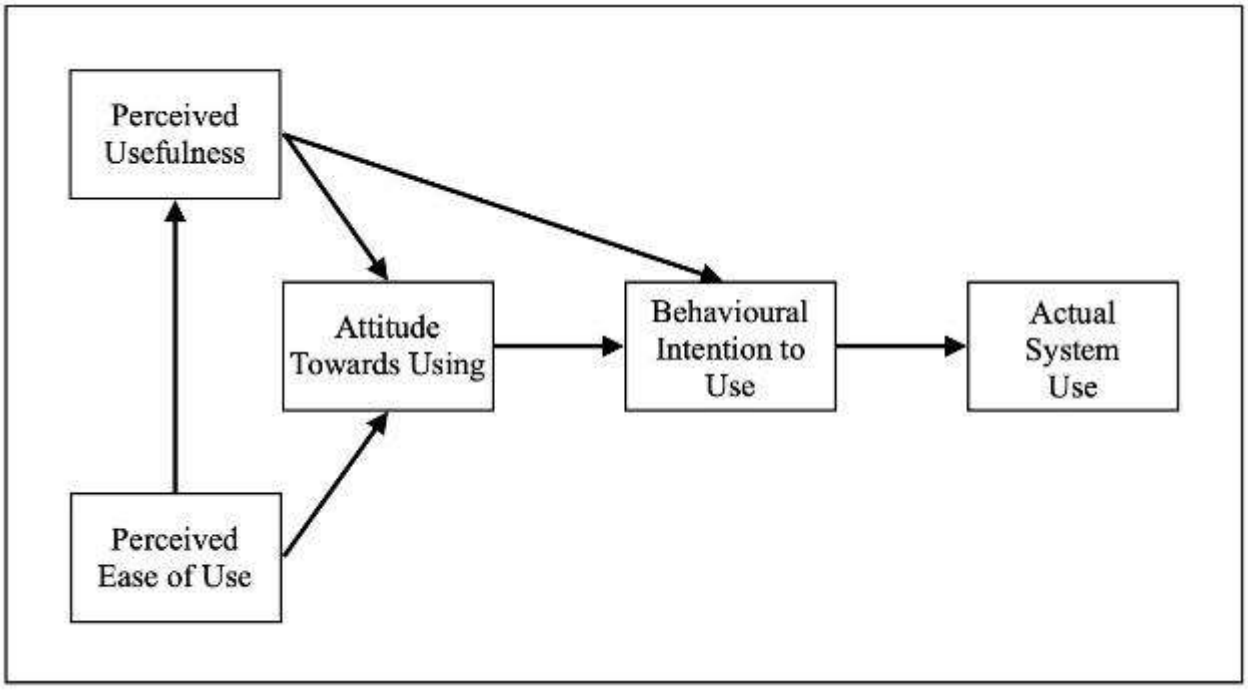
3.3 TAM

TAM is one of the most influential and frequently employed theories in information system (IS) research (Awa et al., 2011; Barki & Benbasat, 2007; Lee et al., 2003; Raza et al., 2018). It explains why users decide to accept or reject technology and helps one to trace the influence of external variables such as belief, attitude, and intention to use on this decision (Davis et al., 1989; Park, 2009). This makes it a specifically suitable framework for the current study's focus on m-learning use. As seen in Figure 3, there are two beliefs that are deemed of primary relevance to the TAM, namely PU and PEOU (Davis et al., 1989). These act as external variables that affect attitude directly, which in turn influences BI and behaviour. Besides

influencing BI indirectly through attitude, PU also has a direct impact on BI. This is shown in Figure 3.

Figure 3

TAM Model



Source: Based on Davis et al. (1989)

3.3.1 PU and PEOU

Davis (1989) defines PU as the degree to which an individual believes that using a specific IS will increase their task performance within a specific context. PU can also be understood as an individual's opinion of how much their productivity would increase if they used a particular system or technology (Lu et al., 2003; Rauniar et al., 2014). As a result, an increase in PU would result in an increase in BI (an individual's intention to use a specific IS). PEOU, on the other hand, refers to the extent to which an individual believes that using the specific IS would be effortless (Davis, 1989; Morris & Venkatesh, 2000). PEOU is thus an individual's assessment of how much effort is involved when using an IS technology (Davis, 1989). According to Al-Adwan et al. (2013), an increase in PEOU leads to an improvement of performance. In summary, according to the TAM, the PU and PEOU of a system affect an individual's attitude towards using it, which in turn affects their intention to use the system (Raza et al., 2018).

Recent studies conducted in the fields of m-learning adoption and DE have shown that the TAM constructs are suitable for investigating m-learning use amongst students. Almaiah et al. (2021) investigated students' perceptions about m-learning platforms by introducing five external factors to the TAM constructs of PEOU, PU and BI. According to the data, the TAM model is the best model for predicting the key factors that influence students' use of a mobile learning platform. The study's results revealed, among other results, that PEOU and PU had significant impacts on BI to utilise m-learning platforms. According to the results, PU is one of the most important factors influencing BI to use m-learning platforms. Students' PEOU of m-learning platforms was also found to be a significant predictor of BI (Almaiah et al., 2021).

Abdallah et al. (2021) also examined the factors that influence students' intentions to use m-learning in HE institutions by using a model based on the Unified Theory of Acceptance and Use of Technology (UTAUT) model and TAM. The results of this study showed that students' intention to use m-learning is significantly influenced by their ability to control their learning. Such a finding speaks to the construct of PBC used in the current study and suggests that learners with highly independent learning skills are more interested in using m-learning when compared to learners with low self-learning skills (Abdallah et al., 2021).

3.3.2 PBC and BI

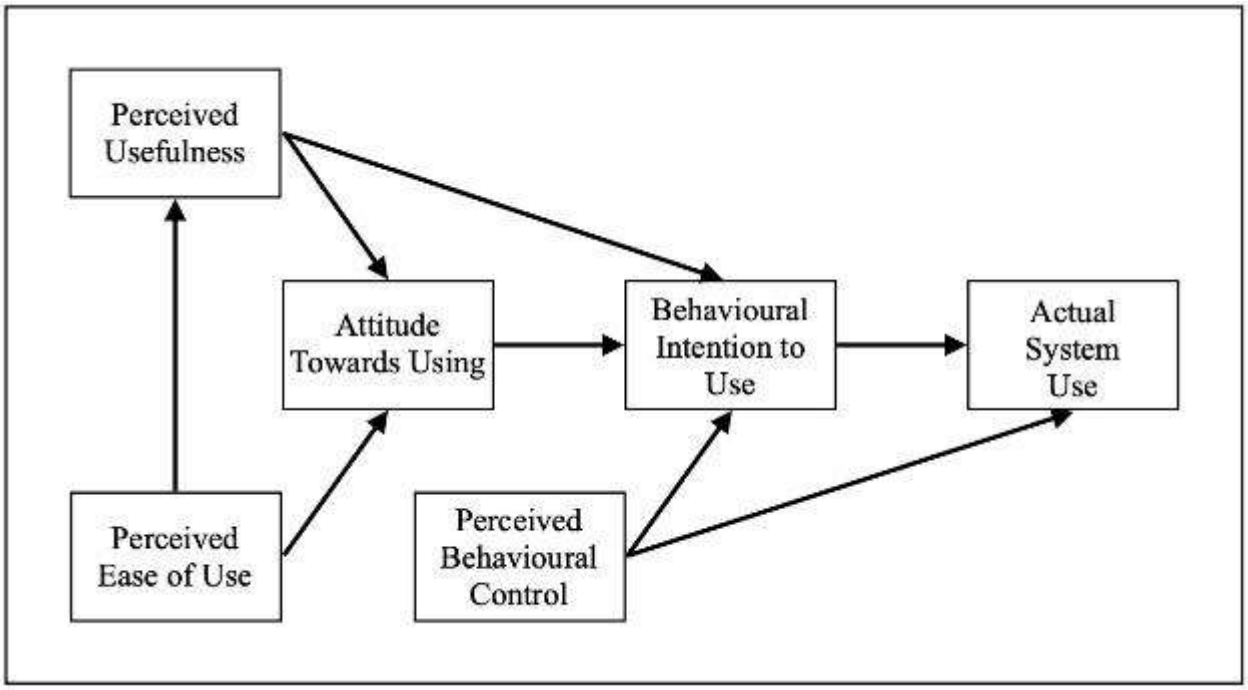
Subsequent to its inception, the TAM framework incorporated PBC as a remedy for its shortcomings, specifically in situations where individuals possess volitional agency over their behaviours (Yandra & Wijayanti, 2022). PBC is an indicator of an individual's perception of their own control or autonomy regarding their technological proficiency (Gayan Nayanajith & Damunupola, 2021). Alternatively stated, it evaluates the degree to which external conditions or factors may promote or impede the implementation and utilisation of technology. It comprises extraneous elements, including accessibility, resources, and assistance (Gayan Nayanajith & Damunupola, 2021). TAM's flexibility (further discussed in section 3.4) allows for the inclusion of additional constructs. The inclusion of PBC is crucial in considering SwD m-learning use as understanding these students' perceived control offers a more nuanced understanding of SwD's interaction with m-learning than the traditional TAM could. Past research has highlighted that an individual's behavioural control increases when they have confidence in their capacity to overcome obstacles associated with adopting a specific

behaviour (Ajzen, 1987; Hartwick & Barki, 1994; Younghwa & Kozar, 2005). In the context of m-learning, research has emphasised the crucial role of PBC in determining users' behavioural intention to engage with m-learning (Cheon et al., 2012; Hsia, 2016).

It is essential to note that a person's intention towards a particular behaviour is intricately connected to their perception of their ability to perform that behaviour successfully (Raza et al., 2018). As BI refers to the belief about the probability that performing a particular behaviour will result in a specific outcome (Madden et al., 1992), a person's intention to utilise the technology is enhanced when they perceive that they have adequate control over its operation.

Figure 4

Adapted TAM Model



In the domain of HE, researchers have extended the TAM by incorporating the construct of PBC from the TPB to explore m-learning usage among students (Cheon et al., 2012; Hsia, 2016; Raza et al., 2018). In line with this, the construct of PBC from the TPB was also adopted and combined with the TAM in this current study. The theoretical model underpinning this study therefore encompassed several psychological constructs, namely PU, PEOU, attitude, PBC, and BI. This adapted TAM was chosen for this study as PBC has shown

to be a significant construct affecting technology use in HE. As the population of interest is SwD, PBC was theorised to be a potentially important psychological factor influencing m-learning use as the control or autonomy SwD may have towards m-learning use may potentially differ for this population of students (Das, 2023; Sinha & Bag, 2023).

An example of the TAM being used in relation to SwD is a study by Yıldız et al. (2022). The researchers investigated the influential factors on e-learning adoption among university SwD, specifically focusing on the effects of different types of disabilities. The study used structural equation modelling and confirmatory factor analysis to analyse the data. The results of the study highlighted the importance of the TAM in understanding the acceptance of e-learning systems by SwD.

Another relevant study demonstrating TAM applicability in technology use research amongst SwD is that of Şahin et al. (2022), which aimed to identify the factors influencing the intention to use e-learning systems by university SwD. The study proposed an extended technology acceptance model for special education and used structural equation modelling to analyse the data. The results of the study provided insights into the factors that influence the adoption of e-learning systems by SwD.

3.4 Critique of TAM

TAM has been utilised in research to comprehend technology adoption and user behaviour and has had a significant impact. Nevertheless, similar to any theoretical framework, it has been subject to criticism and inherent limitations have been highlighted. The principal criticisms of TAM are discussed next.

One of the principal critiques levelled against TAM pertains to its simplicity. The adoption of technologies in the real world can be affected by a variety of factors that extend beyond the scope of TAM. While TAM places emphasis on internal user perceptions and attitudes, it has an absence of external variables. It frequently disregards the impact that external factors may have on the adoption of technology (Ajibade, 2018). Adoption decisions in the real world are frequently affected by economic considerations, social norms, peer pressure, and organisational policies. TAM fails to consider these external influences. Although TAM simplifies the decision-making process associated with technology adoption

by reducing it to a few variables, according to Ajibade (2018) it does capture the complexity of human behaviour.

Next, TAM operates under the assumption of linear relationships among its variables. This implies that users' intentions and behaviours are directly and unidirectionally influenced by PU, PEOU, and PBC. These relationships might be more intricate and contingent upon the circumstances than TAM suggests (Ajibade, 2018). TAM implies that all users appraise technology in an identical manner and disregards individual differences. Individual differences in cognitive styles, personalities, and prior experiences, all of which are noted to have a substantial effect on technology adoption, are not considered (Ajibade, 2018).

Thirdly, although TAM has demonstrated its utility across different contexts, it does not consistently exhibit strong predictive power to forecast real-world technology adoption patterns (Ajibade, 2018). Additional factors that were not accounted for in TAM may have a significant impact on the final results of adoption; for instance TAM does not account for the temporal dynamics of how user perceptions and attitudes may change over time (Ajibade, 2018). Users' perceptions of technology may evolve as they gain experience with it, which TAM does not capture. Cultural and contextual differences in technology adoption are also not adequately incorporated into TAM (Malatji et al., 2020). The degree to which something is deemed useful or easy to use can vary substantially between cultures and contexts.

Fourthly, although user resistance to technology adoption is a prevalent occurrence in numerous organisations, it is not explicitly addressed in TAM (Malatji et al., 2020). For a variety of factors, users may resist new technologies; however, TAM does not offer a framework for comprehending and addressing such resistance. It is crucial to note, notwithstanding these criticisms, that TAM has been modified and expanded throughout the years to rectify a portion of these shortcomings (Malatji et al., 2020).

3.5 Strengths of TAM

TAM's foundational constructs (PU, PEOU) provide a straightforward framework for assessing user attitudes towards technology. This simplicity facilitates its adoption in both academic and practical settings. With the simple structure of this model, TAM has been extensively utilised to assess technology use in various domains, including e-government

(Nurkholis & Anggraini, 2020), online banking (Vuković et al., 2019), and mobile applications (Hutomo, 2023). TAM has been proven useful in further research domains such as online transportation services, demonstrated how TAM can be used to elucidate user acceptance by examining factors such as screen design and navigation (Aulawi, 2020) and e-commerce technology use, highlighting the psychological and behavioural dimensions influencing user attitudes (Oktaria et al., 2024). These studies collectively underscore TAM's versatility and robustness in understanding technology acceptance across various sectors.

The two foundational constructs of PU and PEOU are crucial when considering how SwD engage with m-learning, as they may face unique challenges related to accessibility, adaptability, and ease of use. The construct of PU helps measure whether students believe that m-learning improve their learning experience. For SwD, this includes how well the technology compensates for or addresses their specific needs, making learning more effective and accessible (Al-Rahmi et al., 2019). PU is particularly important for SwD as they might encounter usability barriers. TAM thus allows assessing whether m-learning platforms are designed in a way that minimises difficulties and supports a smooth, intuitive learning process (Al-Rahmi et al., 2019).

One of the key strengths of TAM is its ability to predict user acceptance and usage behaviour effectively, as evidenced by Venkatesh and Davis, empirical studies that demonstrate its capacity to explain approximately 40% of the variance in technology usage intentions and behaviours (Venkatesh, 2000; Venkatesh & Davis, 2000). This predictive power is particularly valuable in rapidly evolving technological landscapes, where understanding user acceptance is crucial for successful implementation. Furthermore, TAM is widely recognised for its effectiveness in predicting technology acceptance and usage behaviour across various technological contexts. Numerous studies have validated the model's core constructs, PU and PEOU, as significant predictors of user intentions and actual usage behaviours. For instance, Salloum et al., (2019) demonstrated that PU positively influences both attitude and BI in e-learning environments, reinforcing TAM's foundational hypotheses. Similarly, Izzati et al. (2024) highlighted TAM's evolution into a robust framework capable of predicting technology adoption in educational settings, outperforming other theoretical models. The model's adaptability has also been evidenced in various domains, including mobile payments and social media, where perceived usefulness remains a critical determinant of user engagement (Allam

et al., 2024; Sleiman et al., 2021). Collectively, these results underscore TAM's enduring relevance and predictive power in understanding technology acceptance.

TAM has shown to be highly adaptable as it can be extended to include specific external factors, which could include accessibility features, assistive technologies, physical or cognitive challenges SwD face (Allam et al., 2024). Adapting TAM with constructs specific to a research case (PBC in the case of the current study) provides a deeper understanding of the barriers and facilitators of m-learning use in the given context. Extending TAM with the psychological construct of PBC accounts for SwD's perception of their ability to control or influence their use of m-learning, which is relevant in this context (Gayan Nayanajith & Damunupola, 2021). As per the definition in section 3.3.2, PBC reflects an SwD's belief about the degree to which external conditions or factors may promote or impede their use of m-learning. This construct captures factors such as accessibility, the availability of assistive tools, and the students' confidence in their ability to effectively use m-learning platforms as disabilities and environmental challenges related to disabilities are such external factors. TAM's adaptability to different contexts of technology use makes it particularly well-suited to evaluating m-learning, especially given the fast-changing technological landscape that ODeL institutions navigate in. m-Learning platforms are typically more dynamic and personal than traditional learning systems (Ye, 2024).

Additionally, TAM has been instrumental in guiding the development of new models and frameworks, such as the UTAUT, which builds upon TAM's foundational constructs while integrating additional factors that influence technology use (Alturas, 2021; Busolo et al., 2021), pointing to the strength of TAM. The ongoing evolution of TAM, including its extensions and adaptations, reflects its enduring significance in understanding the dynamics of technology use and user behaviour (Ozili, 2024). While TAM focuses on PEOU and PU, adding PBC emphasises the practical, daily challenges that SwD may face when using m-learning. It extends the analysis to include whether students believe they have the personal ability, resources, or external support to engage with m-learning at UNISA, thereby bridging usability and accessibility. PBC also taps into the psychological empowerment of SwD over their learning environment (Yandra & Wijayanti, 2022), which is crucial for ensuring that m-learning platforms are inclusive and empowering.

3.6 Summary

The TAM was adopted in the current study to explore the psychological factors (PU, PEOU, PBC, attitude) affecting SwD's m-learning use (for educational purposes). The TAM is widely used in IS research and focuses on PU and PEOU as the key determinants of technology adoption. TAM has been widely used in educational settings to study the acceptance and use of technology by SwD. With the aforementioned in mind, and considering that the TAM is commonly used by researchers and practitioners to explore acceptance (Raza et al., 2018), it seemed plausible that it could provide a strong theoretical basis for the current study. McCoy et al. (2007) alert us that it is time to employ a study programme that addresses cultural difficulties and re-examines technology-focused behavioural models to better understand technology acceptance in a variety of countries and cultural orientations. Thus the use of TAM in this novel context was deemed necessary. TAM's strengths (predictive power, simplicity, adaptability) are highlighted, as well as its applicability to the context of SwD. The adapted TAM allows for the integration of psychological, behavioural, and accessibility-related constructs, making it the most appropriate framework for studying the current study. Incorporating PBC provides a more nuanced understanding of how SwD perceive and navigate m-learning, taking into account not just the functionality of the technology but also their own sense of control over its use. By applying this theory, it was envisioned that the research could promote a better understanding of the psychological factors affecting the adoption and use of m-learning among SwD at UNISA.

Chapter 4: Methodology

This chapter commences by outlining the positivist paradigm which underpinned the study and the non-experimental, cross-sectional survey design which was adopted to collect data from SwD enrolled at UNISA. The strengths and limitations of the methodology are discussed next. The chapter continues by highlighting the research questions, which sought to gain insight into the prevalence of m-learning and its relationship with usage, PU, PEOU, PBC, and attitude. The population, sample, data collection, and data analysis are discussed next. Thereafter, details of the data management procedures and ethical considerations are provided.

4.1 Research Paradigm

The positivist paradigm (conceived by French philosopher, August Comte) and its associated ontology and epistemology underpinned the current study. This paradigm maintains that reality can be observed objectively and that human behaviour can be interpreted through observation and reason (Mack, 2010). According to Cohen et al. (2017), Comte's position led to the general doctrine of positivism which held that all genuine knowledge is based on sense experience, and can be advanced only by means of observation and experiment.

Further to this, positivist ontology is predicated on stable, law-like realities that can be explored objectively, without the researcher's subjective contribution. Its epistemology, on the other hand, emphasises a scientific method that promotes the researcher's detachment from the phenomena under examination (Tuli, 2011). This objectivist ontology and empiricist epistemology inherent in the positivist paradigm require an objective and detached research methodology and design, one which relies on testing hypotheses and measuring variables quantitatively (Sarantakos, 2005), such as that adopted in the current study. This is highlighted in the following discussion of the research design.

4.2 Research Design

A paradigm's ontology and epistemology have an impact on the type of research methodology selected, which in turn determines the research design and instruments employed (Tuli, 2011). In accordance with the positivist paradigm (and with its ontology and epistemology in mind), the researcher adopted a non-experimental, cross-sectional design in order to answer the research questions.

The objective of the non-experimental research strategy is to demonstrate a relationship between variables without attempting to manipulate any (Gravetter & Forzano, 2018). Specifically, this technique does not seek to establish cause-and-effect relationships. Within this broader design, this study applied a cross-sectional design in which data were collected from respondents at a single point in time using an online survey. Surveys were considered well suited in the current study to investigate the use of m-learning amongst SwD, as they are relatively efficient ways to gather large amounts of information (Gravetter & Forzano, 2018).

Moreover, this design allowed the researcher to investigate the use of m-learning without directly observing or interfering with the phenomenon (Whitley & Kite, 2018). By asking a sample of study respondents questions and then generalising the results to the population from which the sample was drawn, surveys provide a quantitative account of a study population's attitudes and opinions which are not normally observable (Whitley & Kite, 2018). In addition, this design was a good fit for this study as it was non-threatening to respondents, as well as convenient and anonymous.

4.2.1 Methodology Strengths and Limitations

A non-experimental, cross-sectional research design using a self-report questionnaire was chosen for investigating m-learning among SwD for its ability to capture a snapshot of the current state of m-learning use and the psychological constructs influencing it. This design allows for the collection of data from a diverse population at a single point in time, facilitating the exploration of relationships between variables without the need for manipulation or control of conditions, which is particularly important in educational research where ethical considerations must be prioritised (Chao, 2019). Moreover, self-report questionnaires are effective in gathering subjective data on students' perceptions, attitudes, and experiences regarding m-learning, which are critical for understanding the psychological constructs at play (Ebardo & Suarez, 2022; Wells & Ngubane-Mokiwa, 2021).

However, the methodologies employed in this study also present certain limitations. The non-experimental design restricts the ability to establish causal relationships, as it does not allow for the manipulation of variables (such as PU, PEOU and PBC) or the control of extraneous factors that may influence the outcomes (Martínez et al., 2020). Extraneous

variables, which are factors that are not under investigation, may influence the results of the m-learning questionnaire. Possible extraneous variables include respondent mood, level of anxiety, physical location or situational variables such as the time of the day or whether others are present during questionnaire completion. Additionally, self-report questionnaires are susceptible to biases such as social desirability and recall bias, which can distort the accuracy of the data collected (Zhang et al., 2021). Furthermore, the cross-sectional nature of the study limits the understanding of changes over time, which is particularly relevant in the context of m-learning, where technological advancements and shifts in educational practices may rapidly alter the landscape (Atan & Shahbodin, 2018; Naciri et al., 2020).

4.3 Research Aim and Objectives reiterated

Overall, this study sought to gain insight into m-learning amongst SwD at UNISA and the psychological factors (inherent in the TAM) affecting m-learning use. With this aim in mind, the following research objectives were envisioned:

1. Determine the prevalence of m-learning use amongst SwD enrolled at UNISA;
2. Examine the relationship between m-learning usage and key constructs in the TAM (i.e., PU, PEOU, PBC and attitude);
3. Establish whether these key constructs; PU, PEOU, PBC and attitude differ significantly by m-learning device; and
4. Determine whether these key constructs; PU, PEOU, PBC and attitude differ significantly by disability.

4.4 Population

This study focused specifically on SwD registered for a formal qualification at UNISA in 2023. It is this group of students who formed the target population to which the researcher aimed to generalise the results (N = 2,808). Their types of disabilities ranged from diabetes to quadriplegic, whereas 16% (n = 463) of SwD chose not to disclose the nature of their disability. This was followed by 10% (n = 289) of SwD who indicated disabilities associated with diabetes, 10% (n = 246) reported muscular/skeletal/joint/limb disorders, and 9% (n = 246) had visual impairment that makes reading difficult. Further disabilities are tabulated below.

Table 1

SwD Headcounts

Type of Disability	2021	2022	2023
Disabilities not mentioned/Undisclosed	500	505	463
Diabetes	325	322	289
Muscular/Skeletal/Joint/Limb	325	324	269
Visually Impaired: Read Difficult	283	287	246
Mental/Chemical Disorders/Phobia	179	233	208
Epilepsy	214	223	205
Visually Impaired: No Audio SM*	161	160	139
Dyslexia/Learning Problems	108	120	117
Hearing: SM Transcribed**	150	139	112
Paraplegic	124	118	111
Visually Impaired: Blind	93	97	93
Neurological Diseases	84	87	84
Serious Chronic Diseases	84	93	80
Deaf	67	70	68
Wheelchair: access	53	71	58
Multiple Disabilities	49	55	54
Communication/Speech Problem	37	43	46
Cerebral Palsied	43	51	44
Cardio-vascular diseases	40	38	39
Kidney/Blood Deficiencies	30	35	31
Stroke/Brain Disorders	40	41	27
Quadriplegic	26	30	25
Total	**3,015**	**3,142**	**2,808**

Source: Ebardo & Suarez (2022), Wells & Ngubane-Mokiwa (2021)
* No Audio SM: Individual does not use audio sensory modalities, such as speech output devices or auditory cues, for support or navigation.
** SM Transcribed: Spoken content is transcribed into written text, facilitating accessibility for individuals who are deaf or hard of hearing.

4.5 Sample

As SwD constitute a small population of UNISA students (Letseka & Ngubane, 2023), with only 0.86% of UNISA students having reported living with a disability, it was necessary

to sample all SwD at UNISA. As such, this study made use of a census sampling technique. Based on a 5% margin of error, a 95% confidence level, and a population size of 2,808, a representative sample of 339 learners was desired (see http://www.raosoft.com/samplesize.html). However, only 247 respondents started the online questionnaire. Of these 247 responses, 27 responses contained substantial missing data and were therefore discarded. This resulted in a sample of 220 students and a final response rate of 7.83%.

4.5.1 Demographic Profile

The gender distribution of the respondents revealed that the majority were female (*n* = 148; 67.3%), while 30% (*n* = 66) identified as male, 1.4% (*n* = 3) as non-binary, and 1.4% (*n* = 3) preferred not to disclose their gender. The age of the respondents ranged from 19 to 66 years. Furthermore, the sample composition included 79.5% (*n* = 175) undergraduate students and 20.5% (*n* = 45) postgraduate students. Respondents were registered for a minimum of one year and a maximum of ten years (SD = 2.34). Demographic information, such as gender, age, race and home language, was collected in order to describe the sample of SwD. Figures 5 and 6 below depict the race and home language distribution of respondents respectively.

Figure 5

Race Distribution

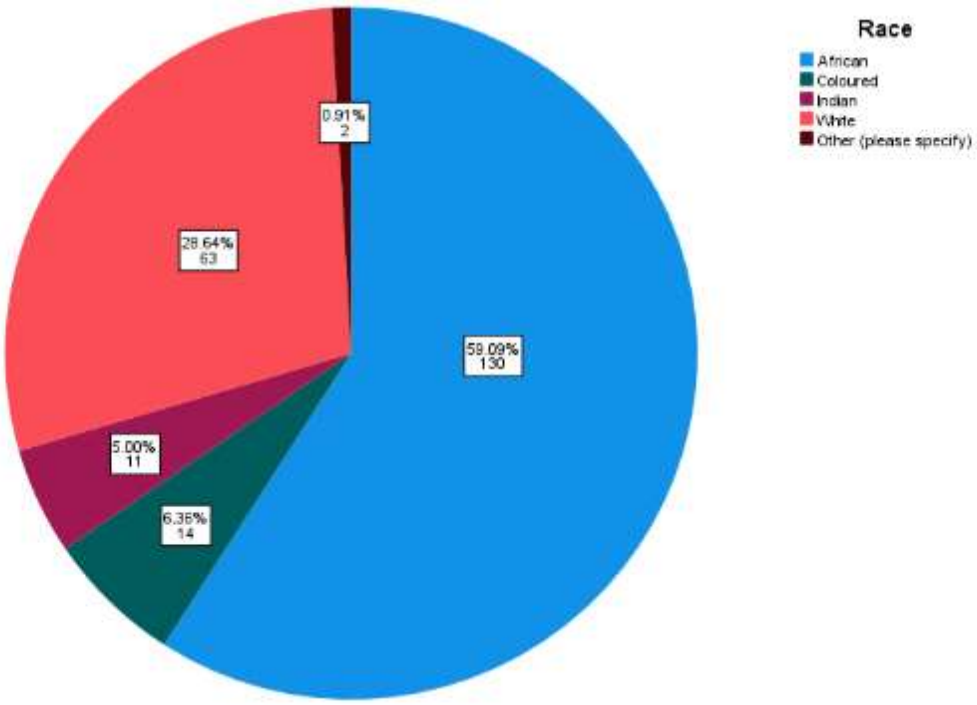


Figure 5 offers a view of the distribution of race amongst the SwD who participated in the study. The majority of respondents were of African descent, making up 59.09% (*n* = 130) of the respondents. This is followed by white participants, making up 28.64% (*n* = 63) as the second largest group. A total of 6.36% (*n* = 14) of the population surveyed were Coloured, and 5% were Indian (*n* = 11). In addition, 0.91% (*n* = 2) of the respondents identified themselves as from another race.

Figure 6

Home Language Distribution

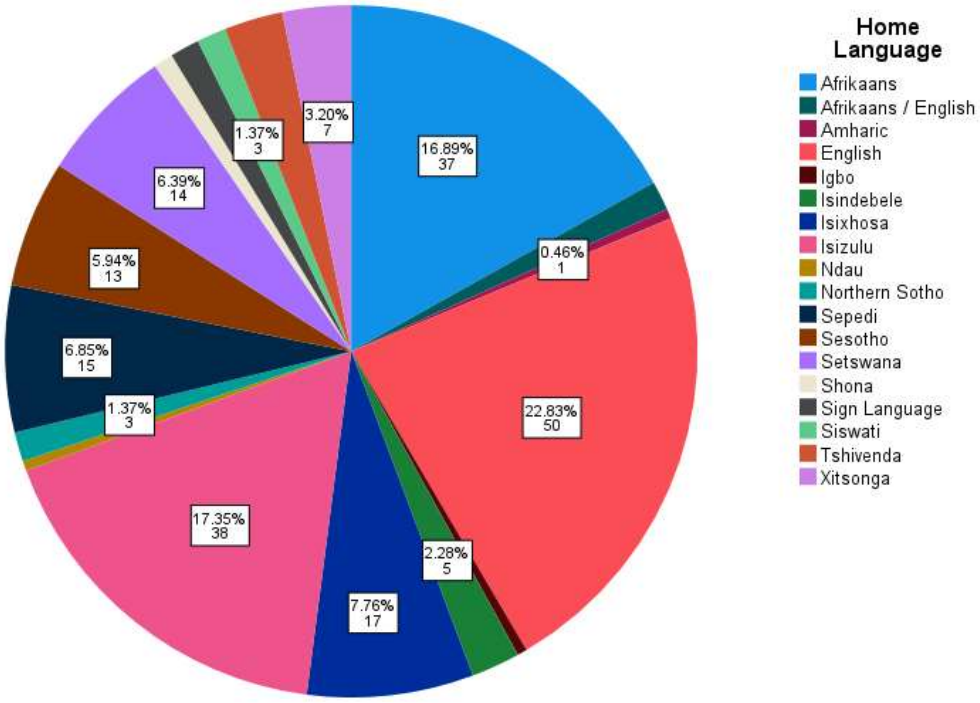


Figure 6 displays the home languages of the respondents. English made up the largest segment of the respondents with 22.83% (*n* = 50). In descending order 17.35% (*n* = 38) of the respondents' home language was Isizulu, 16.89% (*n* = 37) was Afrikaans, with IsiXhosa making up 7.76% (*n* = 17) of the respondents.

4.6 Data Collection

Upon receiving the necessary clearances from the institution (i.e. ethical clearance from the college/department and research permission from the Research Permission Subcommittee, the researcher used the appropriate channels (i.e. the ICT gatekeepers) to distribute the invitation e-mail which contained a link to the online survey. Invitations to participate were sent to the population of 2,808 SwD in June 2023. The researcher provided a brief explanation of the study in the invitational e-mail along with the informed consent (Appendix C) and the link that connected recipients to the online survey.

The data were collected using Qualtrics XM, an online, research-based website that helps create and host surveys (https://www.qualtrics.com). Each respondent was assigned a unique number with no identifying information asked. Respondents were asked to complete

different sections in the survey; demographics, an m-learning questionnaire, and items pertaining to PU, PEOU, PBC, BI and attitude. The questionnaire remained open for a period of two months from July 2023 to September 2023 and respondents were able to complete the questionnaire at any time during this timeframe. Two weeks after the initial e-mail, a reminder e-mail was sent.

4.6.1 Development of the Research Instrument[3]

The research instrument developed by Hsia (2016) was used in the current study. Hsia's (2016) survey adopted the same specific constructs from the TAM used in this study, namely PU, PEOU, PBC, and BI. The m-learning attitudes scale (Al-Emran et al., 2016) was also included to assess the sample's attitude (towards m-learning[4]). Each scale produced a composite score per respondent, which was then used to analyse the data and answer the research questions. A demographics section was also included in the survey to gain a sense of the sample under study.

In order to align the survey instrument with the specific context and objectives of this study, the researcher carefully reworded items from the original questionnaires measuring the constructs under investigation (see Appendix D). This adaptation process ensured that the questions were relevant and directly applicable to the unique aspects of the study. By tailoring the wording of these items, the researcher aimed to enhance the accuracy of the data collection, as well as make the items easy to understand for respondents, allowing the researcher to obtain valuable insights pertinent to the research goals.

4.6.2 Demographic Information Items

As mentioned above, a demographic section was included in the questionnaire which gathered information pertaining to a respondent's age, gender, race, home language, qualification enrolled for, and type of disability. Collecting demographic information was essential for understanding the characteristics of the study sample, controlling for potential confounding variables, ensuring the generalisability of results, and potentially informing policy

[3] Both the supervisor and co-supervisor were consulted during the refinement of the instrument and the subsequent analyses. Both supervisors have extensive knowledge in quantitative methodologies and substantial experience in analysing such data. Resultantly, no statistician was required.

[4] All respondents were provided with a definition of m-learning (as well as examples of mobile devices) to ensure that all respondents had the same working definition of this concept in order to reduce miscommunication.

and interventions. It also plays a crucial role in the scientific rigour and ethical conduct of research (Call et al., 2022). Additionally, including demographics enhances transparency and allows readers to assess the applicability of the study results to different populations.

4.6.3 m-Learning, PU, PEOU, Attitude, BI and PBC

As reiterated throughout this text, the TAM and its inherent constructs (PU, PEOU, attitude and BI) were adopted in the current study in an attempt to understand SwD's adoption of m-learning at UNISA. In order to determine m-learning prevalence, the following question was included in the survey: "How often do you use m-learning for your UNISA studies?" PU, on the other hand, was measured using 5 Likert scale items, where response categories range from *'strongly disagree'* to *'strongly agree'*. Sample items include 'I believe that m-learning can enhance my academic performance' and 'I believe that m-learning can increase my academic productivity'. PEOU was also measured using 5 Likert-scale items, with sample items including 'I think learning to use m-learning is very simple' and 'It is easy for me to become skilful at using m-learning'.

In order to determine the respondent' attitudes towards using m-learning, a 10-item Likert scale questionnaire developed by Al-Emran et al. (2016) was adopted. This scale investigates a respondent's attitude towards the use of m-learning in HE specifically. Sample items include 'Mobile technology is a useful tool for my study' and 'Mobile technology offers opportunities for communication and team-working'. These items have demonstrated acceptable levels of reliability among a sample of 383 students, with a reported reliability coefficient of .89 (Al-Emran et al., 2016). Similar reliability indices were evident among the current sample of SwD, as seen in Table 2.

Considering the online nature of UNISA, the use of m-learning was implied. Resultantly, rather than measuring a student's behavioural intention to use m-learning in the future (i.e. BI), the item contained in the survey was focused on ascertaining continuance intention (CI). PBC was also included in the questionnaire, and these items were also adopted and paraphrased from Hsia's (2016) instrument. This construct exhibited acceptable levels of reliability among the sample. This is reported in Table 2 below, along with the other constructs' reliability coefficients.

Table 2

Cronbach's Alpha Coefficients derived from the Current Research

Construct	Cronbach alpha coefficient (α)
Perceived ease of use (PEOU)	0.91
Perceived usefulness (PU)	0.95
Perceived behavioural control (PBC)	0.91
Attitude	0.93
Behavioural intention to use (BI)	*

*Cronbach's alpha could not be computed as there was only one item measuring

4.7 Data Analysis[5]

A frequency analysis was conducted to explore the prevalence of m-learning among the sample of SwD. Another frequency analysis reported how often SwD use m-learning. These two frequency analyses were used to answer the first research question: What is the prevalence of m-learning at UNISA amongst SwD? In order to answer the second research question: What is the relationship between m-learning usage, PU, PEOU, PBC and attitude, a Spearman's Rho correlation was conducted. This statistical test was chosen for its ability to assess the strength and direction of monotonic relationships between variables when data does not meet the assumptions of parametric tests (Field, 2017). For the purpose of answering the third research question: Does PU, PEOU, PBC and attitude significantly differ by m-learning device, a Kruskal-Wallis was conducted, followed by another Kruskal-Wallis to answer the fourth research question: Does PU, PEOU, PBC and attitude significantly differ by disability?

4.8 Data Management

The data were collected automatically online using Qualtrics XM software (www.qualtrics.com/uk/) and saved to an Excel file. The data were downloaded and securely saved in Google Drive. Access to the raw data was and will be restricted to the researcher's e-mail account and password, which are only accessible to the researcher and the supervisors. Additionally, all study-related documents have been saved in a password-protected folder which is also only accessible to the research team.

[5] See Footnote 3 (page 44).

4.9 Ethical Considerations

The researcher gained research ethics clearance to conduct the study from UNISA's Department of Psychology and College of Human Science Ethics Committee (Ref #: 2020-PsyREC-67141242). This committee reviewed the low-risk application in compliance with the UNISA Policy on Research Ethics on the Standard Operating Procedure on Research Ethics Risk Assessment. Ethics approval was granted from 14 May 2020 to 31 August 2023. The researcher also received written permission to conduct research involving UNISA students. The application regarding this permission was considered by the Research Permission Subcommittee (RPSC) of the UNISA Senate, Research, Innovation, Postgraduate Degrees, and Commercialisation Committee (SRIPCC) on 28 July 2020 (Ref #: 2020_RPSC_024). Research permission was granted from 11 August 2020 until 31 August 2022.

Ethical frameworks in research involving vulnerable populations such as SwD require a strong emphasis on the importance of informed consent, autonomy, and the minimisation of harm (Brown, 2015; McDonald & Kidney, 2012). The current study was deemed to be low risk by the RPSC as pertaining to foreseeable harm to respondents. While some studies highlight the nuanced ethical dilemmas that can arise in such contexts, particularly regarding the balance between protection and autonomy (Newcombe, 2022), the current study utilising an online survey facilitated a straightforward ethical process. The anonymity and accessibility of online questionnaires reduced the potential for coercion and enhanced participant comfort, which is critical when engaging with marginalised groups (Young-Pelton & Dotson, 2017).

The respondents were informed that this study was voluntary. Voluntary participation in research studies refers to the process by which individuals willingly agree to take part in a study without any form of coercion or undue influence (Makumbi et al., 2024). This concept is rooted in ethical principles that prioritise the autonomy and informed consent of participants. In addition to merely signing an agreement, voluntary participation in a study encompasses a broader understanding of the participant's ability to make an informed decision based on their comprehension of the study's nature, risks, and benefits (Kazembe et al., 2022; Makumbi et al., 2024). Respondent were required to consent electronically by selecting the appropriate action. This was done by indicating their consent by selecting the appropriate choice when asked whether they would participate. Those who wished to participate in this study were required to first read the aim of the study as well as the terms and conditions of participation. The consent

form outlined the research in basic, clear language. Respondents had the right to withdraw their consent and to withdraw themselves from the study without penalty. This was clearly stated in the cover letter accompanying the invitation e-mail. Respondents who agreed to participate were provided access to the online survey.

All the information collected was treated confidentially. This means that respondents' information will be safeguarded. Confidentiality refers to anonymisation or pseudonymisation of data, secure storage of information, and limited access to data to the researcher alone (Czarnota-Bojarska, 2021; Surmiak, 2020). All responses to the online questionnaire were anonymous as respondents were not required to reveal any personal details (such as their names, surnames, student numbers or ID numbers). Ensuring the anonymity of respondents refers to the act of protecting individuals' identities and personal information from being disclosed. Anonymity is defined as the state in which respondents could not be identified within a group, thereby safeguarding their privacy and encouraging honest participation (Chagas et al., 2024; Ibbett & Brittain, 2020). There were no other data collection methods employed that could have jeopardised the confidentiality or privacy of respondents.

4.10 Summary

The current study was conducted within the positivist paradigm, which is usually associated with the reliability and validity of instruments and data, quantitative data collecting and analysis methodologies, and the generalisability of results. From within this broader framework, an online survey questionnaire was adopted which collected demographic information from over 220 respondents and measured each of the constructs in the research model. The non-parametric statistical analyses chosen to answer the research questions were discussed, and the results are presented in the next chapter. Chapter 4 concluded with a description of the data management and ethical considerations observed.

Chapter 5: Data Analysis and Results

The first chapter presented the research aim and objectives, as well as briefly introducing the reader to the research context and methodology. Chapter 2 discussed the literature on DE and m-learning and provided an overview of the challenges SwD face in HE. TAM's development and constructs were explained in the third chapter. Before delving into the population and sample of UNISA SwD, Chapter 4 outlined the use of the positivist paradigm and non-experimental research strategy. Against this backdrop, this chapter first restates the research aim and questions, before describing the data analysis strategy. Following that, the reader is guided through the statistical procedures used to answer the research questions.

5.1 Research Aim and Questions Restated

The current research aimed to explore m-learning among SwD at UNISA as well as to examine the psychological constructs affecting these students' m-learning use. Consequently, this study investigated whether PU, PEOU, PBC, and attitude differ significantly by m-learning device and disability. The following research questions underpinned the study:

1. What is the prevalence of m-learning at UNISA amongst SwD?
2. What is the relationship between m-learning usage, PU, PEOU, PBC and attitude?
3. Does PU, PEOU, PBC and attitude differ significantly by m-learning device? And lastly,
4. Does PU, PEOU, PBC and attitude differ significantly by disability?

5.2 Data Analysis Plan

To commence data analysis, the researcher began by assessing the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity to assess the suitability of the data for factor analysis. This was followed by an exploratory factor analysis (EFA) where the pattern matrix was examined to identify latent factors and their respective variable loadings. Subsequently, internal consistency was evaluated using Cronbach's Alpha, a crucial measure for assessing the reliability of the constructs (Field, 2017). Following the exploration of these psychometric properties, parametric assumptions were tested against the dataset; normality, homoscedasticity (i.e. equal/similar variances), independence, and interval/ratio data.

Following these preliminary steps, the researcher addressed the research questions. The first research question was answered using a frequency analysis, providing insights into the distribution of categorical data. To answer the second research question, a Spearman's rho correlation was employed to examine relationships between the non-normally distributed variables. The third and fourth research questions were answered using an independent-samples Kruskal-Wallis test to investigate differences between multiple groups on non-normally distributed dependent variables. This approach ensured a systematic and robust analysis, extracting meaningful insights from the data and facilitating a comprehensive analysis to answer the research questions.

5.2.1 Validity and Reliability

As mentioned above, prior to answering the research questions, the researcher assessed the psychometric rigour of the questionnaire by exploring the validity and reliability using an EFA. An oblique (oblimin) rotation method was used as it allows the extracted factors to be correlated. A principal components analysis extraction method was used to identify underlying factors in a dataset. This method aims to maximise the variance explained by the extracted factors. Next the reliability of the dimensions revealed in the EFA were tested using the Cronbach's Alpha measure of internal consistency. Descriptive and inferential statistical analyses were then employed to analyse the data according to the research questions.

5.2.1.1 EFA

The pre-validation results indicate that the dataset is well-suited for factor analysis due to the high KMO value and the significant Bartlett's Test, as is shown in Table 3. These results imply that there are meaningful relationships among the variables, making it appropriate to explore underlying factors or dimensions within the data (Field, 2017).

Table 3

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.928
Bartlett's Test of Sphericity	Approx. Chi-Square	4261.578
	df	300
	Sig.	.000

Table 4 provides data on the eigenvalues and the total variance explained, indicating the percentage of variance explained by the derived factors. This metric serves to indicate the extent to which the factors account for the original variance. Results revealed that the first four components had eigenvalues ≥1 and explained a significant portion of the total variance in the data (72.3%), with component one explaining 48.24% of the variance in the dataset, component two explaining 11.28%, component three 8.18%, and component four 4.60%.

Table 4

Total Variance Explained

Component	**Eigenvalue**	**Variance explained**	
		% of Variance	**Cumulative %**
1	12.061	48.244	48.244
2	2.819	11.277	59.521
3	2.045	8.179	67.700
4	1.151	4.603	72.303
5	.735	2.939	75.242
6	.652	2.607	77.849
7	.603	2.413	80.262
8	.546	2.183	82.445
9	.518	2.073	84.518
10	.434	1.738	86.256
11	.390	1.559	87.815
12	.369	1.475	89.291
13	.329	1.316	90.606
14	.304	1.214	91.821

15	.278	1.113	92.934
16	.276	1.104	94.038
17	.244	.978	95.015
18	.228	.912	95.927
19	.219	.876	96.803
20	.187	.749	97.552
21	.148	.591	98.143
22	.143	.570	98.713
23	.127	.507	99.220
24	.111	.445	99.664
25	.084	.336	100.000

The following pattern matrix visually tabulates the factor loadings of the survey items on the identified (latent) factors. Higher factor loadings indicate a stronger relationship between the variable and the latent factor (Field, 2017). Results from the pattern matrix revealed that the same structure, as reported on in the literature (Al-Emran et al., 2016; Hsia, 2016), was evident among the sample of SwD at UNISA, thereby attesting to validity of these constructs. This is shown in Table 5.

Table 5

Pattern Matrix from the EFA

	Attitude	**PBC**	**PU**	**PEOU**
m-Learning helps me to develop my learning skills.	0,843			
Mobile apps help me to manage my studies.	0,827			
m-Learning brings many opportunities to the learning process.	0,823			
m-Learning helps me find resources related to my studies.	0,808			
m-Learning offers opportunities for communication and team-working.	0,788			
m-Learning helps me to access the course-material anytime, anywhere.	0,734			

m-Learning helps me to do my coursework.	0,734			
m-Learning helps me to exchange the course-material with my friends.	0,722			
m-Learning is an easy way to get feedback and notifications from my instructors.	0,681			
m-Learning is a useful tool for my studies.	0,393			
I have sufficient self-confidence to use m-learning.		0,826		
I have sufficient knowledge to use m-learning.		0,818		
I have sufficient ability to use m-learning.		0,808		
I have sufficient control to use m-learning.		0,805		
I am able to use m-learning well for my studies.		0,569		
I believe that m-learning enhances my learning effectiveness.			-0,920	
I believe that m-learning increases my academic productivity.			-0,882	
I believe that m-learning enhances my learning efficacy.			-0,877	
I believe that m-learning enhances my academic performance.			-0,876	
I believe that m-learning is useful for my studies.			-0,833	
It's easy for me to become skilful at using m-learning.				-0,871
Learning to use m-learning is very simple.				-0,848
I think using m-learning is easy.				-0,815
My interaction with m-learning is clear and understandable.				-0,571
It is easy to use m-learning to accomplish my study tasks.				-0,566

Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization.

5.2.1.2 Internal Consistency

The Cronbach's Alpha coefficient (α) was then used to assess the internal consistency of the constructs revealed in the EFA. This assessment gauged the collective coherence of the

item sets, revealing the extent to which the questionnaire items consistently capture a unified underlying construct. The Cronbach's Alpha coefficient is interpreted as follows (Field, 2017):

- a coefficient less than .70 indicates low reliability (suggesting that the items in the scale may not be consistently measuring the intended construct);
- a coefficient between .70 and .90 signifies moderate reliability (which is generally acceptable for most research purposes and indicates a moderate level of internal consistency); and lastly
- a coefficient equal to or greater than .90 suggests high reliability.

Results from this part of the psychometric analyses revealed high levels of reliability among the latent constructs; the attitude domain exhibited an excellent level of internal consistency among the 10 items (α = .931). Similarly, the construct of PBC exhibited excellent internal consistency among the five items in its scale (α = .909). Furthermore, the Cronbach's Alpha coefficients for PU and PEOU indicated strong internal consistency among each of the five items in their respective scales (α = .947; α = .906, respectively), suggesting that these items consistently measured PU and PEOU.

Table 6

Reliability coefficients

Construct	***A***	**Number of Items**
Attitude	.931	10
PBC	.909	5
PEOU	.906	5
PU	.947	5

5.2.2 Assumption Checking

It is crucial to check the assumptions before deciding on the appropriateness of a statistical test (Field, 2017). Parametric tests performed on non-parametric data are likely to produce inaccurate results. For this reason, prior to conducting the descriptive or inferential analyses to answer the research questions, the parametric assumptions were envisioned; normality, equal variance, independence, ratio/interval data. To commence assumption checking, the researcher assessed the distribution of the data.

5.2.2.1 Normal Distribution

The distribution of the data was determined using a Kolmogorov-Smirnov (K-S) test. Field (2017) indicates that a significant *p*-value (<.05) suggests that the data are significantly different from a normal distribution and has thus violated the assumption of normality. Results from the current K-S test revealed that attitude, PBC, PEOU, and PU were significantly non-normal ($p < .01$). This result is shown in the Table 7.

Table 7

Testing normality – The Kolmogorov-Smirnov test

Construct	**Statistic**	***df***	**Sig.**
Attitude	.131	199	<,001
PBC	.114	199	<,001
PU	.146	199	<,001
PEOU	.095	199	<,001

In order to corroborate the K-S test results, the measures of skewness and kurtosis were also assessed to establish the distribution of the data (Field, 2017). These statistics were calculated by dividing the respective scores by their standard errors (*SE*) in order to calculate standardised *z*-scores. These *z*-scores were then compared to the suggested cut-offs as indicated by Field (2017); a value greater that 1.96 is significant at $p < .05$, above 2.58 is significant at $p < .01$, and above 3.29 is significant at $p < .001$. These values were used as a cut-off for identifying outliers. Table 8 provides these statistics along with other commonly reported statistics, such as the means and standard deviations.

Table 8

Descriptive Statistics for the Main Variables

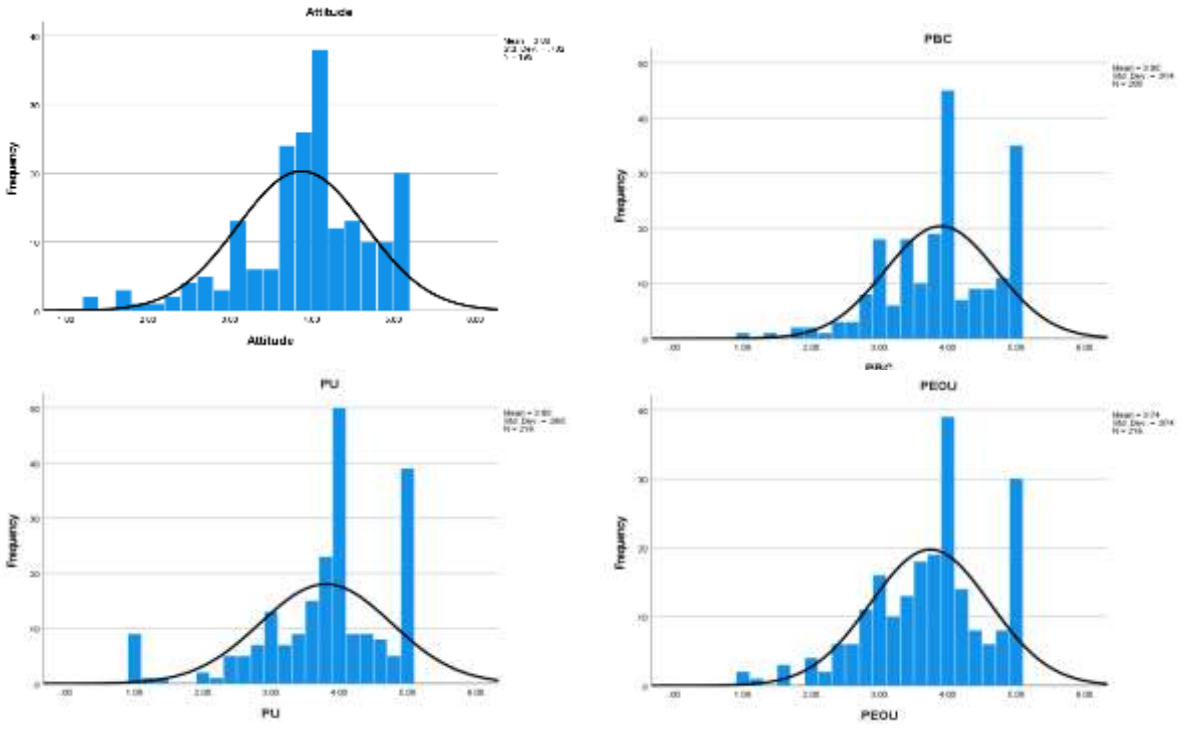
		Statistic	Std. Error	*z*-score
Attitude	Mean	3.8769	.05546	
	Median	4.0000		
	Variance	.612		
	Std. Deviation	.78236		
	Minimum	1.30		
	Maximum	5.00		
	Range	3.70		
	Skewness	-.858	.172	-4.99
	Kurtosis	1.005	.343	2.93
PBC	Mean	3.9106	.05658	
	Median	4.0000		
	Variance	.637		
	Std. Deviation	.79813		
	Minimum	1.40		
	Maximum	5.00		
	Range	3.60		
	Skewness	-.424	.172	-2.47
	Kurtosis	-.185	.343	0.54
PU	Mean	3.8291	.06713	
	Median	4.0000		
	Variance	.897		
	Std. Deviation	.94695		
	Minimum	1.00		
	Maximum	5.00		
	Range	4.00		
	Skewness	-1.068	.172	-6.21
	Kurtosis	1.435	.343	4.18

PEOU	Mean	3.7528	.06163	
	Median	3.8000		
	Variance	.756		
	Std. Deviation	.86945		
	Minimum	1.00		
	Maximum	5.00		
	Range	4.00		
	Skewness	-.511	.172	-2.97
	Kurtosis	.054	.343	0.16

The researcher applied two more measures to inspect the distribution of the data, namely the inspection of histograms and Q-Q plots. Histograms with the normal distribution curve overlaid are shown below and indicate that the data are not normally distributed.

Figure 7

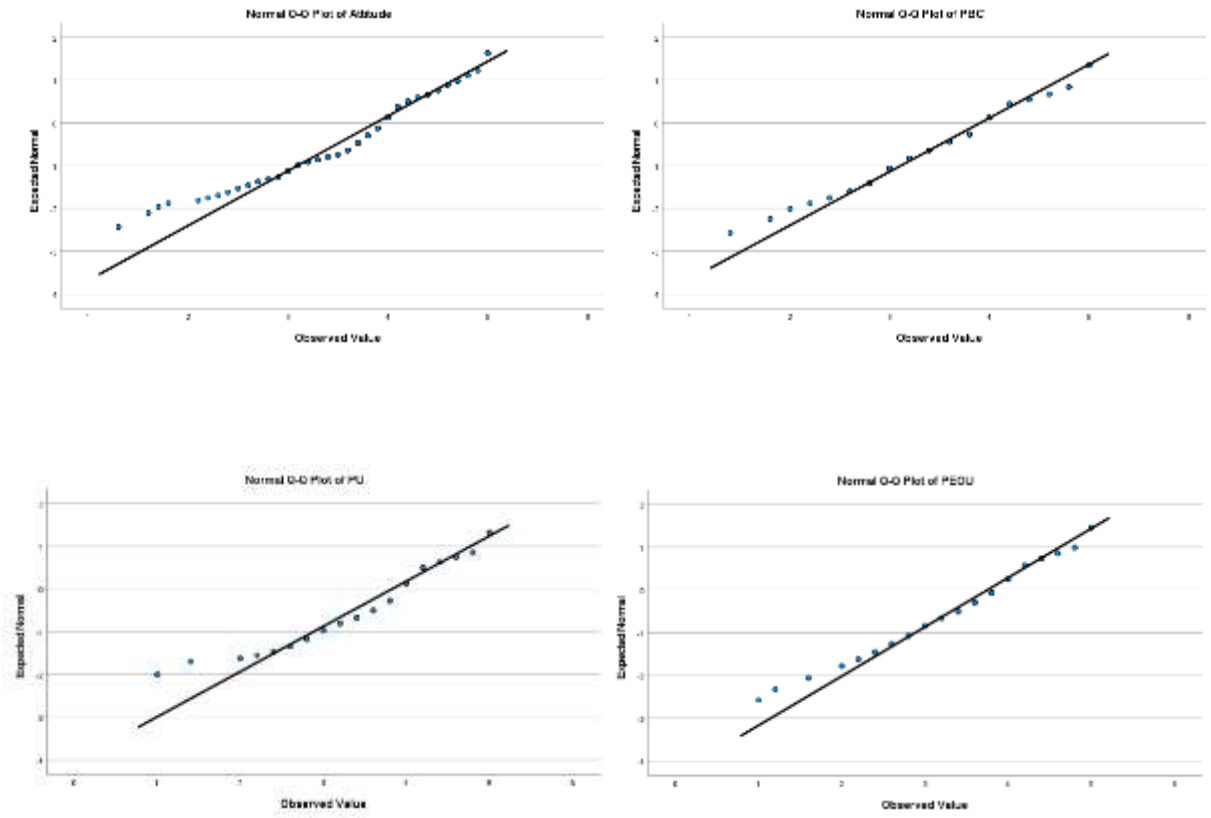
Histograms: Attitude, PBC, PU, PEOU



The Q-Q plots for the constructs under investigation show that the data are not normally distributed as the points on the plot do not closely follow the straight line (Field, 2017). Deviations from the line indicate departures from a theoretically normal distribution. This can be seen in the Figure 8.

Figure 8

Q-Q Plots: Non-normally Distributed



Due to the results contained in the K-S test, the histograms and the Q-Q plots, all of which have indicated that the assumption of normality has been violated, further assumption testing was not necessary (i.e. checking homoscedasticity, independence, ratio/interval data). As a result, non-parametric tests were adopted to answer the research questions. These are presented next.

5.3 What is the Prevalence of m-Learning at UNISA amongst SwD?

The majority of respondents reported engaging in m-learning activities on a daily basis (67.3%; n = 148). When considering those who engage with m-learning either *daily* or *every*

few days, it is evident that a large majority of SwD at UNISA use m-learning (n = 199; 90.5%). A smaller but notable segment of respondents (4.5%) reported using m-learning once a week. Further frequencies are tabulated below.

Table 9

Prevalence

	Frequency	**Percent**
Everyday/daily	148	67.3
Every few days	51	23.2
Once a week	10	4.5
Once every couple of weeks	4	1.8
Once a month	3	1.4
Once every few months	4	1.8
Total	**220**	**100.0**

5.4 What is the Relationship between m-Learning usage, PU, PEOU, PBC and Attitude?

Spearman's rho correlations were employed to examine the relationships between m-learning usage, attitude, PBC, PU, and PEOU. Results from the correlational analyses revealed only one significant positive relationship (with m-learning), and that was between m-learning usage and PU, r_s = .14, $p < 0.05$. This signifies that, as the perceived usefulness of m-learning increases, its usage tends to rise. However, the relationship is considered weak and only exhibits a small effect size (Field, 2017).

Table 10

Non-parametric Correlations

		m-Learning usage	Attitude	PBC	PU	PEOU
m-Learning usage	Correlation Coefficient	1.000	.137	.054	.141*	.059
	Sig. (2-tailed)	.	.054	.443	.037	.392
	N	220	199	208	218	216
Attitude	Correlation Coefficient	.137	1.000	.517**	.626**	.609**
	Sig. (2-tailed)	.054	.	<,001	<,001	<,001
	N	199	199	199	199	199
PBC	Correlation Coefficient	.054	.517**	1.000	.497**	.698**
	Sig. (2-tailed)	.443	<,001	.	<,001	<,001
	N	208	199	208	208	208
PU	Correlation Coefficient	.141*	.626**	.497**	1.000	.599**
	Sig. (2-tailed)	.037	<,001	<,001	.	<,001
	N	218	199	208	218	216
PEOU	Correlation Coefficient	.059	.609**	.698**	.599**	1.000
	Sig. (2-tailed)	.392	<,001	<,001	<,001	.
	N	216	199	208	216	216

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

5.5 Does PU, PEOU, PBC and Attitude Differ Significantly by m-Learning Device?

The results of the independent-samples Kruskal-Wallis tests revealed that there are no statistically significant differences in the means of the psychological constructs (PU, PEOU, PBC and attitude) across m-learning device. These results are shown in Table 11.

Table 11

Independent-Samples Kruskal-Wallis Tests – m-Learning Device

	Independent-Samples Kruskal-Wallis Test Summary	
Attitude	Total N	199
	Test Statistic	16.658[a]
	df	12
	Asymptotic Sig. (2-sided test)	.163
PBC	Total N	208
	Test Statistic	15.555[a]
	df	12
	Asymptotic Sig. (2-sided test)	.212
PU	Total N	218
	Test Statistic	12.261[a]
	df	12
	Asymptotic Sig. (2-sided test)	.425
PEOU	Total N	216
	Test Statistic	10.970[a]
	df	12
	Asymptotic Sig. (2-sided test)	.531

a. The test statistic is adjusted for ties.

5.6 Does PU, PEOU, PBC and Attitude Differ Significantly by Disability?

The results of the next set of independent-samples Kruskal-Wallis tests revealed that there are also no statistically significant differences in the means of the psychological constructs (PU, PEOU, PBC and attitude) across the various disabilities noted among the respondents. This is shown in Table 12.

Table 12

Independent-Samples Kruskal-Wallis Test – Disability

	Independent-Samples Kruskal-Wallis Test Summary	
Attitude	Total N	199
	Test Statistic	71.263[a]
	df	63
	Asymptotic Sig. (2-sided test)	.222
PBC	Total N	208
	Test Statistic	60.526[a]
	df	63
	Asymptotic Sig. (2-sided test)	.565
PU	Total N	218
	Test Statistic	63.517[a]
	df	66
	Asymptotic Sig. (2-sided test)	.564
PEOU	Total N	216
	Test Statistic	68.784[a]
	df	65
	Asymptotic Sig. (2-sided test)	.351

a. The test statistic is adjusted for ties.

5.7 Summary

Chapter 5 presented a comprehensive account of the results derived from the statistical analyses. KMO and Bartlett's test was examined in order to assess the suitability of the data for an EFA. Thereafter, the pattern matrix was examined to understand variable loadings on latent factors, followed by an exploration of the internal consistency of these latent factors using Cronbach's Alpha (a crucial measure for assessing the reliability of the constructs). Following these initial steps, parametric assumptions were explored though the use of histograms, Q-Q plots, *z*-scores and the K-S test. Given that the assumptions of normality were violated, non-parametric analyses followed.

Results revealed that the majority of respondents, comprising 67.3%, reported engaging in m-learning activities on a daily basis, and 23.2% reported using m-learning once every few

days. Cumulatively, these revealed that 90.5% of the sample of SwD at UNISA (n = 199) use m-learning every day or every few days. The Spearman's rho correlational analyses showed that only PU proved to have relatively weak but significant positive correlations with m-learning usage. The independent-samples Kruskal-Wallis tests for the third and fourth research questions revealed no statistically significant differences in the means of the PU, PEOU, attitude, and PBC composite scores across m-learning device and disability, respectively. These results are discussed next, in Chapter 6.

Chapter 6: Discussion and Conclusion

The final chapter presents an in-depth discussion of the pertinent results. Firstly, the salient results from the statistical analyses of this study are discussed in the context of m-learning in ODeL, with comparisons to relevant HE works in the field. Due to the fact that literature (including the field of SwD's m-learning use in an ODeL environment) was scant, results are compared to studies with TAM-based theoretical underpinnings on m-learning acceptance and use amongst students in HE. The practical implications inherent in the results are then discussed, followed by the limitations of the study, with suggested directions for future research. The chapter highlights the key contributions of the study before concluding.

6.1. Background and Aim Reiterated

The research area about the use of m-learning by South African, ODeL SwD is relatively underexplored. This lack of awareness regarding SwD's m-learning use at UNISA hinders the institution's ability to design both educational materials and technological solutions that meet the needs of these students, ultimately affecting equitable education and student support. On this note, Letseka and Ngubane (2023) emphasise the need for further exploration of m-learning practices tailored to the needs of SwD, particularly within the South African educational landscape. This scarcity of research underscores the importance of delving into this area to address the unique challenges and opportunities associated with m-learning for SwD in South Africa in general, and at an ODeL institution in particular. The problem of designing fitting e-learning platforms and educational material for the support of the diverse UNISA student population (including SwD) acted as the primary motivation for this research endeavour.

Against this background, the current study aimed to explore the nature and extent of m-learning use among SwD at UNISA, incorporating PBC into TAM as a basis for understanding the psychological factors influencing its use. This aim was accomplished by obtaining prevalence rates of m-learning use from a sample of UNISA SwD, measuring the PU, PEOU, PBC and attitude of these students and examining the relationship between these constructs and m-learning use. PU, PEOU, PBC and attitude were then compared across type of m-learning device as well as type of disability.

6.2 Brief Overview of the Sample

Overall, 220 SwD at UNISA completed full responses to the online survey. The respondent group was predominantly female (*n* = 148; 67.3%), with 30% (*n* = 66) identifying as male. The sample consisted of 79.5% (*n* = 175) undergraduate students and 20.5% (*n* = 45) postgraduate students. Respondents had been enrolled for a minimum of one year and a maximum of 10 years (*SD* = 2.34).

6.3 Prevalence of m-Learning Use at UNISA Amongst SwD

Two frequency analyses were conducted to explore the prevalence and usage patterns of m-learning among SwD at UNISA, addressing the first research question. The first frequency analysis was conducted to explore how many SwD among the sample use m-learning. The second frequency analysis reported the usage patterns (i.e. how often do these SwD use m-learning).

As far as the prevalence of m-learning use is concerned, the majority of respondents reported using m-learning on a daily basis (67.3%; *n* = 148). When examining individuals who made use of m-learning either daily or weekly, the vast majority of SwD at UNISA do so, accounting for 90.5% (*n* = 199) of the sample. This indicates a significant adoption of m-learning among SwD at UNISA. Additionally, a proportion of respondents (4.5%; *n* = 10) reported using m-learning once per week, suggesting a consistent integration of m-learning into their educational routines.

In a study conducted by Al-Rahmi et al. (2021) exploring the factors affecting m-learning sustainability at King Saud University (Saudi Arabia), results reveal that a significant portion of respondents utilise m-learning several times a day (*n* = 159; 79.5%). Over 9% indicated using m-learning once a day (*n* = 19), while 8.5% reported using it several times a month (*n* = 17). Moreover, a smaller proportion of 2.5% (*n* = 5) disclosed engaging in m-learning once a month. Another study conducted at the same HE institution investigating students' perceptions of actual use of m-learning during the COVID-19 pandemic, prevalence rates of m-learning use amongst students show a slight increase (Alturki & Aldraiweesh, 2022). During this study, 80% (*n* = 240) of respondents reported using m-learning several times a day, with 14.3% (*n* = 43) indicating once a day and 5.7% (*n* = 17) reported using m-learning several times a month.

Although the studies by Al-Rahmi et al. (2021) and Alturki and Aldraiweesh (2022) use slightly different delineations in their prevalence items when compared to the current study (i.e. several times a day vs everyday/daily, respectively), when combining the categories of 'several times a day' and 'once a day' from their research, 89% of students at King Saud University could be said to use m-learning everyday/daily in 2021, with 94.3% in 2022. Comparatively, 67.3% of SwD reporting daily m-learning use is relatively low. This may be attributed to the fact that King Saud University offers both traditional, in-person education as well as DE, while UNISA is focused on ODeL. An HE institution which offers a mix of these two modes of education may have less time flexibility than an ODeL institution like UNISA, where students are more likely to study part-time and/or with a longer time frame. The fact that the studies conducted on King Saud University students made use of students without disabilities while the current study explored the use of m-learning amongst SwD is another factor for consideration. These statements are made tentatively and should be explored in future research.

A literature review conducted by Naveed et al. (2023) noted that previous research indicates that the adoption of m-learning is influenced by internal factors such as behavioural, psychological, cultural, and contextual elements. While contextual variables are shaped by socio-economic factors like procedures, systems, and cultures, which facilitate adoption, the behavioural approach emphasises understanding m-learning's utility, ease of use, learnability, and pedagogical aspects. However, there exists a research problem concerning empirical evidence regarding the organisational-level performance outcomes associated with technology adoption in HE, and more so within the ODeL context.

6.4 Relationships Between m-Learning Use and Psychological Constructs

Spearman's rho correlations were employed to scrutinise the relationships among m-learning usage and PU, PEOU, PBC, and attitude. The results revealed that there were no statistically significant relationships between m-learning and PEOU (r_s = .06; *ns*), PBC (r_s = .05; *ns*); and attitude (r_s = .14; *ns*). These are highlighted next.

6.4.1 m-Learning Use; PBC, PEOU, Attitude

Contrary to this study on m-learning use amongst SwD (which revealed no significant relationship), a study investigating m-learning use amongst medical sciences students found that the intention to use m-learning was significantly and directly influenced by PBC (Azizi & Khatony, 2019). The path coefficient for this relationship was of moderate strength ($\beta = 0.32$).

While the current study investigated the actual use of m-learning, the researcher found that TAM-based research tends towards focusing on future m-learning use. Thus, where the current study measured the relationships between the psychological constructs and m-learning use, comparative studies measured the relationships between these constructs and the BI to use m-learning. Chavoshi and Hamidi (2019) found that PEOU has a direct and significant relationship with BI with a path coefficient of 0.22 ($p < 0.05$). Similar to Chavoshi and Hamidi (2019), a study investigating factors affecting the intention to adopt m-learning found that PEOU has a significant effect on the intention to use m-learning ($\beta = 0.43$; $p = 0.00$) (Senaratne & Samarasinghe, 2019). A study on students' perceptions of actual m-learning use during the COVID-19 pandemic found that PEOU has a relationship with BI to use m-learning ($\beta = 0.21$; $t = 2.66$; $p < 0.01$) (Alturki & Aldraiweesh, 2022).

6.4.2 m-Learning Use and PU

The correlational analysis did, however, reveal a significant positive relationship between m-learning use and PU. This relationship was weak and exhibited a small effect; $r_s = .14$, $p < 0.05$ (Field, 2009). The relationship between PU and m-learning use could be explained (mediated) by BI as the following studies indicate.

Alturki and Aldraiweesh (2022) found a significant positive relationship between PU and BI ($\beta = 0.45$; $t = 6.78$; $p < 0.00$). This means that as PU of m-learning increases, there is a corresponding increase in the BI to use m-learning. Furthermore, this study shows that BI has a relationship with actual m-learning use ($\beta = 0.65$; $t = 16.40$; $p < 0.00$). The results of Alturki and Aldraiweesh (2022) thus indicate a relationship between PU and m-learning use (albeit not directly). While the current study on SwD found a direct relationship between PU and m-learning use, the results of Alturki and Aldraiweesh (2022) found an indirect relationship between PU and m-learning use with BI as a mediator.

A study by Chen (2022) indicates a direct relationship between PU and the use of m-learning. This study analysed the relationship between PU and CI. CI refers to continuance intention which denotes users' willingness to continue using the information or m-learning systems. This study found that PU had a direct relationship with CI ($\beta = 0.65$; $t = 3.34$; $p < 0.01$). The results of the current study as well as other research investigating psychological constructs affecting m-learning use in HE (Alturki & Aldraiweesh, 2022; Chen, 2022) support the idea that students' belief in the usefulness of m-learning is a good predictor of their subsequent m-learning use or intention to continue using m-learning.

6.4.3 Implications of PU Significance

In this context of m-learning among SwD, the finding that PU is a significant construct affecting m-learning use, as measured by the TAM, can be attributed to several interrelated factors. PU plays a critical role in the adoption of technology, particularly in m-learning, as it directly influences the user's belief that using the technology will enhance their performance. According to TAM, PU is one of the key determinants of user adoption, as individuals are more likely to adopt technology if they perceive it to be beneficial in helping them accomplish tasks more efficiently and effectively. In this study involving SwD, PU becomes even more crucial as these students face unique challenges that require adaptive learning solutions. When SwD perceive m-learning as a tool that significantly improves accessibility, learning outcomes, and autonomy, their intention to use it increases. This aligns with prior research showing that PU is a primary factor influencing adoption behaviour, as seen in studies on technology integration in education (Alfalah, 2023).

PEOU might not have had a significant effect on SwD m-learning use in the current study for several reasons. Firstly, SwD often prioritise usefulness and functionality over ease of use, as they may already be accustomed to adapting to various technologies or assistive tools that might not be inherently easy to use (Almulla, 2024; Alyoussef, 2021; Valencia-Arias et al., 2024). For these students, PU, which directly affects learning outcomes, could be more important than ease of use, especially if the technology is seen as providing significant benefits despite some complexity. Additionally, SwD might also rely on supportive features and accessibility tools (AT), which can mitigate usability challenges, thus making ease of use less of a determining factor in their adoption decisions (McNicholl et al., 2019). These factors could

explain why PU, rather than PEOU, emerged as the primary predictor of m-learning adoption in your study.

This phenomenon could be explained by the unique challenges and needs faced by SwD in relation to m-learning (Fichten et al., 2019), which (it is theorised) may shape their perceptions and interactions with m-learning differently compared to students without disabilities.

Secondly, the emphasis on PU over PEOU among SwD may stem from their need for technologies that provide direct, tangible benefits to their learning experiences. Research indicates that SwD often prioritise tools that enhance their academic performance and facilitate their learning processes (Togaibayeva et al., 2022). Togaibayeva et al. (2022) highlights that the effectiveness of m-learning is closely tied to its alignment with students' needs, suggesting that when SwD perceive a technology as useful, they are more likely to engage with it effectively. This aligns with results from Fichten et al. (2019), who note that mobile technologies that assist with essential academic tasks are particularly valued by SwD, reinforcing the notion that PU is a critical factor in their acceptance of m-learning.

Thirdly, the lack of significance of other TAM constructs, such as PEOU, may reflect the fact that SwD often face additional barriers that complicate their interactions with technology. While PEOU may be more applicable in predicting m-learning use amongst students without disabilities, SwD might prioritise the PU of m-learning over its PEOU. This may in fact be the case as the use of technology (including m-learning) is not perceived as easy to many SwD due to practical challenges associated with living with a disability.

Thus, for SwD, the PU of m-learning tools may overshadow other constructs, leading to a singular focus on how these tools can aid their learning. Additionally, the results regarding PU may suggest that the psychological constructs influencing m-learning use among SwD may differ from those of able-bodied students. Research has shown that self-efficacy can significantly impact the acceptance and use of technology among SwD (Hafit et al., 2020). If students perceive an m-learning tool as useful (PU) but struggle with its usability (PEOU), their motivation to engage with it may diminish, further emphasising the importance of PU as a standalone construct in this demographic. In summary, PU is particularly critical for SwD, as

even if they struggle with usability, they may still engage with m-learning if they strongly believe the tool is useful. However, poor usability may reduce their motivation to engage.

As discussed, the predominance of PU as a significant construct affecting m-learning use among SwD can be attributed to their specific educational needs, the prioritisation of practical benefits over ease of use, and the unique psychological factors that influence their engagement with technology. This contrasts with results from studies involving able-bodied students, where multiple TAM constructs may hold significance due to differing priorities and experiences in technology use.

6.5 Differences by m-Learning Device

The third research question (Does perceived PU, PEOU, PBC, and attitude vary significantly by m-learning device?) was investigated using an independent-samples Kruskal-Wallis tests. This non-parametric test was chosen due to its robustness in analysing differences among multiple groups when the assumptions of normality and homogeneity of variance are violated.

The results of these tests revealed that there are no statistically significant variations in the means of the psychological variables (PU, PEOU, PBC, and attitude) across m-learning devices. This finding suggests that students' perceptions and attitudes toward m-learning, as well as their PEOU and PBC, remain consistent regardless of the specific type of m-learning device utilised.

The absence of a significant difference in m-learning use based on the m-learning device could be due to the homogeneity of m-learning platforms or applications across different devices, minimising device-specific effects (Basak et al., 2018). Additionally, m-learning's effectiveness may rely more on other variables rather than the specific device used. Differences in device features or capabilities may therefore not impact significantly on m-learning outcomes if the core functionalities required for learning are consistent across devices.

6.6 Differences by Type of Disability

The fourth research question, "Does PU, PEOU, PBC, and attitude differ significantly by disability?" was also addressed through the utilisation of a Kruskal-Wallis test. Similar to

the Kruskal-Wallis performed above, the results from this analysis revealed that there are no statistically significant differences in the means of the psychological constructs (PU, PEOU, PBC, and attitude) among the various disabilities reported by respondents. This indicates that regardless of the type of disability (diabetes, epilepsy, paraplegia, deafness), individuals generally perceive m-learning similarly in terms of its PU, PEOU, PBC, and attitude. The results of no significant differences in TAM constructs among students with different types of disabilities suggest a commonality in the perception and use of technology across diverse disability types.

6.7 Practical Implications

The results discussed above underscore the significant role of m-learning in the academic lives of SwD at UNISA, highlighting the importance of further research and the need for appropriate support and resources to enhance their learning experiences. The finding of PU being a significant construct affecting m-learning use among SwD has several critical implications for HE institutions, particularly institutions such as UNISA that aim to foster inclusive learning environments. The focus of the following implications is on enhancing equitable education for SwD by ensuring that m-learning technologies are effectively integrated into their learning experiences.

Firstly, this study applied TAM to a new context. While the application of TAM in the context of SwD is a minor contribution, it brings fresh insights into how these students interact with m-learning technologies. This study helps illuminate potential limitations of TAM when addressing the specific needs of SwD. Secondly, the finding of only PU being significant may imply the need for a new model. The primary contribution of this study is the identification of PU as the only significant factor influencing m-learning adoption among SwD. This challenges traditional TAM assumptions that emphasise constructs like PEOU. This study's results suggest that TAM may need to be revised or replaced when applied to SwD, focusing more directly on PU. Given the importance of PU in this context, institutions should prioritise the development and implementation of m-learning tools explicitly designed to meet the unique needs of SwD. Educational technology developers should engage with SwD in the design process to ensure that the tools are not only functional but are perceived as beneficial (PU) to their learning outcomes. Such a collaboration would ensure that the PU of m-learning aligns with the real challenges and objectives of SwD.

Thirdly, HE institutions emphasising PU of m-learning would benefit progress towards equitable education. The direct relationship between PU and actual m-learning use underlines the importance of highlighting the practical advantages of m-learning in educational settings. Institutions such as UNISA should actively promote the benefits of m-learning tools to enhance SwD's perception of their usefulness, which in turn could lead to greater adoption and integration into learning routines. Furthermore, by focusing on PU, UNISA would be able to create a more inclusive learning environment which addresses SwD's academic needs, reinforcing the idea that PU is crucial for effective m-learning. Fourthly, although the relationship between PU and m-learning use is statistically significant, the weak correlation coefficient suggests that other factors may also play a role in SwD's decisions regarding m-learning adoption and use. Fifthly, the study results of attitude not being significant present a theoretical implication, suggesting that future research could explore direct relationships between PU with m-learning use (or BI to use m-learning), instead of focusing on these constructs being mediated by attitude, as is often the case in TAM-based studies.

Sixthly, this study's results suggest that a PU-centred model would be more fitting in this context. A potential direction for future research involves revising TAM to be more PU-centric. Given that ease of use and other constructs may not significantly impact SwD, a model that places PU at the centre could provide clearer insights into m-learning adoption. Moreover, this could guide educational institutions and developers to focus on the relevant factors in technology use for SwD, such as accessibility, functionality, and tangible educational outcomes. Seventhly, future research could delve deeper into PU-specific measurement tools and statistical analyses to refine how PU is assessed. Expanding the number of items that measure PU, increasing the construct validity of PU items, and employing more comprehensive statistical models, would provide richer insights into how PU affects m-learning adoption among SwD.

Eighthly, the results outlined in Section 6.3 imply that HE institutions and policymakers could adopt a versatile approach to m-learning implementation, accommodating a variety of devices without significant differences in the psychological responses amongst SwD. However, it is essential to ensure that m-learning platforms and content are optimised for compatibility across different devices to promote a seamless learning experience for all students, especially SwD. Lastly, the results discussed in Section 6.4 have important implications for the design

and implementation of m-learning interventions for SwD. Since no significant differences in psychological constructs were found across different types of disability, HE institutions and policymakers would be able to adopt a generalised approach to m-learning implementation (amongst SwD), ensuring that resources and support are provided similarly to all SwD, regardless of disability type. Additionally, these results highlight the potential of m-learning to be inclusive and accessible to a diverse range of students, promoting equal opportunities for learning and academic success.

6.8 Limitations and Recommendations for Future Directions

6.8.1 Generalisability

The present research study is subject to certain limitations. Firstly, the scope of the results is confined to UNISA's population of SwD, thereby precluding their generalisability to other ODeL HE institutions, as well as those offering campus-based tuition in South Africa or abroad. Consequently, it is imperative to contextualise the interpretation of these results within their specific setting. Enlarging the sample to encompass other ODeL HE institutions would not only yield valuable insights into the psychological factors that influence m-learning usage among SwD, but also enrich the scant literature on this area of research within the context of ODeL in South Africa.

6.8.2 Self-reported Data, Social Desirability Bias and Self-selection Bias

Secondly, the current study's utilisation of self-reported data to extrapolate results to the broader community of SwD at UNISA represents a notable limitation. Regrettably, self-reported data are susceptible to fabrication or embellishment by respondents, as well as social desirability bias (Teh et al., 2023), which pertains to a conscious effort to respond in a manner that presents oneself in a more favourable light. Additionally, the potential for selection bias may have favoured participation by more technologically adept SwD. Self-selection bias arises when the group under investigation has the autonomy to decide whether to partake in the study (Stone et al., 2023). In exercising this autonomy, there exists the possibility that respondents' inclination to engage in the survey is linked to the research topic, thereby yielding a non-representative sample (Stone et al., 2023).

6.8.3 Research Design

The correlational design employed in the study limited the ability to infer causal relationships. Consequently, the investigation was explorative in nature and focused solely on assessing whether there is a relationship between the psychological constructs inherent in the TAM and SwD's m-learning use. The questionnaire utilised in this study may exhibit incomplete coverage of constructs or incorporate measurement errors, thereby diminishing the measurement validity of the research results.

6.8.4 Recommendations

Building on the results of this study, several recommendations for future research can be made to enhance the understanding of m-learning adoption among SwD and to refine existing technology acceptance frameworks, particularly in the context of HE such as UNISA.

Firstly, a longitudinal study is suggested to track psychological constructs (specifically PU), observing how these constructs change and influence m-learning use in the long term. This approach would offer insights into how continued m-learning use impacts SwD's BI and actual use. Tracking these trends over time could reveal whether the significant role of PU remains consistent or fluctuates based on external factors such as changes in institutional support or technology accessibility.

Secondly, a mixed-methods design is recommended, combining quantitative data collected through surveys with qualitative data from interviews or focus groups. This method would not only validate the quantitative results but also provide deeper insights into SwD's experiences and perceptions of m-learning. By capturing nuanced relationships between psychological constructs and m-learning use, such an approach could uncover aspects that a purely quantitative approach may overlook. For example, the qualitative component might highlight specific accessibility challenges or psychological factors that influence how SwD perceive the usefulness of m-learning tools.

Another avenue for future research is comparative studies between SwD and able-bodied students to identify unique challenges and facilitators of m-learning adoption. Conducting a study with able-bodied students at UNISA would help determine whether PU remains the only significant factor influencing m-learning adoption across different

populations, or if constructs like perceived ease of use (PEOU) play a more prominent role in able-bodied groups. If PEOU proves significant in the general student population but not among SwD, this will confirm that SwD prioritise usefulness due to their specific needs and challenges, while able-bodied students may rely more on ease of use.

Additionally, experimental studies could be conducted to assess the effects of interventions targeting specific psychological constructs, particularly PU. Such studies would provide causal evidence of how focused interventions could enhance m-learning engagement among SwD. For instance, experimental designs could implement changes in m-learning platforms or educational tools that directly improve perceived usefulness and measure the resulting impact on m-learning adoption and satisfaction.

Lastly, given the finding that PU was the only significant factor, it is suggested that theoretical models such as TAM may need to be revised for SwD populations. Future research could explore a model that places PU as the central construct, while discarding PEOU or replacing it with other psychological factors. These constructs may provide a more accurate representation of what drives m-learning use among SwD, leading to a more robust theoretical framework tailored to their needs.

In conclusion, future research should not only validate the importance of PU but also refine m-learning tools and platforms by collaborating with SwD during the design phase. By prioritising PU, developers can ensure that the resulting platforms are not only functional but directly aligned with the needs of SwD. As demonstrated, PU remains key to the adoption of m-learning tools, and future research and development must centre on this construct to enhance equitable education for SwD and ensure technology solutions are effective.

6.9 Contributions

The present study makes a significant contribution to the understanding of psychological factors and their impact on the use of m-learning among SwD. Specifically, the research sheds light on the prevalence rates and the influence of PU, PEOU, PBC and attitude in this context, thereby enriching the understanding of the underlying psychological constructs. Moreover, the investigation of m-learning within the realm of ODeL institutions represents a noteworthy contribution to the existing literature. By focusing on the lack of knowledge

regarding SwD m-learning usage at UNISA (which obstructs the institution's efforts to design inclusive educational resources and technological solutions) this study contributes to progress towards educational equity and effective student support for SwD. This research advances knowledge pertaining to technology-mediated education in diverse educational settings, particularly within the domains of DE in South Africa and among SwD.

This research is one of the first studies to investigate the prevalence rates of m-learning among SwD at UNISA, shedding light on an underexplored area of educational technology. This is in line with the call for more research on the use of mobile technology in education, particularly among SwD (Chiwandire & Vincent, 2019). Additionally, the study delves into the theoretical underpinning of the TAM among a sample of SwD in South Africa, providing insights into the psychological factors influencing the use of m-learning among this demographic. By applying the TAM to SwD in an m-learning context, the study extends existing psychological frameworks used to understand how users adopt technology. Specifically, the study challenges the traditional design of TAM, which emphasise both PEOU and PU as critical factors in predicting user behaviour. The finding that PU was the only significant factor in m-learning adoption among SwD suggests that, for this population, functionality and perceived benefit (PU) outweigh ease of use (PEOU). This has implications for the broader field of psychology, particularly in understanding how different user groups prioritise specific constructs in technology adoption based on their unique psychological and physical needs.

Moreover, this research contributes to the ongoing refinement of theoretical models in technology use by proposing that TAM may not fully explain technology acceptance for SwD. It suggests a shift in focus towards PU as a core psychological factor while reconsidering the relevance of PEOU in such contexts. This insight opens avenues for future research to build on the psychological underpinnings alternative constructs that may better explain technology adoption among populations with specific needs. Lastly, the results from this study may hold implications for educational policy and practices. Policymakers, educators, and instructional designers can draw upon these results to aid in developing and implementing strategies aimed at increasing accessibility of m-learning among SwD. This research thus serves as a potential resource for informing evidence-based policies and practices within the realm of inclusive HE and technology-mediated learning.

6.10 Conclusion

The results revealed the fact that the majority (*n* = 199; 90.5%) of SwD make frequent use of m-learning for their studies and that both disability type and type of mobile device do not affect the use of m-learning significantly differently. This study also sought to investigate the psychological constructs of an adapted TAM in relation to the m-learning use of SwD at UNISA. In light of the TAM being used extensively to examine HE students' m-learning use and considering the usefulness of mobile technologies both for HE studies and use as affordable and accessible AT, the exploration of the TAM constructs with a sample of SwD was deemed necessary.

However, despite the widespread use of TAM in examining technology use, the current study revealed that only PU significantly influenced m-learning use in the sample of SwD. The additional construct of PBC added to the traditional TAM did not have a significant impact on the m-learning use among SwD, nor did PEOU or attitude. While these results shed light on the m-learning use of SwD at UNISA, the fit of TAM underpinning m-learning among SwD at UNISA may be questioned and should be explored further.

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Appendix A: Ethical Clearance

UNISA university of south africa

COLLEGE OF HUMAN SCIENCES RESEARCH ETHICS REVIEW COMMITTEE

14 May 2020

NHREC Registration # :
Rec-240816-052
CREC Reference # : 2020-PsyREC-67141242

Dear Adam Adriaan Louw

Decision:
Ethics Approval from 14 May 2020 to 31 August 2023

Researcher(s): Adam Adriaan Louw

Supervisor(s): Mr Hugo van der Walt C.
vdwalhd@unisa.ac.za

ODel Students with Disabilities' M-Learning Use, and Psychological Factors Influencing M-Learning Use

Qualification Applied: MA Psychology

Thank you for the application for research ethics clearance by the Unisa Department of Psychology College of Human Science Ethics Committee. Ethics approval is granted for three years.

The ***low risk application*** *was* ***reviewed and*** **expedited** by Department of Psychology College of Human Sciences Research Ethics Committee, on **14 May 2020** in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

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2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Department of Psychology Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
7. No fieldwork activities may continue after the expiry date **(31 August 2023)**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2020-PsyREC-67141242** *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

Signature :

Prof I. Ferns
Ethics Chair: Psychology
Email: fernsi@unisa.ac.za
Tel: (012) 429 8210

Signature :

Prof K. Masemola
Executive Dean : CHS
E-mail: masemk@unisa.ac.za
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Appendix B: Ethical Clearance Amendment

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RESEARCH PERMISSION SUB-COMMITTEE (RPSC) OF THE SENATE RESEARCH, INNOVATION, POSTGRADUATE DEGREES AND COMMERCIALISATION COMMITTEE (SRIPCC)

11 August 2020 (Date of issue)
02 February 2023 (Date of 1st amendment)

Decision: Research Permission Approval from 11 August 2020 until 31 August 2023.

Ref #: 2020_RPSC_024
Mr. Adam Adriaan Louw
Student #: 67141242
Staff #: N/A

Principal Investigator:
Mr. Adam Adriaan Louw
Department of Psychology
School of Social Sciences
College of Human Sciences
adamlouw.al@gmail.com; 071 897 8280

Supervisor: Mr. Hugo van der Walt, vdwalhd@unisa.ac.za
Ms. Kelly Anne Young, 084 018 8703

ODeL Students with Disabilities' M-Learning Use, and Psychological Factors Influencing M-Learning Use.

Your application regarding extension for permission to conduct research involving UNISA employees, students and data in respect of the above study has been received and was considered by the Research Permission Subcommittee (RPSC) of the UNISA Senate, Research, Innovation, Postgraduate Degrees and Commercialisation Committee (SRIPCC) on 25 January 2023.

It is my pleasure to inform you that permission has been granted for the study. You may:

1. Request ICT to send the survey to all registered students with disabilities.
2. You may reach blind and visually impaired students through the assistance of ARCSWiD.
3. You may approach the students with disabilities at Sunnyside campus to request their voluntary participation in the study.

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You are requested to submit a report of the study to the Research Permission Subcommittee (RPSC@unisa.ac.za) within 3 months of completion of the study.

The personal information made available to the researcher(s)/gatekeeper(s) will only be used for the advancement of this research project as indicated and for the purpose as described in this permission letter. The researcher(s)/gatekeeper(s) must take all appropriate precautionary measures to protect the personal information given to him/her/them in good faith and it must not be passed on to third parties. The dissemination of research instruments through the use of electronic mail should strictly be through blind copying, so as to protect the participants' right of privacy. The researcher hereby indemnifies UNISA from any claim or action arising from or due to the researcher's breach of his/her information protection obligations.

Note:
*The reference number **2020_RPSC_024** should be clearly indicated on all forms of communication with the intended research participants and the Research Permission Subcommittee.*

We would like to wish you well in your research undertaking.

Kind regards,

Dr Retha Visagie – Deputy Chairperson
Email: visagrg@unisa.ac.za, Tel: (012) 429-2478

Prof Lessing Labuschagne – Chairperson
Email: llabus@unisa.ac.za, Tel: (012) 429-6368

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Appendix C: Informed consent

PRC_REW#: 2020_RPSC_024

Dear Prospective participant,

My name is Mr Adam Adriaan Louw, and I am conducting research for the completion of my master's degree at the University of South Africa (UNISA). I am inviting you to participate in a study entitled '*ODeL SwD m-Learning Use, and Psychological Factors Influencing m-Learning Use*'.

The survey you have received has been designed to study your experiences of using m-Learning. You were selected to participate in this survey because you currently study at UNISA and have registered as living with a disability (you will not be eligible to complete the survey if you are younger than 18 years). By completing this survey, you agree that the information you provide may be used for research purposes, including dissemination through peer-reviewed publications and conference proceedings. It is anticipated that the information we gain from this survey will help higher education institutions to better understand your experience of using m-Learning. You are, however, under no obligation to complete the survey and you can withdraw from the study prior to submitting the survey. The survey is developed to be anonymous, meaning that you will not be required to disclose your student number or name. As such, we will have no way of connecting the information that you provide to you personally. However, because it is anonymous, you will not be able to withdraw your responses from the study once you have clicked the send button, as we will have no means of identifying your response from the dataset. Your responses will be kept confidential, with all data being reported on a grouped level, and never identifying you in any way.

If you choose to participate in this survey it will take up no more than 30 minutes of your time. In addition to the time taken to complete the online survey, participants will also incur minimal internet costs.

Use the following link to the survey:
https://UNISAir.qualtrics.com/jfe/form/SV_0DqDbz8xyHTtM9M

You will not benefit from your participation as an individual, however, it is envisioned that the results of this study will help institutions better understand the challenges you face. The full report will be published on UNISA's research website. However, if you would like to be personally informed of the final research results, please contact Mr Adam Adriaan Louw (67141242@mylife.unisa.ac.za).

We do not foresee that you will experience any negative consequences by completing the survey. The researcher undertakes to keep any information provided herein confidential, not to let it out of his possession and to report on the results from the perspective of the participating group and not from the perspective of an individual. Electronic copies of data will be kept a minimum of five years and stored on a password protected computer, for audit purposes.

You will not be reimbursed or receive any incentives for your participation in the survey. The research was reviewed and approved by the PARC Ethics workgroups. In addition, permission to conduct research was granted by the Research Permission Subcommittee (RPSC). The researcher, Mr Adam Adriaan Louw (67141242@mylife.unisa.ac.za) can be contacted by email. Alternatively, should you have any questions regarding the ethical aspects of the study or any ethical concerns, you can contact the PARC ethics committee, Dr R Visagie, visagrg@unisa.ac.za. In addition, you can report any serious unethical behaviour at the University's Toll-Free Hotline on 0800 86 96 93. You are deciding whether to participate by continuing to the next page. You are free to withdraw from the study at any time prior to clicking the send button.

Appendix D: Online survey and adaptions

Question Rewording

	Original Question	Reworded Question
1.	I believe that learning from m-learning would enhance my academic performance.	I believe that m-learning enhances my academic performance.
2.	I believe that using m-learning would increase my academic productivity.	I believe that m-learning increases my academic productivity.
3.	I believe that using m-learning would enhance my learning effectiveness.	I believe that m-learning enhances my learning effectiveness.
4.	I believe that using m-learning would enhance my learning efficiency.	I believe that m-learning enhances my learning efficiency.
5.	I believe that m-learning would be useful for my studies.	I believe that m-learning is useful for my studies.
6.	I think learning to use m-learning is very simple.	Learning to use m-learning is very simple.
7.	It would be easy for me to become skilful at using m-learning.	It's easy for me to become skilful at using m-learning.
8.	I think using m-learning is easy.	I think using m-learning is easy.
9.	It is easy to use m-learning to accomplish my studying tasks.	It is easy to use m-learning to accomplish my study tasks.
10.	My interaction with m-learning would be clear and understandable.	My interaction with m-learning is clear and understandable.
11.	I have a sufficient extent of knowledge to use m-learning.	I have sufficient knowledge to use m-learning.
12.	I have a sufficient extent of control to make a decision to adopt m-learning.	I have sufficient control to use m-learning.
13.	I have a sufficient extent of self-confidence to make a decision to adopt m-learning.	I have sufficient self-confidence to use m-learning.

14.	I have a sufficient extent of ability to use m-learning.	I have sufficient ability to use m-learning.
15.	I would be able to use m-learning well for learning process.	I am able to use m-learning well for my studies.
16.	Mobile technology is a useful tool for my study.	Mobile learning is a useful tool for my study.
17.	Mobile technology can offer opportunities for communication and team-working.	Mobile learning offers opportunities for communication and team-working.
18.	Mobile technology can help me in finding resources related to my study.	Mobile learning helps me in finding resources related to my study.
19.	Mobile technology can bring many opportunities to the learning process.	Mobile learning brings many opportunities to the learning process.
20.	Mobile technology can help me to access the course-material anytime anywhere.	Mobile learning helps me to access the course-material anytime, anywhere.
21.	Mobile technology can be an easy way to get feedback and notifications from my instructors.	Mobile learning is an easy way to get feedback and notifications from my instructors.
22.	Mobile technology can help me to exchange the course-material with my friends.	Mobile learning helps me to exchange the course-material with my friends.
23.	Mobile Apps can help me to manage my study.	Mobile Apps help me to manage my study.
24.	Mobile technology can help me to do my coursework.	Mobile learning helps me to do my coursework.
25.	Mobile technology can help me to develop my learning skills.	Mobile learning helps me to develop my learning skills.
26.	I will use mobile learning for my courses in the future. I intend to use mobile learning as often as possible.	I intend to use mobile learning (m-learning) for my UNISA studies in the future.

Appendix E: Editor's Declaration

I 'Avenir Consulting

Monica Botha
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TO WHOM IT MAY CONCERN

This serves to confirm that I have edited and proofread the dissertation entitled

ODeL students with disabilities' m-learning use and psychological factors influencing m-learning use

prepared by Mr Adam Adriaan Louw, submitted in fulfilment of the requirements for the degree of Master of Arts in the subject Psychology at the University of South Africa, according to the specifications of the University, where available, and the latest standards for language editing and technical (computer-based) layout.

Editing was restricted to language usage and spelling, consistency, formatting and the style of referencing. No structural writing of any content was undertaken.

As an editor I am not responsible for detecting any content that may constitute plagiarism.

To the best of my knowledge, all references have been provided in the prescribed format.

I am not accountable for any changes made to this dissertation by the author or any other party after the date of my edit.

(Electronically signed – actual signature withheld for security reasons)
MONICA BOTHA
28 February 2024