EVALUATION OF FIRST YEAR UNIVERSITY STUDENTS' DIGITAL APPREHENSION, PROBLEM-SOLVING APPRAISAL, AND TRANSITION TO HIGHER EDUCATION.

Heather Lindsey Smith
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Abstract

This research was designed to discover the presence and prevalence of a new concept *Digital Apprehension* in first year higher education students. The first year is seen as the year students begin their undergraduate degree at a tertiary institution (higher education). Higher education (university) in the current age of technological advances, has adopted communications technologies as they become available, leading to innovations in the way that tertiary education is delivered. University study requires students to confidently use different types of technology to complete their courses. However, students' desire to interact with technology is often underpinned by their understanding and experience of technology, and this experience is not equal for all. Some students may feel apprehension around the use of digital technology (Digital Apprehension) and this can negatively affect their studies. Digital Apprehension has, as its foundation, the psychological literature into learning and motivation. The presence and prevalence of Digital Apprehension was explored, using the newly created psychometric instrument measuring Digital Apprehension, problem-solving appraisal, and transition expectations (DAPSET), also examining if it was a unique first year phenomenon or university wide.

There were three phases to the project, the first phase was qualitative, the next two phases were quantitative. The qualitative aspect of the project enabled a deeper, richer understanding of students' thoughts and experiences, while the quantitative examined and confirmed reliability of the findings. The first phase of the project involved thematic analyses of transcribed answers to the focus group questions, individual interview questions and written answers via email (N = 30), to understand the concept of Digital Apprehension (DA) and create the questionnaire. The second phase involved an initial survey (N = 766) comprised of 54 items, including the DA, a short problem-solving appraisal questionnaire (PSI-12), and an expected transition questionnaire (the Student Transition Scale - Revised - Adapted; STS-R-A). This phase then created the final measure, the DAPSET psychometric instrument. The third phase (N = 1407) used the DAPSET, and indicated that Digital Apprehension was experienced by 36% of students in their first year, and 40% across the University. Digital Apprehension can become a catalyst for a downward spiral, and be involved in the lack of insight, capability, and resourcefulness. The ability this

measure brings to recognise Digital Apprehension would help the recognition of those struggling, and therefore enable crucial support before difficulties occur.

Certification of Thesis

This thesis is entirely the work of Heather Smith except where otherwise acknowledged. The work is original and has not been previously submitted for any other award, except where otherwise acknowledged.

Supervisor name: Tony Machin
(Principal Supervisor)

Supervisor name: Nick Kelly
(Associate Supervisor)

Supervisor name: Liam Hendry
(Associate Supervisor)

Student and supervisor's signatures of endorsement are held at the University.

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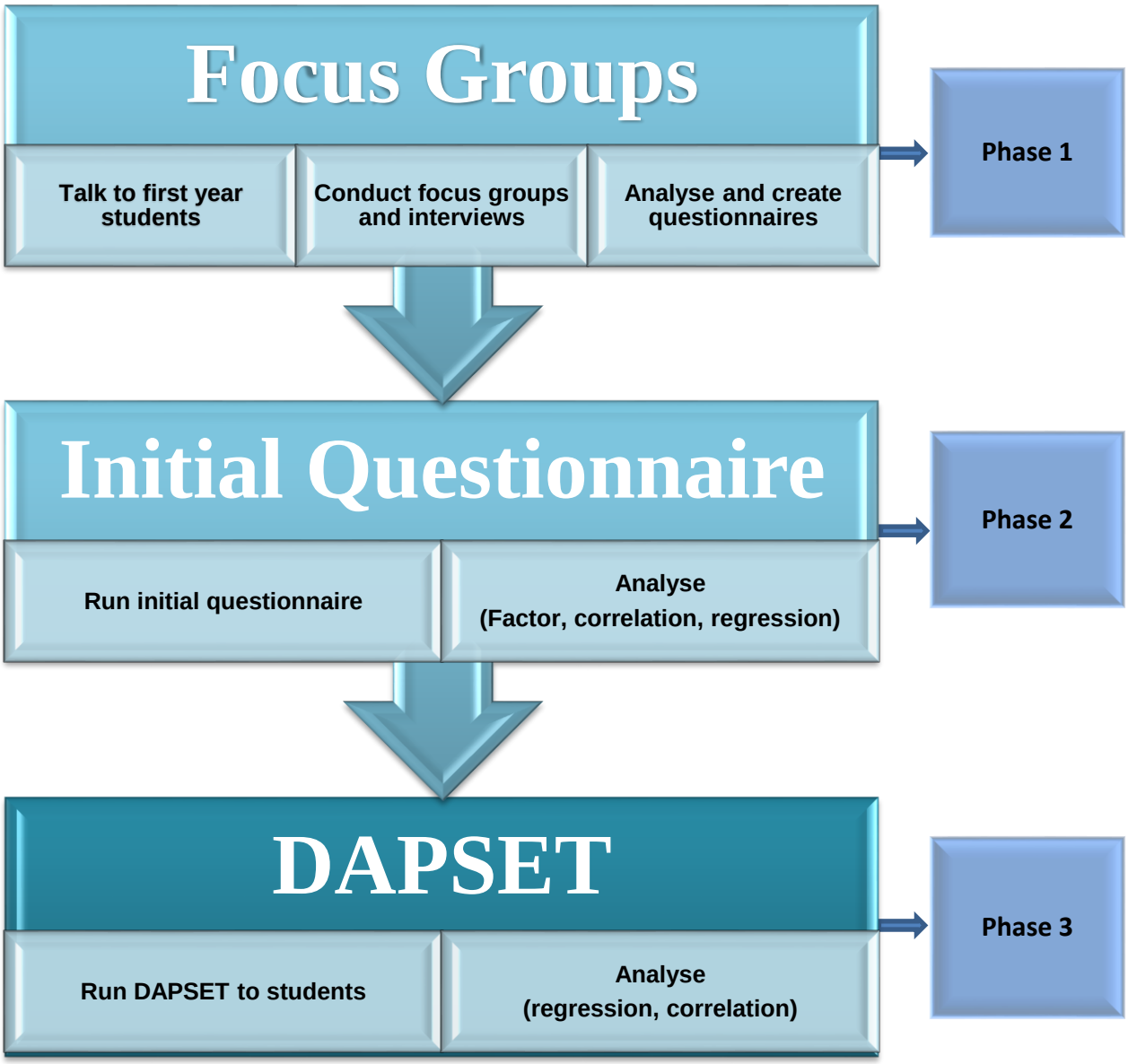
CHAPTER 1

Overview of project



Introduction

The world today is immersed in technological advances including the world-wide-web (internet), with much communication and learning occurring online. This era is commonly known as the digital age, and has had a significant impact on the academic world. In the 21st century there has been a rise in the use of technology within academia (D. Kennedy & Fox, 2013; Prensky, 2001a, 2001b), and now it is commonly expected for students to use digital tools for communication, assessment, and research (Glen, Johnson, & D'Agostino, 2008). This impact on higher education in turn steers the technology required to operate learning management systems, and "other innovations that respondents say are likely to have a profound effect on the academic experience" (Glen et al., 2008; p. 6). However, not all students have equal access, ability, or competence in being able to use this technology (Bradley, Noonan, Nugent, & Scales, 2008; Glen at el., 2008; James, Krause, & Jennings, 2010). There is cause for concern that the relationship between students and technology causes an unnecessary barrier to learning and/or effective participation (Czerniewicz & Brown, 2013).

Learners beginning their studies in higher education face many barriers, for example, an absence of peer support and lower socioeconomic status. In particular, peer support is seen as an important way to help students successfully manage the academic load of assignments and deadlines, and has shown to have a positive effect on retention and transition (Smith & Burton, 2013), while lower socioeconomic status students may face financial hardship, with difficulty purchasing relevant computer equipment (Harvey, Drew, & Smith, 2006). In addition, Lizzio and Wilson (2006) note that feeling a connection to the university and peers, learning readiness, and managing any challenges that may emerge are key contributions to success. Prior studies show that first year success and transition can be impacted by factors of students' unmet expectations, age, autonomy, engagement, and the general student learner experience (Box, Callan, Geddes, Kemp, & Wojcieszek, 2012; A. R. J. Briggs, Clark, & Hall, 2012; Penn-Edwards & Donnison, 2011), in addition to their relationships with technology (Buckley, Pitt, Norton, & Owens, 2010; Ellis, Ginns, & Piggott, 2009). However, there is insufficient knowledge about first year students' experience of apprehension around the use of digital technology, what this research refers to as *Digital Apprehension*. Specifically, if this experience of trouble using digital technology is a general phenomenon then there is cause for concern that many of these students were hindered from effectively participating in learning due to Digital Apprehension. By making Digital Apprehension the object of research, insight into possible confusion and inconsistency

experienced by students is gained. This in turn would prove beneficial to recognise those struggling and in need, enabling valuable support before difficulties occur.

Digital Apprehension has as its foundation the psychological literature into learning and motivation (Bandura, 1977; Eysenck & Calvo, 1992; Skinner, 1950), a possible driving force encouraging Digital Apprehension. The behavioural and cognitive viewpoints are examined including people's intentions, social norms, and attitudes towards behaviour, as seen in the Theory of Planned Behaviour (TPB; Ajzen, 2002; Fishbein & Ajzen, 1980). This then is the foundation that builds and develops the construct of Digital Apprehension as a way of explaining this phenomenon. Whilst there is a significant body of research around the theme of digital literacy (G. E. Kennedy, Judd, Churchward, Gray, & Krause, 2008; Prensky, 2001a, 2001b; Tapscott, 1998), there is a shortage of work that attempts to understand why some students successfully use technology whilst others experience difficulties (Kennedy et al., 2008). In most settings, the use of technology and digital tools effectively requires confidence by the user, or at the minimum an understanding of why something was not only helpful, but warranted (Lizzio & Wilson, 2013). There has been general agreement that further investigation into people who struggled with technology and change is warranted (Mikal, Rice, Abeyta, & DeVilbiss, 2013).

In the demand-driven university model currently adopted in Australian universities, students have experienced different walks of life, are in differing life stages, socio-economic levels and varying degrees of education (Bradley et al., 2008). For those who want to be successful at higher education, to go on to completion of their courses, there is a need for students to know how different types of technology and digital tools should be used to support and remove unnecessary impediments that may confuse or frustrate. There is a link between use of technology and university success – in terms of course grades – as well as course completion (Herman, 2012; Ransdell, Kent, Gaillard-Kenney, & Long, 2011; Seale, Draffan, & Wald, 2010). The experience of using digital tools is different for everyone, and some students feel overwhelmed, frustrated, or confused by the technology they are required to use within their university studies (Smith, Quinn, & Kelly, 2015). It is likely that this relationship to technology can negatively impact upon the students' ability to learn. This research investigates ways to understand how students respond to the technology available.

The research aims to develop diagnostic instruments and use them in a regional Australian university to identify to Digital Apprehension so that, through targeted interventions, these students may be able to become confident when they use technology or digital tools, and to enable universities to support students' adjustment. This research has the

potential to not only benefit students, but also the business sector, or anyone using technology in their industry, by enabling supports to be put in place to retain students or valuable employees, and therefore to deter any early termination of work (or study). The goal of this research project was to discover factors that lead students to turn away from the available technological 'helps' and not use the tools available to them. It not only indicated areas in which to support students during their first year, but also enabled a more precise understanding of how digital tools can help – and hinder – students in their quest for success.

Aims and Objectives

The aim of this research is to understand the barriers experienced by university students in relation to use of technology for their studies. The research explores the relationship between the attitudes and behavioural intentions of first year university students with regard to technology and digital supports.

This aim is achieved through objectives of:

1. Exploring the psychological basis for Digital Apprehension and proposing a way of measuring it. This objective was achieved through focus groups and interviews of first year higher education students.
2. Constructing and validating a measure of Digital Apprehension. This was accomplished by thematic analyses of the data transcribed from the discussions by the focus groups and interviews, which was used to create the initial Digital Apprehension Questionnaire (the DAQ).
3. Analyses of the data attained from the initial phase of the research to create the psychometric instrument measuring Digital Apprehension, problem-solving, and expected transition (DAPSET).

These objectives firstly confirmed the existence of Digital Apprehension, then enabled the researcher to create a measure; then with examination of the internal consistency of the measure, explored if Digital Apprehension was a unique first year phenomenon or university wide. While knowing the aim of research is important, understanding the boundaries and explanations are equally significant. Having considered the aim and objectives of this research, the following section discusses the scope of the project including some of the main definitions involved in developing the concept of Digital Apprehension.

Research Scope and Definitions

The literature review revealed broad definitions that encapsulated some semblance or portions of Digital Apprehension. Definitions included were from areas such as digital literacy, computer competency, computer self-efficacy, and computer anxiety. However, to

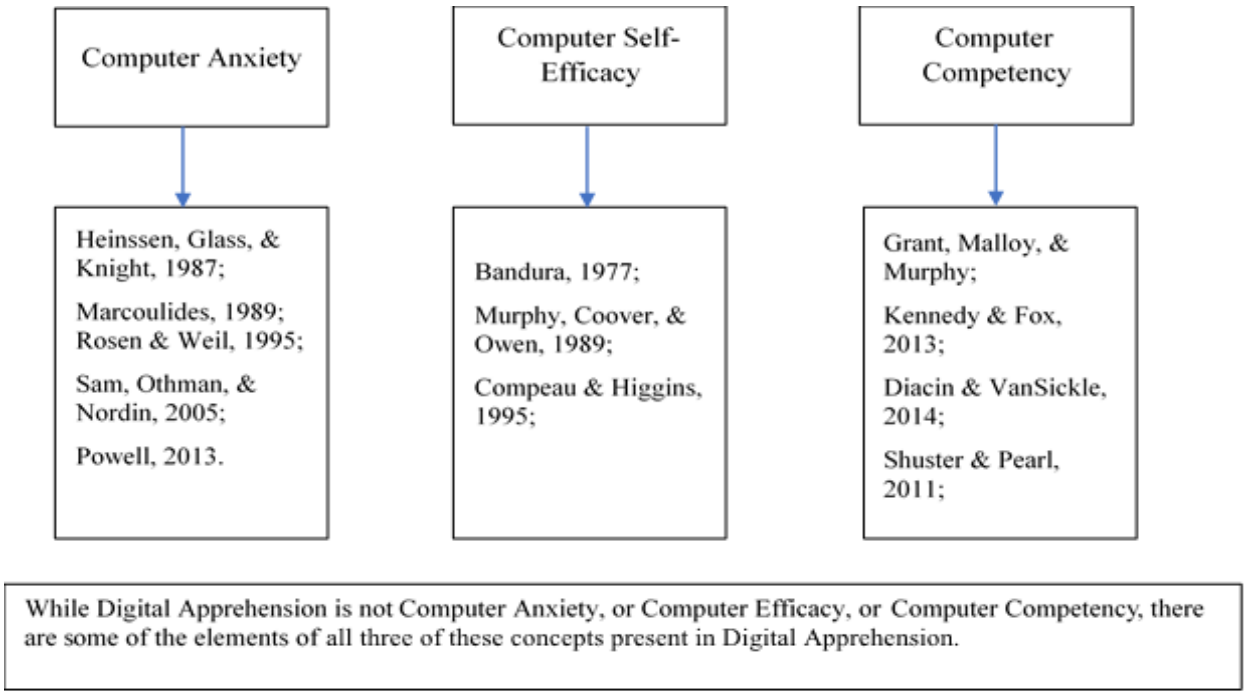
discover a definable concept of Digital Apprehension presented difficulties as it was integrated into several of these concepts and not separate. Digital Apprehension as a concept has not undergone thorough investigation prior to the current research. Therefore, to separate and distinguish Digital Apprehension as an original stand-alone concept, it was necessary to set parameters. Literature posits definitions for digital literacy (Eshet-Alkalai, 2004; G. E. Kennedy et al., 2008; Prensky, 2001a, 2001b; Tapscott, 1998), computer ability and motivation (Alarcon & Edwards, 2013), computer anxiety (Sam, Othman, & Nordin, 2005), computer self-efficacy (Bandura, 1977; Compeau & Higgins, 1995) and computer competency (Hedberg, 2011; G. E. Kennedy et al., 2008). However, there is little to specifically suggest a concise definition of Digital Apprehension. Therefore, this section provides a brief definition of digital literacy and technology, then a definition of Digital Apprehension as determined by this research in order establish the boundaries of the concept, and to distinguish it from other areas.

Digital literacy is a widely-used concept; however, its meaning is a highly contested area (Eshet-Alkalai, 2004; Pangrazio, 2016). According to Eshet-Alkalai (2004) "Digital literacy can be defined as survival skill in the digital era. It constitutes a system of skills and strategies used by learners and users in digital environments" (p. 102). Eshet-Alkalai describes a model involving five types of literacy that include photo-visual, reproduction, information, branching, and socio-emotional. While digital literacy may include aspects of Digital Apprehension, by definition alone, it is too broad. In particular, it is at a level of abstraction that is not helpful in understanding why many people who are digitally literate, do not make effective use of technology in the first year of university. Pangrazio's (2016) examination of critical digital literacy, and his critique of the varied definitions of digital literacy demonstrate not only how broad definitions are, but also, the difficulty in creating a simplistic statement easily understood by the broader population to define digital literacy. Hagel (2015) notes that the Deakin University Library considers digital literacy to be "using digital technologies to find, evaluate, synthesise, create and communicate information in an ethically and legally responsible manner" (p. 10). Nevertheless, definitions mostly described the user's ability and/or action rather than the personal reaction to technology and digital tools. Thus, we need to introduce a new concept to explicitly deal with people's apprehension about using technology.

Technology is defined as "The application of scientific knowledge for practical purposes, especially in industry", "Machinery and devices developed from scientific knowledge", and "The branch of knowledge dealing with engineering or applied sciences"

(http://www.oxforddictionaries.com/). According to Surry (2008) technology can be described as narrowly or as broadly as the situation allows. Surry explains technology could be as narrow as "any thing or tool employed for a practical use. A saw, a hammer, or even a rock are examples of simple technological tools" (p. 389) or as broad as "… a discussion of the socio-technical systems in which the artefacts exist …" (p. 389). Again, a very difficult definition to write in a simple one sentence explanation, although, the general population usually are aware of what is meant when the word technology is used. Technology in this research is defined in similar terms as M. Carter and Grove (2015), in that any digital appliance or tool - smartphone, laptop, tablet, iPod, computer, or software, including the internet and service providers - used in the carrying out of everyday life. Specifically, in this research it also includes the access and participation of any university action involving technology. Technology is the main focus of Digital Apprehension.

While studies on technology and education have experienced difficulties with reliabilities of measures, definitions of technology, and test re-test abilities involved in participants limiting their use of technology in higher education (Corrin, Lockyer, & Bennett, 2010; Powell, 2013), this current research involves discovering the cognitive motives behind this unwillingness to participate in the use of technology, from the perspective of TPB. The concept of Digital Apprehension is introduced as the condition of apprehension based on a combination of anxiety or fear that occurs when using technology (Embi, 2007; Cowan & Jack, 2011; Powell, 2013), but also involving a reluctance and unwillingness brought about by mistrust or indifference to using technology. It is described as a motive leading to the reluctance to use technology, whether this motive is anxiety, non-compliance, frustration, or lack of knowledge with technology, and includes navigating the tools involved and completion of necessary tasks. While Digital Apprehension incorporates elements of Computer Anxiety, Computer Self-Efficacy, and Computer Competency it is a stand-alone concept created during this research (see Figure 1.1).



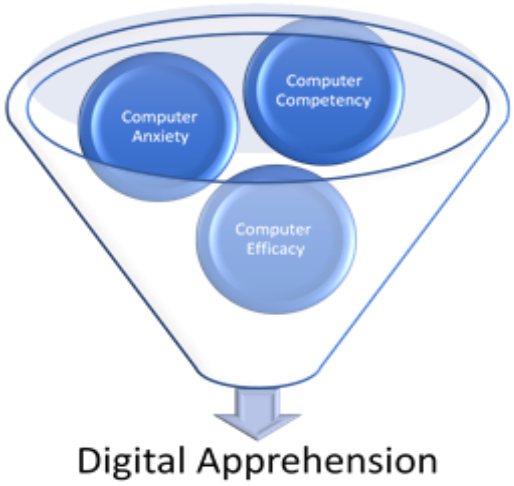


Figure 1.1. Digital Apprehension as a standalone concept created during this research.

Organisation of the Thesis

This section provides an overview of the chapters through the thesis, with a sequential explanation of the research process and results. The three phases of the research have been allocated individual chapters, each having a small discussion section at the end of each chapter, with a chapter following the final phase of the research for an overall discussion. This is then followed by the significance and conclusion of the research.

Chapter 1 gives an introduction of the expectation of technology use in higher education, and why students need to use technology in university. It introduces the concern

that there are students who do not avail themselves of the technology or the digital supports to help them during their time at university, specifically during their first year of study. It then introduces the idea that students may be apprehensive, and the relevance of this, and the construct of Digital Apprehension in first year university students. It then describes the aim of this research, to search for understanding barriers experienced by students concerning technology and learning. This is then explained through the objectives of this research which include exploring the psychological basis for Digital Apprehension, with the construction of a psychometric measure and by confirmation of the reliability of the measure. This was followed by the scope and key definitions of digital literacy and technology.

Chapter 2 explores the literature in respect to the presence of technology in higher education, and the Australian response. It discusses the thinking behind changes to Australian universities since research was carried out concerning the state of Australian higher education, compared to the global situation (Bradley et al., 2008). It discusses the technology present in higher education, in respect to the diversity present (McMillan, 2008); Digital Apprehension and its origins; and presents existing evidence that many first-year students in higher education experience difficulties using digital technologies. This chapter also discusses first year university students, and situations or problems they may face, and experience during the transitional process. It also discusses previous research into first year university students, technology, and students who prefer a technologically proficient university. It presents the literature regarding the position, the technology, and the diversity of higher education in Australia, reflecting the current phenomenon of Digital Apprehension.

Chapter 3 discusses the process involved in determining the concept, the boundaries of Digital Apprehension, and includes discussion around other concepts such as computer anxiety, self-efficacy, and competency. While these concepts are relevant to Digital Apprehension, in comparison are narrower in their scope. Investigation of the determinants of theory associated with technology as the motivator, or conversely, the emotional/attitudinal reasoning as the motivator are presented, giving an understanding of the influences behind the ineffective use of technology by students. Consequently, relevant theories are discussed, including learning theories, behaviourism, cognitivism, and constructivism. While learning theories have characteristics in common with the explanation of Digital Apprehension, there is not a vigorous enough consideration from the technological point of view. Also, while Digital Apprehension involves the learning process, it is not a learning of technology, or learning management system (LMS), but involves attitudes, intentions, and perceived control consistent with the TPB perspective. In addition,

examination of the technology acceptance model (TAM; Davis, 1989). is presented. Lastly, the psychological TPB is presented. This theory offers an understanding of the phenomenon of students not effectively using technology (and their supports) providing a theoretical foundation for the present research (project).

Chapter 4 then clarifies the methodological approach taken in this research, describing the attributes of the qualitative and quantitative analyses methods, showing that mixed methodology in this project took into consideration application, integration and the anticipated achievement of this project. The qualitative aspect consisted of thematic analysis seeking confirmation of the presence of Digital Apprehension as a concept. The method of coding was then discussed. Subsequently, the qualitative and quantitative analyses performed in the research gave rise to the final instrument the DAPSET, giving understanding to the statistical implications of those whose data were analysed.

Chapter 5 presents the three-tier first phase of the project, identifying Digital Apprehension as a concept, the thematic analysis (and coding) of data towards the development of the Digital Apprehension questionnaire. The first tier involved conducting semi-structured observer and participator focus groups and personal interviews. The second tier involved coding the data into themes, through listening to the audio recordings, and reading the transcriptions and emails. The third tier involved the scrutiny and analysis of the coded data with NVIVO software program, finalising with the creation of the initial DAQ to be included in the composite measure for the initial phase of the research. The procedure, results, analyses were all reported and discussed revealing that not only was Digital Apprehension present, but at 66% who took part experienced Digital Apprehension.

Chapter 6, the second phase of the research, involved the initial questionnaire consisting of 766 respondents. The initial questionnaire consisted of three instruments, the initial DAQ, PSI-12 (Beccaria & Machin, 2010), and the STS-R-A, which measured Digital Apprehension, problem-solving appraisal, and expected transition, respectively. Significant relationships were examined among key variables, as well as an exploratory factor analysis (EFA) of the problem-solving measure and the expected transition measure. The Digital Apprehension measure was not included in the EFA due to the qualitative aspect of the majority of questions involved in the measure. This chapter revealed Digital Apprehension present in 36% of participants, and that first-year females were more inclined to experience Digital Apprehension as opposed to first year males. This was followed by the creation of the final psychometric instrument, the DAPSET, consisting of the refined and final Digital

Apprehension questionnaire (DAq[1]), the problem-solving questionnaire (PSq) and the expected transition questionnaire (ETq), in readiness for the final phase of the research.

Chapter 7 presents the results of the final phase of the research which includes the whole of university students (N = 1407), using the DAPSET, its reliability, and prevalence. The data were examined and again significant relationships and differences between key variables were reported and discussed. In this final phase, the DAPSET was used not only to survey first year students, but also all university students, including undergraduate and post-graduate participants to see if this was a uniquely first year phenomenon. The results revealed that 40% of participants, university wide, experienced Digital Apprehension. Relationships and differences were examined between Times 1 and 2 of the data, revealing that as respondents progressed in their course, more reported experiencing Digital Apprehension.

Chapter 8 presents an overall summary, comparing the two survey results, the prevalence, possible limitations, and finally a brief discussion of the significance and conclusions. The confirmation of the existence of Digital Apprehension is considered, along with the creation of the psychometric instrument from beginning to end. This is followed by an examination of the prevalence of Digital Apprehension not only among first year students, but also university students as a whole. Limitations of the research were also reviewed including the sample logistics and self-report surveys. Finally, the significance of the research is discussed including the conclusions made and the impact this research could have.

[1] The difference should be noted between the survey instruments' acronyms. Specifically, to differentiate between the initial and the final instruments created, the initial phase surveys all have upper case 'Q' whereas the final phase surveys have a lower case 'q', for example, DAQ and DAq; PSQ and PSq, ETQ and ETq.

CHAPTER 2 – The Literature

Australian Higher Education

This chapter reviews the ideas that provide the foundation for this research. Use of technology is important for success in the modern university, particularly for transitional first year students. Much is known about student transition, but there is a gap in what we know about the impact of technology on student relationships, that this research aims to address.

The Importance of Technology in the Modern University

Contemporary universities are increasingly making use of technology, a situation that is likely to continue (Glen et al., 2008; G. E. Kennedy et al., 2008). Therefore, students' ability to effectively use technology to aid their learning process (learning technologies) is important for success (Surry, 2008). Surry (2008) notes that "the inherently complex and interconnected nature of technology" (p. 389) makes it difficult to measure the impact of technology and student success. We do not understand this nexus of who will succeed and who will struggle with technology. Simplistic arguments such as those based on age do not explain it (e.g. digital natives). We need more nuanced constructs that address the psychology of students to establish why they may not be using these tools that are there to help them learn. Specifically, the relationship between students and the technology that they are using is complex and defies simplistic single-factor explanations such as age. There are a number of constructs from the psychology literature that are useful for explaining this complex relationship, addressing the multiple interdependent factors such as motivation, fear, and knowledge.

Knowledge is currently disseminated throughout most of the world using differing types of technology in everyday life (smartphones, tablets, etc.), and higher education has adapted the classroom accordingly. This adaptation has included the implementation of pedagogical platforms, such as LMS which were created to enable teaching and support online, and foster interactions between students, lecturers, and course content (Lonn, Teasley, & Krumm, 2011; Powell, 2013; Surry, 2008). Learning management systems can include differing platforms to aid with instructions, assessments, and interactions (Lonn, et al., 2011), with research showing that many students preferred the digital pedagogical platforms (Lonn, et al., 2011; Prensky, 2001a, 2001b; Tapscott, 1998).

There is a strong case for Australia needing to consider incorporating the wider community into higher education to enrich the standard of Australian education, and to enhance the overall Australian educational level (Bradley, et al., 2008). The review by Bradley et al. (2008), or the Bradley Report as it is commonly known, provides a clear example of the way that the relationship between students and technology in higher education

has changed in recent years. When Australian higher education encountered the global connection brought about through the internet and online learning capabilities, it not only embraced this connection, but sought and acted upon feedback gained from the ensuing reports, such as the Bradley Report. The mere presence of the global connection suggested a need for higher education to become internationally competitive - economically, culturally, and academically (Australian Bureau of Statistics; ABS), in order to become competitive on the global educational stage. Stimulated by this, the Australian government assessed the position and recommended reviews of Australian higher education, and in turn, recommend the accessibility of higher education to the majority of Australians (Bradley, et al., 2008). That is, to open up Australian universities to people who normally would not have access (as a result of economics, remote location, or disability) to a higher education.

The Bradley Report (2008) addressed the current state of Australian higher education, revealing that to compete both educationally and economically on a global level "we must create an outstanding, internationally competitive tertiary education system … and must act now … to remain competitive …" (p. ix). The report holds that creating this outstanding and globally competitive education system entails opening the doors of higher education to a more diverse student population, thereby giving more students the opportunity of a university degree, subsequently raising the educational standard of Australians, and enabling Australia to be globally competitive (Bradley et al., 2008). Previously, there was a tendency for higher education in Australia to be perceived as being available only to the privileged or those without disadvantages such as lower socioeconomic status, regional/remote location, disability, incarceration, and Indigenous people, to attend university (A. R. J. Briggs et al., 2012). Since the release of the Bradley Report, strategies have been implemented to specifically support this more diverse range of first year students in contemporary higher education and to consider the needs of the student above the university requirements. The argument for Australian higher education to be responsive to students' demands (rather than students responding to university demands) was supported by reports such as, the Bradley Report (2008), in addition to research regarding first year experiences (Baik, Naylor, & Arkoudis, 2015; Harvey et al., 2006; James et al., 2010).

The demand driven system allowed for student demands to be considered, giving a better opportunity for disadvantaged students (Bradley et al., 2008), for instance, the allocation of funding to regional, remote, incarcerated, and Indigenous students. Therefore, the twofold targets of educating more Australians by 2020, as well as enabling the competitiveness necessary to meet the needs of the "rapidly moving global economy"

(Bradley et al., 2008; p. xi) would become tangible. This also gave support to the belief that if more Australians had access to higher education, then Australians generally, would have a higher overall standard of education. To achieve this, the government enacted a range of budgetary measures and strategies encourage a diverse range of students to consider a university education (ABS, 2012). The consequence of this was that higher education communities grew with increasing numbers of lower socio-economic, international, multi-cultural, and distance students (ABS Australian Social Trends, 2013). Such diversity included Indigenous people, English-as-second-language students, incarcerated students, first-of-family students, disability students, and regional/remote online students. With this diversity, and the advancement of the digital age, the higher education community structure has changed dramatically, and change has paradoxically become the new 'constant' (G. E. Kennedy et al., 2008). This advancement, in conjunction with the diversity in Australian universities is an important aspect that warrants further discussion. Not enough is yet known about how to ensure students within this diversity are able to succeed in their studies at university. Early indicators suggest that more work is needed to understand the factors involved in this combination of technology and diversity.

Technology and Diversity

The operation of contemporary Australian universities includes functioning and interacting not only among diverse groups, but also interacting with learning technologies on a daily basis (ABS, 2013). There is evidence that certain groups within this student population face more challenges using technology than others. These groups include those who participate through distance education, international students, rural students, online students, minority ethnic students, the mature aged, and students from different socio-economic strata (A. R. J. Briggs et al., 2012; McMillan, 2008; Smith & Burton, 2013). Many of these students have grown up in an age where computers, technology, and the internet have always existed (the digital age), not knowing a world without these (Prensky, 2001a, 2001b, 2007; Stoerger, 2009). That is to say, many people now consider interactions such as online relationships, e-conferencing, and e-communication (blogs, email, social media, discussion forums, etc.) to be everyday occurrences (Richardson, 2009; Sharpe, Benfield, Roberts, & Francis, 2006). In response to this, higher education has evolved, incorporating lectures, courses and programs that are recorded and downloaded on to computers, mobile phones, tablets, and MP3 players. Consequently, many higher education institutions have adopted communication technologies as they become available, leading to innovations in the way that tertiary education is delivered. Where today services such as online tutorials, digital

learning, e-learning, u-learning, and virtual learning are commonplace, 50 years ago they were unheard of (Hedberg, 2011; Kasraie & Kasraie, 2010; Price & Kadi-Hanifi, 2011). Considering the above information, there is a definite need to respond to the increasing diversity in the digital age to understand how higher education institutions and educators can create a quality environment for first year students.

First year students encounter unique situations which often includes the learning of new specialised technology. This is in addition to learning how to cope with the day to day problems as they arise (problem-solving), and adjusting and adapting (transition) this to their new student identities (Gale & Parker, 2011). How students react or cope with learning and technology may be negatively affected by students' appraisal and reaction to situational problems that occur within the process of this new identity creation (A. R. J. Briggs et al., 2012). Recent studies investigating these unique first year issues included the examination of learning and technology (Buckley et al., 2010), problem-solving appraisal (Geytenbeek, 2011), students' learning experience (Ertl & Wright, 2008; Harvey et al., 2006), and student transition (Lizzio & Wilson, 2006). Buckley et al. (2010) investigated first year students' approaches to study and learning styles in relation to technology, and they bring a salient point in that, "educators need to understand ... how students set about their learning tasks, their intentions and strategies, and how these impact on the quality of their learning ..." (p. 55, 56).

Furthermore, the aspect of transition in the first year is an important part of the students' journey, often with the ability to positively or negatively affect the whole of the higher education experience. Amid other things, the adaption to the new university environment and the added usage of specialised technology often created hurdles in the first-year students' transitional process (D. Kennedy & Fox, 2013). Previous research has shown that many first-year students needed to feel accepted and included by a connection to their university in order to follow through with their chosen path (Lizzio & Wilson, 2006; McMillan, 2008). The enabling of the new student to positively transition from the new unknown university life to the confident student identity becoming everyday life involved the combination of general day to day living experience (previous identity) with the creation of the (new) 'student' identity (A. R. J. Briggs et al., 2012). This combination of learning educational technology, coping with problems that may arise, amid the creation of the confident student identity often includes employment, managing a family, leaving home for the first time, or a combination of these or similar situations, creating their own set of unique hurdles for first year students.

Hurdles for First Year Students

Technology.

Given the importance of technology (and digital tools) and how these are applied in the modern university, the ability to use mandatory learning technologies during the first year is a critical factor in student success. This has the capacity to complicate an already multifaceted experience by limiting student success. Student success is seen as the primary factor both for universities and students (A. R. J. Briggs et al., 2012). As most contemporary universities are immersed in the digital age (Burton, Lawrence, Summers, Gibbings, & Noble, 2013; Teo, 2012), it is important to understand key technological factors among other complicating factors and their relationships that may be affecting first year students' journeys and their success (Buchanan, Sainter, & Saunders, 2013; Teo, 2012). Research has shown that technology and digital support tools are emerging and proliferating, and are implemented to benefit first-year students and to aid in student success (Burton et al., 2013). As Burton et al. (2013) noted, "the modern trend away from printed texts and written notes in all levels of education" (p. 1) has necessitated an increase in support for first year students, especially in regard to technological aspects of higher education. This combined with the trend for less school-leavers (19 years and under) attending university, the rise in lower socioeconomic status students, and the majority of students accessing online learning (Baik et al., 2015) give credence to the possibility that students may be struggling with technology in their higher education experience, and needs to be thoroughly considered.

Previous higher education research in areas of technology (Corrin et al., 2010; Embi, 2007; Simsek, 2011), problem-solving appraisal (Mandelman, Tan, Kornilov, Sternberg & Grigorenko, 2010; Smith & Burton, 2013), and transition (Box et al., 2012; McMillan, 2008; Mikal et al., 2013), investigated areas of interest, but were mostly singular in their focus. As Corrin et al.'s (2010) research noted, within a group of younger students with the age limit set to those born in or after 1980, students used technology more for personal/social use rather than for academic use. Corrin et al.'s research examined the technology use of students (over a period of three weeks), as measured by high (daily or weekly), low (occasionally), and non (never), concerning desktop, laptop, mobile phones, USB drives, and various other devices. However, Corrin et al.'s research was limited within its scope in respect to age, and duration, and did not consider the reasoning behind people's non-usage, which this current research investigated. There needs to be a cohesive investigation examining factors affecting first year students *in combination*, and how these interact, rather than individual domains that have been discussed in previous research, especially considering the diversity and technology

present in higher education today and that most students who have grown up with information and communication technologies often adapt well (Prensky, 2007).

Digital natives and apprehension.

Students who adapt well to technology in life and specifically in higher education are often referred to as digital natives. 'Digital native' was a term coined by Prensky (2001a) and described those who grew up in a world surrounded with modern communication technologies. Parameters of the digital native include (but are not limited to) the following factors, those born in 1980 or after with the ability to proficiently multitask differing technologies (D. Kennedy & Fox, 2013); "have developed an inherent ability and reliance on technology across all contexts of their lives" (Corrin et al., 2010, p. 387); and experience a quick and proficient adaptation to new technology (Prensky, 2001a). Prensky (2001a) enlightened many to the requirements of the 'digital natives' and how pedagogy should "invent digital native methodologies for all subjects, at all levels, using our students to guide us" (p. 6). Due to Prensky's research, it was considered legitimate that digital natives should be strongly taken into consideration for research and innovations surrounding technology and education. That is to say, educators and institutions ought to accommodate and adapt pedagogical platforms to allow quality education, specifically encompassing the digital native cohort (Prensky, 2007; Price & Kadi-Hanifi, 2011; Ransdell et al., 2011; Sharpe et al., 2006; Tapscott, 1998). However, over time, a debate arose, as to the legitimacy of digital natives.

Parameters of the 'digital native' were questioned, including age (Jones, Ramanau, Cross, & Healing, 2010), culture (D. Kennedy & Fox, 2013), socio-economic status (James et al., 2010), and even geographical locale (G. E. Kennedy et al., 2008; Ransdell et al., 2011). The existence of the digital native was also questioned, noting that "There is increasing agreement in the literature that the concept of students as 'digital natives' with good access to and 'innate' understanding of technology is a myth" (Czerniewicz & Brown, 2013, p. 45). Concerning the use of specialised technology, G. E. Kennedy et al.'s (2008) critique of digital natives holds merit. While G. E. Kennedy et al. did not deny the existence of the digital native, and consistently used the term, the research used words such as "so-called Digital Native" (p. 117) giving rise to the questionable nature of the terminology. As G. E. Kennedy et al. noted, although digital natives' use of technology was an everyday event, in the area of specialised technology needed at the higher education level, the digital native cohort did not dictate a "one size fits all" (G. E. Kennedy et al., 2008, p. 118) scenario. Specifically, the research gave weight to the thinking that, while there were particular cohorts that happily used technology, according to their research, it remains that at least half of digital natives in

their research had not used a computer for specialised technology (e.g., creating web pages, using specific university program software, statistical software, etc.). However, G. E. Kennedy et al.'s supposition that there were no studies or empirical data to back up the digital native case is not entirely accurate. Studies have shown there to be a difference between those students aged between 18-24 years and the more mature cohort, concerning their adaptability, and even expectancy of digital usage (see Lee, Kim, Park, Kim, & Jeong, 2012; Prensky, 2007).

Furthermore, assuming the presence of digital natives, literature has emerged confirming that students who were perhaps the most prolific users of technology (digital natives and the digitally literate), were not necessarily comfortable using technology in the classrooms (Burton et al., 2013; D. Kennedy & Fox, 2013; G. E. Kennedy et al., 2008). Their stated discomfort was due to the interplay between the privacy needs of their social interactions, the unfamiliarity of specialty software (Corrin et al., 2010; Heaton-Shrestha et al., 2009), or their transition to the unfamiliar environment of university, giving rise to a challenging and stressful experience, affecting their use of technology (Ransdell et al., 2011; Tinto, 2009). Nonetheless, there remain two sides, one supporting the existence of the 'digital native', and the other arguing against. Therefore, this research recognises there may be a certain cohort that are more *digitally literate* than others, and uses the terminology 'digital native'. However, this research also acknowledges a generalised definition of people with the same qualities of the 'digital native' as brought about by exposure and willingness, but not necessarily age, described as 'digitally literate'.

The substance in Prensky's (2001a, 2001b, 2007) detailed research gives credence to digital natives' existence (and their parameters) despite the surrounding digital native debate, including consequential research and discussions produced (Pokorny & Pokorny, 2005). In consideration of the Bradley Report (2008) findings, and that higher education in Australia has incorporated a more diverse intake of students, the twofold question should be asked about the integration of technology for the digital native, and the diversity of the current university population (lower socioeconomic, indigenous, incarcerated, etc.). That is to say, the current diversity of higher education has changed the population so much so that sometimes only a quarter of the students enrolled in first year courses are of the purported age-based digital native cohort (Edwards & van der Brugge, 2012). Many students are mature age, lower socio-economic, English as their second language, living with a disability, incarcerated, or living in remote areas without access to reliable technology. As the 'digital native' proponent may be the minority, it is important to question how well the diverse

university community is coping with their digital native (and digitally literate) peers, and the level of technology required for higher education. Specifically, those who studied alongside this cohort may feel inferior (Smith et al., 2015), confused, or apprehensive toward technology while working with the specialised technology, coping with disadvantages, whilst also adapting to their new student identity.

Whilst there is research indicating students have mostly taken advantage of the available technology and stayed motivated (Buckley et al., 2010; Price & Kadi-Hanifi, 2011; Sharpe et al., 2006), not all students have. There are those who became apprehensive due to unfamiliarity, confusion, or doubt in otherwise familiar areas (Heaton-Shrestha, May, & Burke, 2009; D. Kennedy & Fox, 2013; Tinto, 2009). This apprehension may have generated from doubt about their abilities, or even non-compliance with utilisation of digital tools and familiar technology (Heaton-Shrestha et al., 2009; D. Kennedy & Fox, 2013). From this, emerged the notion of 'Digital Apprehension' for the higher education student, as a new concept reflecting an aspect of the digital age and diversity in higher education.

Digital Apprehension in this project is described as a motive that leads to a reluctance to use technology, whether this motive is fear, non-compliance, frustration, or just lack of knowledge with technology, including the navigation of tools involved in studying and course completion. Previous research investigated primarily the hardware (the computer) and abilities, and not how people reacted to technology, and why - for instance, computer anxiety (which involves a fear of using computers), computer self-efficacy (based on Bandura's 1977 model) and computer competency (involving ability). These will be discussed in further detail in Chapter 3 when examining the theory behind Digital Apprehension. The concept of Digital Apprehension may be the factor influencing people's refusal to use learning technologies that are there to help, for example, specialised software (specialised referencing software, statistical software, or any type of internet virtual storage of valuable information). Furthermore, considering it has been 15 years since Prensky's explanations (2001a, 2001b), and 8 years since the Bradley Report (2008) recommendations, it is necessary to continue the ongoing review of Australian higher education, which in turn reviews Australia's position on the global academic stage to ensure quality globally competitive education, particularly during the first year. The first year of higher education is often the 'make or break' time and strongly influences whether or not students commit to three (or more) years of study (James et al., 2010; Lizzio & Wilson, 2013).

According to Baik et al.'s (2014) two-decade comparison of first year experiences, the first year is a crucial time to monitor students, and improvements implemented have shown to

improve retention and the engagement process aimed at first year students. The investigation of students' first year enables clarification of ways to monitor and generate suggested changes to support the student experience and enhance student success (Ertl & Wright, 2008). This therefore allows universities to be kept abreast of the necessary changes needed to allow them to offer quality learning. As a result, continued research is important to confirm that right directions, decisions, and discussions have been thought through, validated and initiated. These aspects, plus the findings of G. E. Kennedy et al. (2008) that even the 'tech savvy'[2] students were not always comfortable with specialised technology, suggested a need for a measure that incorporated not only Digital Apprehension, but also problem-solving appraisal, and transition. Consequently, questions remained in relation to how students coped regarding technology and higher education, and any difficulties (e.g., findings by G. E. Kennedy et al., 2008), which warranted further investigation.

Baik et al. (2014) notes that "first year students surveyed in 2014 were generally very positive in outlook, significantly more positive than first year students surveyed in the past two decades" (p. 22), suggesting relative success in the instigation of first year transitional support initiatives. However, it is still a challenge for universities - especially when considered with the diversity and the digital learning technologies now embraced by contemporary universities. Despite potential problems with Digital Apprehension, technology has been seen as a way to enable and empower students to embrace their new roles and student identities. Universities in the digital age rapidly devour the latest technological pedagogical platforms, dispensing to all the benefits of the latest digital program contemporary universities can offer. The digital age is well and truly established in most higher education institutions (Buchanan et al., 2013) and even though such technologies are often seen as helpful, supportive and economical, especially for those students of the *digital native* (Prensky, 2001a) cohort, there were concerns about the ability for all students to access their potential benefits. To some students, due to problems experienced, technology becomes a burden rather than a support (Smith et al., 2015), therefore, problem-solving appraisal is a key issue to be investigated.

Problem-Solving Appraisal.

One aspect of predicting first year student success is appraisal of the ability of problem-solving. Problem-solving appraisal, as a theoretical concept, refers to one's ability to cope with a situation that arises (D'Zurilla & Goldfried, 1971; P. P. Heppner & M. J. Heppner,

[2] 'Savvy' is a word meaning a participant who knows and understands the subject at hand (e.g. technology)

2013). Turning this into a tangible, measurable construct enabled researchers to understand how students coped, their perceived abilities (or lack thereof), how they adapted, and contributed to research enabling educators to monitor the unique problems of novice students (P. P. Heppner, Witty, & Dixon, 2004; Largo-Wight, Petersen, & W. W. Chen, 2005). How students managed these unique problems should be a considered factor when examining Digital Apprehension, specifically in combination with transition to university (Lizzio & Wilson, 2013). Lizzio and Wilson (2013) state, "it is students' perceptions, rather than any objective features or tasks that are crucial ..." (p. 390). With regard to students' perceptions and problem-solving appraisal, P. P. Heppner, et al. (2004) noted, "self-appraised effective problem solving (and particularly Problem-Solving Confidence) was significantly associated with adaptive study habits and effective attitudes toward studying …" (p. 391). This implies that students who had effective problem-solving appraisal adapted better to the rigours of study and assessment (Smith & Burton, 2013). Recently, research by Beccaria and Machin (2010) examined a short problem-solving inventory (PSI-12-item) in an Australian setting. This inventory has four subscales: problem-solving self-efficacy (PSSE); impulsive/haphazard problem-solving (IHPS); planned/rational problem-solving (PRPS); and overwhelmed problem-solving (OPS), as variants of appraisal style. Recent research by Harvey (2010) used this 12-item inventory and found "self-appraised effective problem-solvers are more successful at university …" (Harvey, 2010, p. 24).

The PSI-12 (Beccaria & Machin, 2010) measure has been used in the higher education sector to research the effect of students recognising their problem-solving appraisal and how this functioned positively to support the transition from their previous lifestyle to the new situation, for example, becoming a student (Harvey, 2010; Smith & Burton, 2013). For instance, students who recognised their problem-solving appraisal abilities, and sought guidance, were more likely to have had a more positive experience in their first year of higher education (Smith & Burton, 2013). In contrast, students who were unaware of their problem-solving appraisal, faced new situations and challenges, and in conjunction exhibited overwhelmed and/or impulsive/haphazard problem-solving appraisal, may have experienced negative effects for their university transition (Smith & Burton, 2013). Students' reactions to challenges often depended on problem-solving appraisal (Lizzio & Wilson, 2013; Smith & Burton, 2013), and this ability was an important factor in enabling them to "work through life transitions and adjustments" (P. P. Heppner et al., 2004; p. 346). Smith and Burton (2013) contend that students' problem-solving appraisal was positively affected by online peer mentoring. Therefore, if students can be positively influenced by external sources, such as

peers or support to recognise and steer their ability to problem solve, it stands to reason that other external sources, such as frustration from technology (or Digital Apprehension) may negatively influence their ability to problem-solve. That is to say, if a positive input can positively steer a person's path, it stands to reason the opposite may also be true, that negative input may negatively steer a person's path. Subsequently, if people's ability to problem-solve is negatively affected, it may well amplify any Digital Apprehension. As a result, if people believe they can grasp new concepts and technological tools easily, their problem-solving appraisal amplifies apprehension, and transition is complicated and problematic, then support is needed when the dissonance between the ideal and the real arises.

Consideration of transitional problems that students face in the first year, their appraisal of these problems, and how well they perceive their ability to cope and achieve, is important and potentially central to student retention (James et al., 2010). James et al. (2010) note that from 1994 to 2009 there have been productive improvements in addressing the transition experience. For example, transition programs have been introduced in many Australian universities and were at the core of much research (Box et al., 2012; A. R. J. Briggs et al., 2012; Burnett & Larmar, 2011; Chester et al., 2013; Lizzio & Wilson, 2006; McMillan, 2008; Penn-Edwards & Donnison, 2011). One proven strategy employed to map transition, was via Lizzio's (2006) Student Transition Scale, which enables better understanding of the transitional problems faced by students (Box et al., 2012; Burnett & Lamar, 2011; Chester, et al., 2013; Hutchinson, Mitchell, & St John, 2011). While James et al. in their review show that at least half of new first year university students were having their expectations met, it also means that around half were *not* having their expectations met, opening the door for a negative transition experience. This experience may be amplified, for example, by a negative experience engaging with the learning technologies (navigation of university websites, negotiating online course enrolments, ability to log in, etc.), negative appraisal of problems faced, or expected transition experience, to name a few. The task of managing the dread, frustration, or annoyance has the potential to create problems for anyone who was attempting to work through any apprehension felt. How people coped with any problems they faced had an impact on their reaction to the technology (Smith et al., 2015), and any Digital Apprehension they may have experienced.

Therefore, the need to understand problem-solving appraisal, and how this benefitted the understanding of Digital Apprehension, including what part it played in student transition was a natural assumption to investigate. Clearly, the formation of positive social, academic,

and community networks are central in the first year for a positive transition experience (Bryce et al., 2007; Dyson & Renk, 2006; Harvey et al., 2006). Therefore, in contrast, negative social, academic and community networks would be involved in first year students perceiving that their expectations were not met, and were more than likely to experience problems transitioning, and therefore were more likely to withdraw (Bovill, Bulley, & Morss, 2011; A. R. J. Briggs et al., 2012; Lizzio & Wilson, 2013). Consequently, it is important to examine ways in which students are supported to achieve a positive transition experience (Box et al., 2012; Harvey et al., 2006; Heaton-Shrestha et al., 2009; Lizzio, Wilson, & Simons, 2002; Tinto, 2009).

Transition.

Transition is a different experience for everybody, and specific to this research involving first year students, 'transition' was defined as moving from what was prior (past experience) to what is now (present experience), and how the difference/dissonance between the two were negotiated. Specifically, how students adapted moving from the past experience to the present experience. Student transition is a theoretical concept describing students' initial adaptation to university (Lizzio & Wilson, 2006). Attending university involves considerable changes in people's lives as they entered (transition) into the role of 'student' (A. R. J. Briggs et al., 2012). For instance, managing and coping in new circumstances with deadlines and course requirements, and adaption to the new parameters brought into their lives by this transition to education at the tertiary level (Smith & Burton, 2013). To succeed at the tertiary level, a high input of interaction and autonomy within a new environment is required. Adaptation to this higher level, while taking in the knowledge necessary to embark upon and complete a program, involved various factors that may have led to stress, confusion, and possibly withdrawal from university, especially in the first year of study (Bryce, Anderson, Frigo, & McKenzie, 2007; Chandler & Potter, 2012; Heaton-Shrestha et al., 2009). An obvious aim of higher education establishments is to retain students by enabling and supporting them to successfully complete their programs (Forbes, 2009; Radloff, Coates, James & Krause, 2011; Tinto, 2009; Willcoxson et al., 2011). While there was no single factor that contributed to students dropping out (Alarcon & Edwards, 2013), according to Alarcon and Edwards (2013), there were "many reasons why students may leave a university, such as: personal motives, lack of integration, dissatisfaction with a course …" (p. 129). Subsequently, there are many factors that have been considered to counteract this phenomenon, for example, one of the best predictors of first year student retention is student success (Burnett & Larmar, 2011; Harvey et al., 2006).

Student success often involves overriding factors such as students' perceptions, and confidence that they had been enabled to achieve a sense of belonging, and a sense of connection to their studies and university (A. R. J. Briggs et al., 2012; James et al., 2010; Lizzio & Wilson, 2006). According to Lizzio and Wilson (2013), students' perceptions of their capabilities were one of the most important influencing factors. When students perceived these to be achievable, they were more likely to continue to completion of their programs (Chandler & Potter, 2012; Penn-Edwards & Donnison, 2011). Additionally, Tinto (2009) noted several conditions that created an environment conducive to student success, including clearly understood expectations, support (academic and social), student engagement, and feedback. Understanding these considerations enables a more positive experience for all involved.

Chapter Summary

The literature has been examined regarding the position of higher education and first year students, the diversity, and the implementation of learning technologies in Australian higher education, and hurdles of first year students (technology, Digital Apprehension, problem-solving, and transition). This enabled clarification of the phenomenon experienced as apprehension with technology by students. Furthermore, this chapter presented information to suggest that a gap existed in the literature with no adequate explanation currently available. Therefore, the following research questions need to be addressed: If Digital Apprehension (DA) is a viable stand-alone concept and exists among first year university students, is it unique to first-year students and what is its prevalence. Additionally, does DA hinder students, and if so what is psychological basis creating the barriers for DA. It was therefore hypothesised the reluctance was due to the concept of Digital Apprehension, and this in turn influences people's expectations, intentions and subsequent actions. This hypothesis is realised with the project's three objectives of establishing the existence of Digital Apprehension as a concept, the creation of a psychometric instrument to measure the concept, and the evaluation of how Digital Apprehension interacts with students' reluctance to use technology in a higher education setting. These objectives were underpinned by the understanding of this phenomenon and the clarification of what lies beneath the intentions and behaviours of Digital Apprehension. The following chapter examines the theoretical perceptions of Digital Apprehension, and gives insight into what lies beneath modern mindsets and behaviours around technology.

CHAPTER 3 - Conceptual Framework, theories and perceptions.

Introduction

This chapter discusses the theoretical foundations for Digital Apprehension and presents a conceptual framework. This chapter also examines Human Computer Interaction (HCI; Holt & Fraser, 2004), with an explanation of some of the challenges faced by people attempting to carry out intentional activity, and their behaviour in using learning technologies. Three areas of theory are drawn upon to develop the epistemological and ontological foundation for the work: learning theory; technology theory; and psychological theory. Digital Apprehension has its foundations in the scholarly literature in psychology, as a unifying concept that relates to the attitudes, intentions, and behaviours involved in people's reluctance to use technology.

The Conceptualisation of Digital Apprehension

Digital Apprehension is a form of apprehension that afflicts individuals regarding the use of digital technology. It involves the psychological factors preventing a positive attitude prior to and during use of computers. It describes certain negative emotions, attitudes, intentions, and behaviours of people towards software, hardware, and connected technology, and can be used to explain impacts upon subsequent behaviours. This research investigated Digital Apprehension in the higher education sector, focussing upon students' attitudes toward current learning technologies in higher education. In the 21st Century students are expected to use technology to complete tasks in their selected programs. Digital Apprehension is a useful concept for explaining some of the difficulties that may be experienced by students in undertaking these technology-centred tasks.

Digital Apprehension builds upon previous research and theories with HCI that attempt to give an understanding of humans' intentions, reactions, and actions, with their reluctance to use and persist with computers and technology (Barnes, 2000; Bazerman, 2010; Buchanan, 2013; He, 2014; Powell, 2013). Social Constructionist Theory was examined by Barnes (2000) who argued that HCI incorporates the social constructionist approach which involves self-directed learning and the interactivity between visualisation and the 'doing' of learning. This is utilised when humans interact with computers by using some type of utensil or artefact (mouse, keyboard, etc) and learn by exploration and interaction, constructing the learning process between the human and the computer. Activity Theory was reviewed by Bazerman (2010) with a focus on HCI and proposed that the blurring of the boundaries between the computer interface and the human cognitive or consciousness aspect is consistent with Activity Theory and gave clearer understanding of humans and computers and how they interacted as one. This blurring of the boundaries being in contrast to the normal rigid

boundaries of the separation of human and computers. Furthermore, Buchanan et al. (2013) examined HCI when they considered faculty adoption of learning technologies and discovered that both the self-efficacy of the individual and the context of technology use were highly positively correlated with technology adoption. A limitation of the study though were questions of causality and the determining factor of higher internet usage. Powell (2013) explored HCI involving computer anxiety history with a comprehensive review covering the 1900s and 2000s examining common variables (such as self-efficacy, personal characteristics, perceived ease of use, perceived usefulness, etc.) and statistical comparisons noting attitudes to computers, performance of individuals and computer anxiety, and recognised the shortage in computer anxiety research. According to Powell (2013), many of the studies reviewed either had an unacceptable number of limitations or narrowness in their scope due to low sample size or sample demographics. Educational technology theories were examined and reviewed by He (2014) and noted that limitations existed due to scholars around the world missing the focus by concentrating on the learning theory instead of the teaching and instructional design theories and practicalities. The emergence of Digital Apprehension has identified that the current literature does not adequately explain the reluctance of users to fully embrace computers and technology.

The Foundations of Digital Apprehension

Digital Apprehension seeks to provide an explanation for the observed reluctance for humans to make use of available technology and digital tools. There are three key foundational concepts underlying DA including: Computer anxiety (Marcoulides, 1989; Sam, Othman, & Nordin, 2005), computer self-efficacy (Bandura, 1977; Compeau & Higgins, 1995), and computer competency (Hedberg, 2011; G. E. Kennedy et al., 2008).

***Computer anxiety*.** The concept of *computer anxiety* (Marcoulides, 1989), and similarly, *technophobia* (Rosen & Weil, 1995), mainly apply to the use of computers (hardware and software) and technology used. These terms describe an irrational fear of using computers, where people became anxious because they are afraid of breaking the computer, or looking foolish because of their inadequacy in using computers (Sam et al., 2005). The term, computer anxiety was used by Marcoulides (1989) to measure "perceptions by students of their anxiety in different situations related to computers" (p.733). Powell's (2013) comparison research notes that "The majority of the [computer anxiety] studies use measures developed in the 1980s" (p. 2379), and while there are many computer anxiety scales available, most are based on measures developed over thirty years ago. Furthermore, results of most studies involved either personality measures, or measuring computer anxiety

in relation to computer competency, or efficacy in combination with the Computer Anxiety Scale (CAS), or another anxiety scale, the Computer Anxiety Rating Scale (CARS).

Marcoulides (1989) created the CAS to determine strategies to lessen the impact of anxiety when using computers and to improve computer achievement. The CAS is a self-report survey, consisting of 20 items and measures students' perceptions of their anxiety towards computers (Marcoulides, 1989). The CAS is a 5 point Likert scale, ranging from "*not at all*" to "*very much*", with higher scores indicating higher self-reported anxiety. The participants in Marcoulides study consisted of 225 college students, where approximately half the participants had experienced computers previously in college courses. The CAS consists of two factors, general computer anxiety, and equipment anxiety factor. The general computer anxiety factor included actual use, thoughts about computer classes, training, error messages, and the role of the computer in society. The equipment anxiety factor included working on a computer, working on a typewriter, printouts, and watching someone else operate computers (Marcoulides, 1989). Similarly, the CARS is a 19 item self-report survey (created by Heinssen, Glass, & Knight, 1987) and measures respondents' anticipated level of anxiety. The CARS is a 5 point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with higher scores indicating higher computer anxiety.

Powell's (2013) comparison of the research noted that the CAS (Marcoulides, 1989) had been used mainly with specific minority cohorts, and/or with people's ability (or inability), not the reasoning behind their action or inaction. The most important message (for Digital Apprehension) from previous computer anxiety research was noted by Powell in her comparison study "Because of the changes in technology and the increased ubiquity of computers, it is possible that people have a different form of computer anxiety than they had in the past" (p. 237). While Digital Apprehension includes computer anxiety as a foundational concept, it is a broader construct that encompasses other aspects such as apprehension due to deadlines, frustration due to inadequate training or slow internet connections, and cumbersome web pages. Digital Apprehension does involve negative attitudes such as fear, however, there are other characteristics where fear is not present, such as non-compliance.

***Computer self-efficacy*.** This is based on Bandura's (1977) model of self-efficacy, and is more often than not a performance based construct based on skill and whether or not an individual perceives that they can master the task (Sherer et al., 1982). This differs from Digital Apprehension in that computer self-efficacy examines people's perception of confidence in their ability to perform the tasks (Compeau & Higgins, 1995). Whereas,

Digital Apprehension examines people's reactions to the actual technology, not their performance. There are several self-efficacy scales, but two of the commonly used are, the 32-item Computer Self-Efficacy Scale (CSES; created by Murphy, Coover, & Owen, 1989) and the similarly named 10-item Computer Self-Efficacy Scale (created by Compeau & Higgins, 1995). The CSES (Murphy et al., 1989) has 32 self-report items, with a 5 point Likert scale, with three main factors. These measured, beginning-level, advanced level, and mainframe level computer skills (Torkzadeh & Koufteros, 1994). Whereas, the scale of Compeau and Higgins (1995) is a 10-item, self-report measure, and measures tasks, and difficulty level with a yes/no answer, as well as a confident rating Likert-type scale, with 1 (*Not at all* [confident]) to 10 (*Totally* [confident]). The more positive answers scored indicating a higher perception of self-efficacy.

Again, an aspect of self-efficacy is involved in Digital Apprehension in that the behaviours of some users are influenced by their lack of confidence in their own ability. While this can be seen in Digital Apprehension in the aspect of low confidence, self-efficacy does not provide an adequate explanation to other aspects that are involved in the reluctance to use technology (Digital Apprehension) such as the reasoning behind non-compliance (privacy, mistrust, and indifference) and English as a second language. Furthermore, Digital Apprehension encompasses all technology (software & hardware) as well as user reactions, including navigating the tools involved in studying and course completion, such as downloading information to smartphones, and using specialised software. Conversely, computer self-efficacy involved people's perceived confidence in their ability to operate computers. For example, Sam et al. (2005) state that "computer self-efficacy is a belief of one's capability to use the computer" (p. 206), and not does not include frustration from software, servers, or websites. Computer self-efficacy is based mainly on the self-perception of one's ability to use the computer or technology. Sam, et al. also noted that "computer self-efficacy is positively related to performance" (p. 207), indicating that computer self-efficacy impacts computer performance. While DA does impact on performance and self-efficacy these are end factors of Digital Apprehension. It should be noted that while computer self-efficacy is a critical factor in determining what someone chooses to do, how much effort they expend and how long they persist, it does not necessarily account for the attitudes towards the functional ability of technology. As the main condition of success in assessing self-efficacy is based on the participant's decision of attribution (chance or skill) this is insufficient for the assessment of Digital Apprehension. This shortfall of self-efficacy in relation to DA is seen in people who are high in self-efficacy but still have DA for example the non-compliant

aspect of DA. This is where a student will refuse to use learning technology because the amount of time that is spent trying to reach a specific website as they have to re-sign in each time they click on a different icon.

Computer competency. This is based on the end result of operating the technology, and is also known as computer proficiency or computer skills (Grant, Malloy, & Murphy, 2009; D. Kennedy & Fox, 2013, Shuster & Pearl, 2011). While it may play a part in determining the outcome of Digital Apprehension, again it only covers a part of the reasoning why people persevere with technology. Digital Apprehension does involve self-perceptions, however, it is not competence based, but assesses reasoning and attitudes in regard to technology use. Specifically, Digital Apprehension does not measure the results of using technology, but is a reason why technology is not used. Although computer competency reveals capability in undertaking tasks on a computer, and computer self-efficacy deals with perceptions of capabilities, they have the commonality of the ability of people to operate computers. It is often a graded result, based on an assessment, and ascertains people's performance and proficiency (Jiang, W. Chen, & Y. Chen, 2004) when individuals used technology, not why they chose not to use it. Research involving computer competency examines areas such as computer usage in sport with specific programs and tasks (Diacin & VanSickle, 2014), or student knowledge or self-assessment (Shuster & Pearl, 2011), and perceptions and abilities (Grant et al., 2009). The need for the construct of Digital Apprehension is based upon the observation that it is quite possible to be computer confident (have high computer self-efficacy) and competent (have high computer competence), and still experience Digital Apprehension. Thus there is clear need for the development of an additional construct. This shortfall of computer competency in relation to DA is seen in people who are high in computer competency but still have DA for example the non-compliant aspect of DA. This is where a student will refuse to participate in an online discussion group because they perceive them to be just for 'needy people' and a waste of time.

The differences noted between Digital Apprehension and computer anxiety, self-efficacy, and competency, have shown that certain aspects are present in Digital Apprehension, however, there are major differences with end usage. Thus, whilst these three terms all relate to and shed light on Digital Apprehension, there is a motivation for adopting this new term that brings together these relevant aspects of apprehension – the psychological factors preventing a positive attitude prior to and during use of computers. Digital Apprehension is much broader in concept, and involves other aspects such as frustration with

the level of technology, or the speed of systems, the appropriateness of software, frustration with translating English, and involves an attitude, emotion, and reaction to the technology, and not necessarily an ability. Consideration of the three concepts, computer anxiety, self-efficacy, and competency, has given clarification of the concept of Digital Apprehension and enabled the recognition of the limitations of these three concepts in relation to Digital Apprehension.

Having recognised the intention of Digital Apprehension, the focus now turns to understanding why people's experience, intentions, and behaviours are affected by Digital Apprehension and the theory behind the concept. The concept of Digital Apprehension is understood as an attitude leading to a behaviour that has been created either by nervousness, frustration, contempt, or fear experienced when using technology or digital tools. When trying to understand Digital Apprehension, it is necessary to consider where the motivation (or determining factor) for the phenomenon began. Understanding the fundamentals of Digital Apprehension, its legitimacy and scope involves differing factors. Consideration ought to be given to the idea that the human mind and the way it functions (cognition) has not changed drastically over time; however, social development and technological advance have (Powell, 2013). Digital Apprehension can be understood as sitting at the intersection of technology theory and social psychology theory. Technology theories posit the impetus begins with the technology (Luck, 2008). According to Luck (2008) technological determinism theorises that technology is the driving force creating the changes within society and human reactions, and as technology develops the society is directed by technological change; whereas Luck notes that [social] psychological determinism suggests social factors and individual differences as the impetus with technology changing accordingly as society changes (see Figure 3.1).

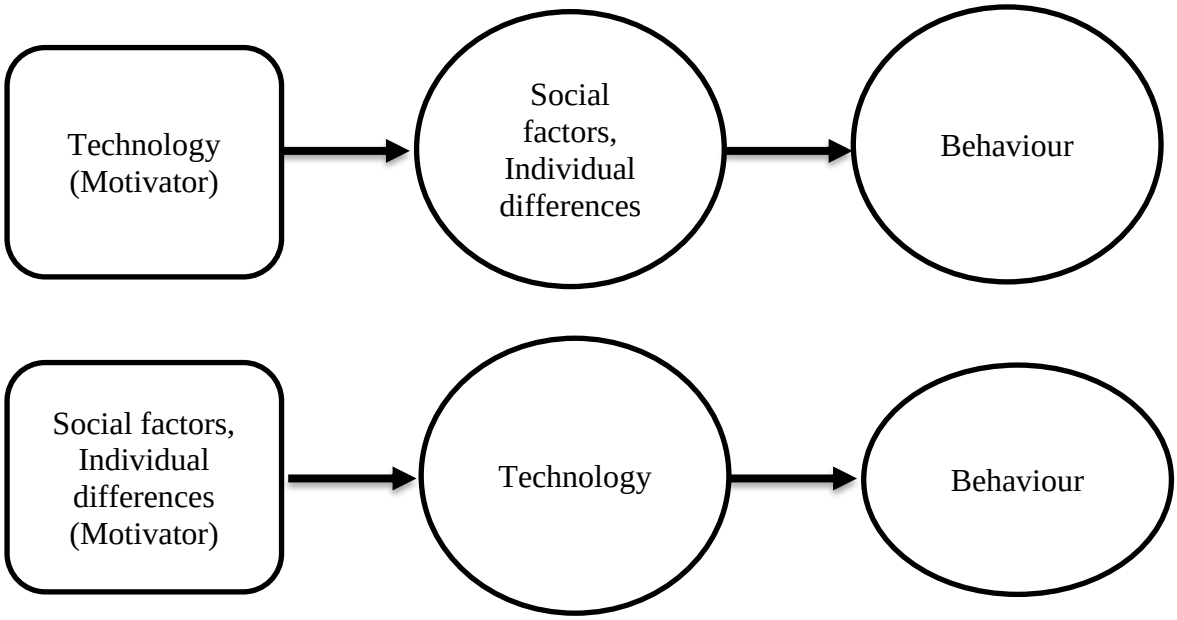


Figure 3.1. Difference between technological determinism and psychological determinism.

Digital Apprehension within the scope of this research is considered to lean toward the social psychology theories with human attitudes, intentions, and behaviours interacting with technology. The subsequent section seeks to examine DA in relation to the relevant established theories Behaviourism (Watson, , Cognitivism (Ertmer & Newby, 2013), and Constructivism (Siemens, 2004); TAM (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989); and TPB (Ajzen, 2002).

Theoretical Foundations

Individuals are taught that technology is there to benefit the student and is easy to use, and success is more likely to occur if learning technologies are used (Lonn et al., 2011; Prensky, 2007; Surry, 2008). Individual experience however, reveals something entirely different each time, in that technology is frustrating one time and not the next, confirming that Digital Apprehension is not just about inability or anxiety. Human Computer Interaction (HCI; Holt & Fraser, 2004) and theories associated with HCI can be challenging to tease apart aspects that are specific to technology and those specific to humans. Furthermore, the context in which the interaction between humans and computers is occurring can have a strong influence upon the outcome of that interaction. For example, there are many HCI theories about how humans are able to interact with external technologies - and what affordances of the technology can make it easier (or harder) for humans. Part of the calculus of Digital Apprehension is the design of the ICT that the students have experience with. For example, Shuster and Pearl (2011) found in their study (over a 7 year period) that high on the list of frustrations among nursing students were not only the computer hardware and software

interaction, but also a number of participants who were competent in computers were frustrated with others who were less competent.

Another theory that may seem to capture the application of findings about Digital Apprehension and is more specific to technology, is the Technology Acceptance Model (TAM; Davis, 1989). Research investigating the TAM in the context of computer self-efficacy, computer anxiety, and the roles these play with Learning Management Systems (LMS) was conducted by Saade and Kira (2009). According to Saade and Kira results revealed that computer anxiety is lessened by higher computer self-efficacy when using an LMS. This research highlighted the need to understand perceived attitudes and feelings of the person interacting with computers. It should be noted however, that Saade and Kira's research only investigated one learning tool and may not be generalised across the whole spectrum of technology. While this theory (TAM; Davis, 1989; Davis, Bagozzi, & Warshaw, 1989) gives recognition of the importance of locus of control and attitudes, it does not seem to make a distinction between control and where the control is within the users' scope. Digital Apprehension is concerned with the users' control over their decision to use the learning technology despite what normative beliefs are in play, specifically the difference between the psychological state, the expected behaviour, and the observed behaviour. The goal of this next section is to examine the theories that address the relationships between psychological states and observed behaviours.

Theories to Explain Observed Behaviours.

Digital Apprehension illustrates that expected behaviour is not always the observed behaviour according to normative beliefs in relation to the use of technology. It explains the gap between expectations to use the technology, and the reluctance (or refusal) to use technology. For example, the intention may be for a student to use a software program to insert citations and footnotes into a document (expected behaviour). The student has been told the software program is easy to use, is beneficial, and will save time (normative beliefs). The student uses the software and discovers the program continually inserts the incorrect formatting and the document 'freezes' and any unsaved work is lost - the student refuses to use the software (observed behaviour). Originally the expected behaviour was for the student to use the software, however, the observed behaviour is the student refuses to use the software. The ensuing gap is attributed to Digital Apprehension. The recognition that expected behaviours and intentions are different to observed behaviours is theorised in differing models and behavioural explanations, particularly in learning theory.

This research is concerned with the investigation of Digital Apprehension within learning in a higher education setting. Digital Apprehension is defined as the psychological factors that prevent constructive use of ICT to achieve tasks. It investigates the reluctance to use technology and includes unwillingness or negative attitudes due to aspects such as unsatisfactory tasking of technology, inability of the user, and frustration due to consistency of deliverables while using technology. As a psychological phenomenon, DA is entirely dependent upon context. The context of the task that we are interested in this research is using learning technologies in higher education. Accordingly, there is a need to examine common learning theories to enable clarification of the setting and understanding of the shortfalls of these in relation to DA and to distinguish between the context (the learning setting) and the conceptual object (learning technologies). While learning theories do give insight into various aspects of DA it will be shown that these theories lack the depth needed to sufficiently incorporate all the factors, including the attitudinal position, the technology, and the cognitive aspects involved in DA. Following three main learning theories are examined.

Digital Apprehension involves the cognitive and behavioural both interacting with learning technologies employed in universities. Based on Bandura's (1977) Social Learning Theory the cognitive is when the mind decides, contrary to pressure (either from peers or from the university), that using the technology is not beneficial. The behaviour is then the action of non-use of the learning technologies. The instruments used in this research have their origins in a cognitive theory, the Theory of Planned Behaviour (Ajzen, 2002) that reveal the processes inside the minds of learners. Thus, the work does draw upon this notion of learning but not the actual higher education learning of course material. The learning process applied to Digital Apprehension is when students decide (learn) in their mind either the positive reaction - to use technology; or the negative reaction - not to use technology. This can be seen where a good grasp of technology is experienced with computer competency (Shuster & Pearl, 2011) and self-efficacy (Compeau & Higgins, 1995) present, however, due to previously experiencing time consuming downloading of material refuse to use learning technologies. Three paradigms for learning can be described as Behaviourism, Cognitivism (Ertmer & Newby, 2013), and Constructivism (Siemens, 2004).

Behaviourism is often used to explain or predict why people exhibit certain behaviour, including the control of behaviour, and purports to produce unbiased results (Watson, 1994). It is often implicit from Skinner's (1950) understanding of operant conditioning, which reasons that it is difficult to test and retest the unseen cognitive. Whereas reinforced

behaviours (either positively or negatively) are more reliably measured and understood in that "A purely behavioral definition of expectancy has the advantage that the problem of mental observation is avoided and with it the problem of how a mental event can cause a physical one" (Skinner, 1950, p. 194). The understanding of operant conditioning is that difficulty arises when trying to test and retest the unseen cognitive, whereas reinforced behaviours (either positively or negatively) are more reliably measured and understood.

Skinner's famous 1954 quotation - "Education is what survives when what has been learned has been forgotten" - captures the connection between Behaviourism (Watson, 1994) and education. Education in this respect is the learning process. The learning process applied to Digital Apprehension is when students learn either the positive or negative results of using technology in the higher education setting. This results in one of two situations, the learnt response dictates students to use the technology, or Digital Apprehension drives students not to use the technology. Aspects of Behaviourism (Watson, 1994) are explained in Digital Apprehension in that, on some occasions, the behaviour had nothing to do with the cognitive process but involved repeated behaviour, despite cognitive understanding of technology - not unlike a phobia, in that the behaviour persisted even when cognitions changed. This can be seen in the non-compliant factor of Digital Apprehension, where a good grasp of technology is experienced with computer competency and self-efficacy present, however, the refusal to use technology is apparent.

The concept of Digital Apprehension purports that while Behaviourism (Watson, 1994) is a major factor of Digital Apprehension, one of the major considerations of Behaviourism (Watson, 1994) is that the mind (cognitive) is like a 'black box' that cannot be looked into, and therefore the ability to replicate findings is thwarted by opinions and suppositions about what was in the mind (or 'black box'). Therefore, it was not considered an acceptable explanation as the 'black box' of the mind is accessible and becomes transparent when questions are asked, giving the test-retest ability as sound. Specifically, the lack of cognitive explanations with Behaviourism (Watson, 1994) gave rise to the theory as being not holistically sound for the applications involved in Digital Apprehension. This leads to another common learning theory Cognitivism (Ertmer & Newby, 2013).

Cognitivism (Ertmer & Newby, 2013) is based on the premise that the mind is the main contributor to the learning process and enters, stores, and retrieves information (Ertmer & Newby, 2013). This theory has merit on the premise that it addresses the Behaviourism (Watson, 1994) deficit with the implication of opening up the 'black box' known as the mind. This gives the understanding that psychological processes can indeed be successfully

mapped, and is understood as knowledge influencing the mental activities and behaviours (Ertmer & Newby, 2013) rather than the conditioning orchestrating the perpetuation of behaviours. While Cognitivism (Ertmer & Newby, 2013) emphasises the mind, the explanation of Digital Apprehension not only involves the cognitive aspect, but also involves behavioural changes which cannot be adequately accounted for with this cognitive theory. In examining the two learning theories presented so far in relation to DA, it can be seen that behavioural intentions and actions are influenced during DA, and while the previous behavioural theory gave some explanation, and cognitive theory gives some explanation, the majority of the Digital Apprehension concept is not sufficiently clarified with the either theory alone. However, it should be noted that aspects of both Behaviourism (Watson, 1994) and Cognitivism (Ertmer & Newby, 2013) are included in DA within the reasoning behind the perpetuating behaviours. For example, the cognitive aspect is seen in attitudes, intentions and normative beliefs, and the behavioural aspect is seen when the use or non-use of the technology is actuated.

The third learning theory, Constructivism (Siemens, 2004), according to Dalgarno (2001) involves the belief that "within a domain of knowledge, there may be a number of individually constructed knowledge representations that are equally valid" (p.184). Dalgarno (2001) noted there is substantial difference of belief in respect to the details of applying the principles of Constructivism (Siemens, 2004). Constructivism (Siemens, 2004) has its basis in Piaget's work with accommodation and assimilation and is ambiguously a cognitive theory (Dalgarno, 2001). According to Siemens (2004) Constructivism gives understanding to the reaction that occurs when experiencing Digital Apprehension by clarifying that as individuals experience negative reactions to technology through frustration or impatience, their behaviour will reflect that negativity - with the refusal to continue to use technology. However, as Constructivism (Siemens, 2004) is mainly concerned with individuals acquiring knowledge, and assimilating that knowledge through actively learning (Toraman & Demir, 2016) this approach is applicable mainly within the teaching framework, and not necessarily within the experience of Digital Apprehension. Specifically, individuals are taught that technology is there to benefit the student and is easy to use, and success is more likely to occur if technology is used, however, this is not always the case.

The relevance of Constructivism (Siemens, 2004) is that increasingly, higher education is subscribing to a constructivist conception of learning, and learners are using technology in a way that is influenced by this (Ertmer & Newby, 2013). While the application of findings about Digital Apprehension may be considered in the context of a constructivist learning

environment, its application would be limited by the context of the learning environment. While constructivist theory holds some interest regarding the explanation of Digital Apprehension, especially with the concept of created meaning rather than acquired meaning (Ertmer & Newby, 2013), again, like the previous theories, it clarifies only a part of Digital Apprehension, and does not give a full understanding of the concept. For example, the Constructivism (Siemens, 2004) approach is present in the belief that students will succeed if they use technology, whereas, DA incorporates aspects that show this to not be the case. Specifically, it falls short by not accounting for areas that despite the normative belief that technology is there to benefit and will end in success, it does not and therefore does not capture the full extent of DA.

In summarising the learning theories, while there were aspects that enabled understanding to some of the characteristics of Digital Apprehension, no one theory gave a complete enough understanding. Specifically, while distinct in their own right, they have many general similarities, and often "prescribe the same instructional methods for the same situations" (Ertmer & Newby, 2013, p. 46). According to Siemens (2004) these theories do not take technology into account. However, in contrast to Siemen's connectivism, theories have been adapted to incorporate the technological advances that have occurred. According to Luck (2008) theories in regard to technology and education started to appear as early as the late 1950s, which were the basis for theories such as Information Processing Theory (Estes, 1978), or the Technology Acceptance Model (TAM; Davis, 1989). However, since Digital Apprehension involves the cognitive, the behavioural, the intentions, and the normative beliefs all interacting, the learning theories fall short. That is to say, one theory gives understanding from the behavioural viewpoint (lacking in the cognitive), and represents a limitation on what we can learn about what is happening in the minds of learners. Others give understanding to the cognitive viewpoint (lacking in the behavioural). However, the origins in cognitive theories of learning and studies that use other methods to reveal the cognitive processes inside the minds of learners. Thus, while the work does draw upon this notion of learning, it incorporates the human interaction with computers - the intent, the normative beliefs, and of learning to use (or not use) technology. However, the idea of HCI is more fully captured with a theory more specific to technology - the TAM (Davis, 1989). From this theory we can recognise the importance of locus of control and attitudes. While TAM (Davis, 1989) was discussed earlier, the origins and general concept will now be discussed through the lens of the application findings of Digital Apprehension and this technological perspective.

Technology Acceptance Model.

The TAM (Davis, 1989) originates from Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA) which purports that an evaluation of attitudes motivates behaviours in a way that is seen as the 'norm' (Hsu & Lu, 2003). The general concept of TAM (Davis, 1989) was used as a prediction in regard to people using technology again in the future (Lee & Tsai, 2010). Generally, research that has been carried out in regard to TAM (Davis, 1989), has involved extrinsic and intrinsic locus of control (Moon & Kim, 2001). Perceived usefulness, perceived ease of use, and behavioural intentions are also important factors within the TAM (Lee & Tsai, 2010; Svendsen, Johnsen, Almas-Sorensen, & Vitterso, 2013). With regard to Digital Apprehension, there seems to be no distinction between locus of control, whether the negative experience is counted as users' control or the control is beyond the users' control. Digital Apprehension occurs when things are not in line with the user's belief of how things should work. This means than whether the locus of control (Davis, Bagozzi, & Warshaw, 1989) is internal or external DA still occurs and attribution of locus of control is better explained with the Theory of Planned Behaviour rather than TAM (Davis, 1989). Therefore, while TAM (Davis, 1989) explored the technological aspect, it did not fully satisfy the explanation of Digital Apprehension.

Having discussed Behaviourism (Watson, 1994), Cognitivism (Ertmer & Newby, 2013), and Constructivism (Siemens, 2004) as relevant learning theories due to the research conducted in a learning environment, and the technological theory of TAM (Davis, 1989), this section now turns the focus to the [social] psychological Theory of Planned Behaviour.

Theory of Planned Behaviour.

The Theory of Planned Behaviour (Ajzen, 2002) was also derived from Fishbein and Ajzen's (1980) TRA. According to Truong (2009) the TRA created confusion (giving conflicting results) between attitudes and subjective norms warranted a theory that would address this weakness. The TPB (Ajzen, 2002) incorporates Perceived Behavioural Control in addition to Attitude Toward Act or Behaviour and Subjective Norm, therefore address the weakness (Truong, 2009). It has shown to be robust with the prediction of technology adoption (Teo, 2012; Yang & Zhou, 2011). This theory gives a good deal of understanding with regard the actions and behaviours people plan to take. For instance, according to the TPB (Ajzen, 2002), Digital Apprehension is an attitude conceived from the belief that using technology is not worth the trouble experienced for various reasons. People's behaviours are influenced by their intentions, which in turn are influenced by their attitudes. Applying the theory to the Digital Apprehension model, the societal norm is the belief that technology is

there to help and support students and is a positive experience, enhancing study practices. There are three factors of intention involved: personal attitudes, social norms, and perceived behavioural control. These intentions interact in regard to the final behaviours. This can be seen in Digital Apprehension in the following: *Attitude* is seen as the person's overall evaluation that using technology is a negative experience; *subjective norm* is seen as the expectations that others believe that using technology is good and a positive experience; and *perceived behavioural control* is seen as the four aspects of Digital Apprehension, that is, confidence, language, knowledge, compliance.

According to the TPB (Ajzen, 2002), the perceived behavioural controls (confidence, language, knowledge, or compliance) will produce either a favourable or unfavourable attitude towards behaviour. This is irrelevant to what the social pressure is (normative), and is decided by the behavioural controls whether people believe that it is an easy or hard thing to do (Teo, 2012) as to whether people experience Digital Apprehension. The final results are that Digital Apprehension evokes the intention of not to use technology or digital tools (see Figure 3.2).

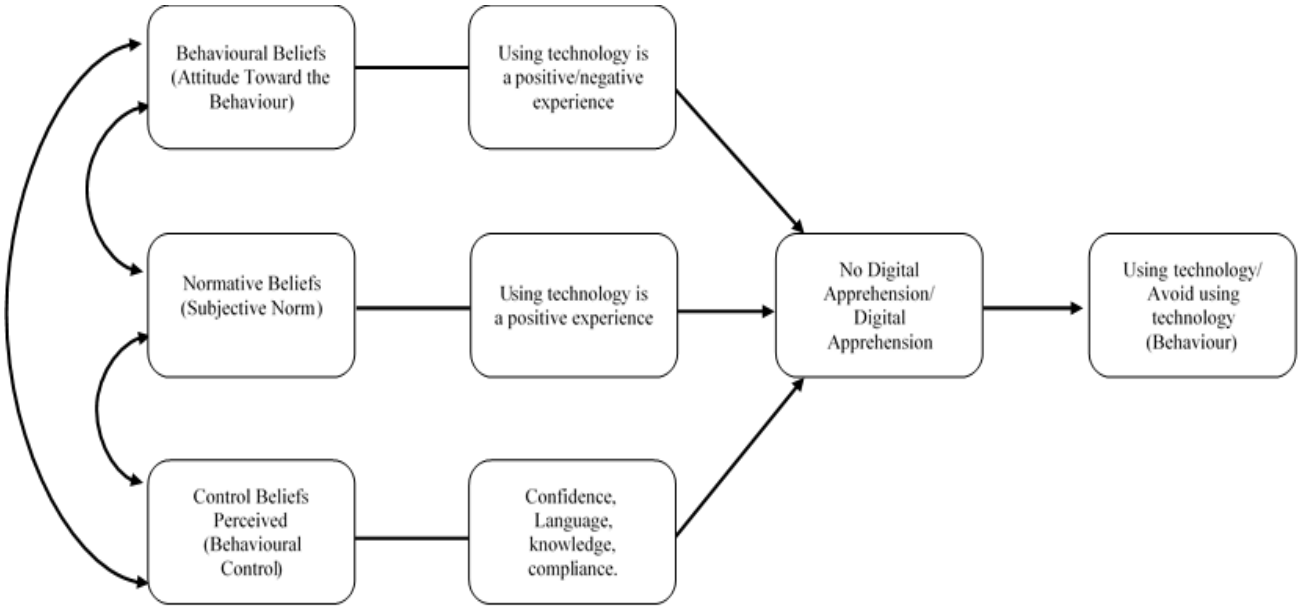


Figure 3.2. Theory of Planned Behaviour applied to Digital Apprehension (adapted from Ajzen, 2013).

This theory has given clarification and an explanation regarding relationships between Digital Apprehension, people's intentions and their actual behaviours. Digital Apprehension may play a similar role to the behavioural intentions concept in the TPB, but it needs to be better understood. Digital Apprehension gives understanding to the belief that despite the knowledge that technology makes things easier, people still refuse to use the technology.

Chapter Summary

This chapter has discussed the conceptualisation of Digital Apprehension, including issues involved with creating a new concept, parameters of the new concept and clarification of (seemingly) similar concepts. This was followed by a discussion on relative theories namely - Behaviourism (Watson, 1994; learning theory), Cognitivism (Ertmer & Newby, 2013; learning theory), and Constructivism (Siemens, 2004; learning theory); the TAM (Davis, 1989; technological theory) and the TPB (Ajzen, 2002; psychological theory). The conclusion was that the Theory of Planned Behaviour adequately accounted for the underpinnings of Digital Apprehension as framed in this current research. The next chapter will examine and describe the methodological approaches used in this study.

CHAPTER 4 – Research Design

Methodology

This research used qualitative (Phase 1) and quantitative (Phases 2 & 3) methodological approaches, resulting in an integrative, mixed methods design. Both methods have strengths and limitations, although each brought a certain complementarity to the other (Truscott et al., 2010). Qualitative approaches generally incorporate ideas and opinions, and utilise focus groups, case studies, and interviews, whereas quantitative approaches generally apply mathematical analysis of experiments (both biological and psychological), mathematical explorations (physicists and computers), and questionnaires (surveys). The mixed method design was formally recognised around 2000 (Lund, 2012) and brings together a balance of purposive and probability, comprehension and explanation, narrative and numeric (Tillman, Clemence, & Stevens, 2011). Importantly, depth is attained through the addition of qualitative methodologies, while objectivity is enhanced through quantitative methodologies (Lund, 2012). Rather than being at opposite ends, as Karasz (2009) suggests, the two methods 'dove-tail' together, merging strengths and minimising limitations, to form a solid holistic position. When employing a mixed methodology, consideration must be given to the application, integration and anticipated achievement of the project. Using both methods in this current research gave understanding not only to the statistical implications of the results, but also the personal ground level 'feelings and thoughts' of those whose data were analysed (Truscott et al., 2010). The current project explored specific factors that limited students' growth and success in the first year of higher education, using a qualitative approach for Phase 1 (focus group and interviews) and quantitative methodology for Phases 2 and 3 (factor analysis, descriptive statistics, regression, and correlation), to achieve a combination of depth of perspective with methodological rigour. Phase 1 was the creation of the DA survey questions, and the next two phases (3 and 4) were quantitative online surveys. It is an important aspect of research to understand the basis for a survey, the reasoning behind the questions asked, and clarification of the survey questions. To enable validation, retesting, relevance and examination of the survey it is prudent to have in-depth understanding of the thoughts and attitudes of the present and possibly future participants. It is also important to gain understanding from the base level, the students themselves by discussion and interaction of those who are most likely to be using the technology. To form the initial Digital Apprehension survey questions, first advice was sought from an expert in psychometrics (psychological measurement creation) and in consultation with the researcher, questions were created with the topic (digital apprehension) in mind. Then the students' thoughts and ideas were sought in regards not only the composition of the questions, but also the answers to the

questions. Therefore, the first phase of the research used the focus groups, interviews and written responses to ensure all this was covered. Focus groups give a baseline approach showing students' thoughts and opinions, which were then to be used in the initial creation of the Digital Apprehension survey. Interviews were conducted one-on-one, face to face with students who were nervous to give their thoughts and opinions within a group situation, but still wanted to participate in the survey. There were also a third of the participants (n = 10) who would have liked to participate in the focus groups, however due to time constraints (employment, family commitments, etc.) were not able to participate in the allotted times for the focus groups. These participants were emailed the focus group questions and asked to write their answers and return them via email. The qualitative approach in this current research involved coding of the data through thematic analysis.

Phase 1 involved the collation of information from the literature, the focus groups and interviews (and transcriptions), the thematic analyses and subsequent coding of the data, culminating in the formation of the concept of Digital Apprehension.

Thematic Analysis

Thematic analysis is a detailed identification of similar occurrences (patterns/themes) that are grouped together from a larger data set and coded (Braun & Clarke, 2006). Where qualitative research is involved, according to Braun and Clarke (2006), thematic analysis should be viewed as an approach in its own right. Thematic analysis not only enables a richness and a deepness, but also provides basic insights that are stepping stones to conducting any manner of qualitative analyses (Braun & Clarke, 2006). According to Braun and Clarke, data can fall into one (or more) of four different groups: data-corpus (all data for a particular project); data-set (data used for certain analysis - a segment of the corpus); data-item (particular types of data); and data-extract (a single coded section of data). Data can be in more than one group. For example, you can have data that represent an extract, part of an item, part of a set, and part of the corpus. This enables the flexibility to help understand the different characteristics of the data, which gives an advantage over other methods. As with any method, there are advantages and disadvantages to using this type of analysis.

To know the limitations, and then to address them, is not only logical but also a necessary functionality. Therefore, in consideration of the limitations of thematic analysis it is prudent to understand the flexibility. In itself one of the main advantages. However, it can also be a disadvantage, in that the tendency to allow the "... 'anything goes' ..." (p. 78) approach, which opens the way for criticism of the qualitative method (Braun & Clarke, 2006). Likewise, not many scholars agree on the boundaries, regulations, and what actually

constitutes the guidelines (Braun & Clarke, 2006). Furthermore, there is a lack of adequate explanation discussing the means of analysis in the literature. That is to say, there does not seem to be clear clarification of the analyses methods performed in particular research, therefore making it difficult to retest/appraise for reliability and validity. Often words such as 'emerged' or 'revealed' are scattered throughout a report (Braun & Clarke, 2006) with no clarification as to how this emergence occurred. To address these disadvantages, this current research will use the flexibility, while bringing in parameters that will guide, without restricting to the point of rigidity, and clearly detail and clarify how the themes were reached and analysis carried out.

The importance of thematic analysis, according to Braun and Clarke (2006), is that rather than themes emerging, or miraculously appearing, it is the researcher's hard work in studying the literature, negotiating the hours of data studied, training, and recognising familiar themes/links that occur because of the previous knowledge and work. Therefore, based on applied scientific knowledge, previous research, and current information, an informed decision can result. This enables replication, validation and provides reliable research, and therefore enriches knowledge, learning and understanding of areas in psychology that have previously been thought of as whimsical and unscientific (Vale, 1994). Therefore, themes extracted from the data collected will be specific to the research questions at hand. The research questions of this current research include, what does Digital Apprehension look like as a concept, does this concept exist in first year university students at the University of Southern Queensland (USQ), Australia, and if it does exist, what is its prevalence, then, is this a unique first year phenomenon, or is it university wide? To establish the existence of Digital Apprehension as a concept, the ideas and concerns of students were listened to, recorded, written down, coded and themes extracted to form the concept.

The most important factor when deciding what constitutes a theme should be the research question/s (Braun & Clarke, 2006). There should also be a link that gives meaning to the data set. Another consideration needs to be - how often does the theme occur, and is this occurrence meaningful to the data. For this part of the research, themes were judged on these criteria. The first thing examined was occurrence, followed by the link to the data plus relevance to the research question/s . Lastly, research knowledge (literature reviews, training, and experience) was applied to confirm themes (see Figure 4.1.).

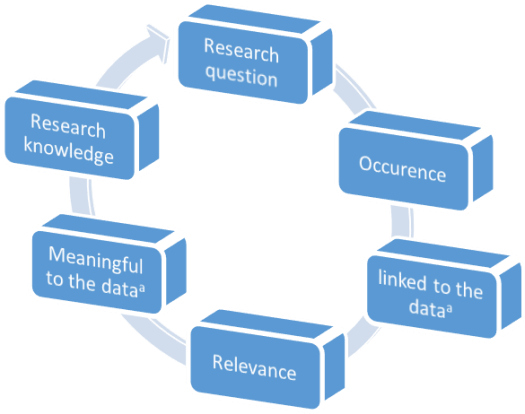


Figure 4.1. The cycle of thematic analysis used in this paper.[3]

While prevalence may not necessarily be the most important feature of the theme, the occurrence played the part of first 'port of call', or the baseline (Saldana, 2009) with which to highlight areas that were examined for the coding of the data. This then was taken into consideration with the significance to the data in relation to the research question which was of first importance. Consequently, the data were coded according to prevalence, meaning, and relevance. The coding stage involved the collation of the relevant focus groups, interviews, emails, and transcriptions.

Coding.

"Coding is not a precise science; it's primarily an interpretive act" (Saldana, 2009, p. 4). Saldana (2009) who wrote several manuals on how to code data, notes that while coding varies from project to project, data should be coded in a consistent manner throughout the whole process during each project. It also must be recognised that throughout the whole coding process, each researcher is an individual and interprets through the particular lens afforded by the researcher (Saldana, 2009). That is to say, the data were first filtered through the mindset and bias of the researcher. Different people may interpret different words, phrases, or ideas into different codes. While this is not ideal, as different researchers have different lenses, and when more than one person works on a project this may become complicated, the general idea is to bring consistency throughout the research. When coding was applied in this current research, the researcher investigated the reasoning behind the words that were spoken or written by the participants. For example, if a respondent noted a sense of "overwhelmed" with technology, during the focus groups, interviews, or via email,

[3] [a] Data refers to the audio recordings and information recorded from the focus groups, personal interviews and email responses from participants.

the researcher asked (or contacted in the case of the emails) questions of the interviewee the basis for this response, to ascertain the reason the respondent felt overwhelmed by the technology.

If the participant responded with an answer that was more in connection with life challenges, rather than the technology itself, this was duly noted and sub-coded as such. For example, if the respondent noted that due to the life challenge of being time poor (because of studying distance due to financial hardship, and including the care of three children) this was coded as an overwhelmed sub-code of time poor. Whereas someone was overwhelmed due to not having the confidence to attempt technology (due to fear of breaking the technology, or no confidence in technological ability) this was coded as an overwhelmed sub-code of technology. This was to verify the background and to attempt to nullify as much bias as possible brought to the research by the researcher's lens. However, bias has some distinct advantages, in that the mindset of the coding, and therefore the thinking behind, was consistent, and not fraught with distractions from other directives. Specifically, if bias exists in the form of the narrowness of the scope due to the researcher only focusing on areas that pertain to Digital Apprehension, then other areas such as technological inability will not be considered. This then shaped the new construct of Digital Apprehension (DA) and the formation of the initial Digital Apprehension questionnaire (DAQ).

Chapter Summary

This chapter has introduced the methodology and explained the rigorous approach that is included in a mixed-method design. It surmised that with a mixed-method design richness and depth were achieved, as well as logical statistical information. The thematic analysis was then explained, followed by the interpretation of coding in regard to this current research, in particular the first phase of the research, the focus groups.

CHAPTER 5 – Focus Groups and Interviews

Method: Phase 1

Objective

The objective of the first phase of the research was broken into three parts. The initial part of the research defined Digital Apprehension and its viability as a concept among first year university students. This involved conducting semi-structured focus groups and one on one interviews, as well as written (email) responses, followed by the transcription of the data collected. The second part involved the coding and thematic analyses of the data and the third, the development of a questionnaire derived from two main areas - the literature, specifically pointing to the nature of Digital Apprehension; and the information gathered from transcriptions. An initial 12 item instrument, the Digital Apprehension Questionnaire (DAQ) was then developed which measured the concept of Digital Apprehension to be used in Phase 2.

Participants

A convenience sample (N = 30) of current (2014/2015) first year USQ students, 18 years and over, participated in semi-structured focus groups, interviews, or written responses (via email). Twelve participants attended face to face (either as a group [$G1$ = 6, $G2$ = 3, $G3$ = 3], or individual interviews, n = 3), whereas 10 answered focus group questions via email, and 8 (in two groups of four) participated in online focus groups via Skype. Participants were only allowed to participate once to avoid duplication of data. Participants from three USQ campuses were represented with 36% from Toowoomba, 17% from Fraser Coast, and 10% from Springfield, with 37% studying online/distance (see Table 5.1). Participants were from seven different disciplines: Science 33%; Education, 26%; Business, 20%; Health, Arts, and Law, each having 7%. The majority of participants were female with 30% being male. Age of participants ranged from 19 to 61 years (M = 35.17, SD = 12.69). The majority were Australian (93%), with one Canadian/ Australian, and one Indigenous Australian participant, and one participant having English as a second language.

More than half (62%) of the participants were working, and of those who were working, 24% were working at least 40 hours per week. Approximately two thirds of participants were studying full-time, while the remaining 37% were part-time. Almost half of the participants were in their first semester, while half were in their second semester, with one participant in the third semester. All the participants lived in Australia, with 25 living in Queensland (QLD), two participants living in New South Wales (NSW), and the three remaining participants living in the Australian Capital Territory (ACT), South Australia (SA),

and Western Australia (WA), respectively. Three of the participants had left high school in the previous 12 months.

Table 5.1

Focus Groups, Interviews, and Form-filled Dates, Times, and Groupings

Location & Date	**Number of Participants**	**Participant Mode**	**Time taken**	
G1 - Fraser Coast 8/10/2014	5 + 1[a]	Face to face group interview	1hr.26[b] minutes	
Toowoomba 20/10/2014	1 + 1[a]	Face to face individual interview	22 minutes	
G2 - Toowoomba 23/10/2014	2 + 1[a]	Face to face group interview	24 minutes	
Skype1 - 27/10/2014 12Noon	3 + 1[a]	Skype online group interview	40 minutes	
Skype2 - 27/10/2014 6pm	4 + 1[a]	Skype online group interview	42 minutes	
Springfield 29/10/2014	1 + 1 [a]	Individual interview	9 minutes	
Springfield 5/11/2014	1 + 1[a]	Individual interview	9 minutes	
G3 - Toowoomba 6/11/2014	2 + 1[a]	Face to face group interview	29 minutes	
Email - 20/10/2014 to 11/11/2014	10	Written emails	n/a	
	Skype	Form-filled	Focus Group	**Total**
Toowoomba	3	3	5	11
Springfield	-	1	2	3
Fraser Coast	-	-	5	5
Ext/Online	5	6	-	11
Total	**8**	**10**	**12**	**30**

Note. *G1* = Group 1; *G2* = Group 2; and *G3* = Group 3. No participants attended any focus group, interview, or filled out a written response more than once so no duplication of data was present. [a] = The researcher was present as a participator and observer. [b] = This focus group was made up of two separate recordings due to duration of focus group, to include a break.

Instrument and Protocol

Focus group and interview questions and logic.

The following questions were asked to ascertain participants' views and attitudes towards the use of technology at the various campuses they attended. Included in the questions were the topics of technology, attitudes, and challenges negotiated during respondents' time at university, and life in general. Most of the questions were open-ended, with one scaling question. The questions listed below were worded in everyday colloquial

language, so as not to appear stiff or formal and include the logic of the questions asked, and the perceived benefit of each question:

1. *How far into your course are you now?* This question was asked to determine participants' stage in their study, to understand the exposure to the university web site, course sites, and university life in general, experienced by the participants.
2. *Can you recall your initial reaction to uni when you started?* This question was asked to give understanding to participants' initial reaction to university, to discover what participants experienced, whether a positive or negative outlook (or both), as well as gaining an overall picture of the beginning stages from the participants' perspective.
3. *When you first started uni, did you have many challenges in other areas of your life to get through before you could get on with study?* This question was asked to ascertain stressors, or other factors that may have been in play during the initial stages of starting university. This enabled support for the relevance that problem-solving appraisal strategies were an important aspect of participants' reaction to technology, and university life and identity in general.
4. *If so, how much did those issues affect your ability to get on with study? And how much did those issues affect how easily you adapted to the use of technology at uni?* This question was asked to ascertain the differences between participants' knowledge of their problem-solving appraisal, the level of effect any difficulties had on forming study habits. This question also appraised participants' evaluation of resulting complications or frustrations in relation to any apprehension experienced due to the issues, while using, or trying to connect with the university and any technology associated with the university or courses.
5. *Can you rate the level of difficulty you faced at the time, where 1 equals 'it was pretty easy' and 10 equals 'I thought it'd never get sorted out'?* This question was asked to ascertain an average, as well as extremes, and gave the ability to discuss areas where participants struggled. This also had the benefit of giving an understanding of areas that need future support, improvement, or non-useful/deterrent aspects, as well as the positives that were already in place.
6. *How easy was it to connect up with your fellow students when you started?* This question was asked to ascertain a sense of belonging with other students, as well as another avenue of possible negative or positive experience. Discussion around this also highlighted the question of the importance (or not) of connection to peers. This question

also allowed for any support to aid in connection that was in place to be confirmed or something new that needed to be initiated.

7. *What were your initial reactions to using the technology associated with the uni and your program/courses?* This question was directed at the technology associated with particular courses or programs, and is industry specific. This question allowed for discussion around the positives and negatives of course specifics, including design, interaction with, and disclosed areas that were constructive, beneficial, time-wasting, or lacking.

8. *Did you feel if you expressed concern about using technology at uni that people would think you were dumb?* This question was asked to give an overall interaction between participants and their peers, staff, and others. This question allowed for protocols to be assessed between staff and participant interactions, peer pressure situations, and also gave insight into participants' confidence in asking for help, and the reasoning behind the reluctance or expectancy.

9. *Did you feel that everyone was watching what you were doing when you were using technology at uni?* This question enabled a general description of the participants' disposition to the self and the importance this played in the interaction with technology at a public level.

10. *Did you feel connected to a certain group of people?* This question was asked as a confirmation of the importance of feeling the connection to a group. This question also allowed for discussion about the need (or not) to belong to a group, and how that helped or hindered life as a student using technology.

11. *What would have helped you with your use of technology when you started uni?* This question was asked to give an idea of possible supports, or ways that would enable a smoother transition, when using technology in this particular setting. This question also gave an idea of how much information participants knew about supports (or lack thereof), and areas that they may have struggled in. This question also gives a small indication of participants' insight of their own struggles.

12. *What specific strategies did you use to help you manage your use of technology when you started uni?* This question again, gives insight into participants' understanding of their strengths and weaknesses experienced, and how participants overcame any difficulties experienced. Discussion around this question also gave suggested supports and time-wasting issues, that could be instigated or negated.

13. *If you had to start uni again, how would you manage your use of technology? Would it be different to what you've done this time?* This question showed the insight participants had with regard to their strategies and issues faced, and ways in which participants came up with these strategies. This question also allows for supports to be realised and initiated, as well as some pitfalls that may befall the uninitiated student.

14. *Is there anything else you'd like to share with me about your experience with technology when you began your uni studies?* This question was a general last question to cover anything that had not been covered with the previous questions, and to ascertain that every participant was satisfied with the results of the questions and the answers that were given. It was also a time of debrief and reassurance to any participants who may have experienced negative feelings from the discussion.

Procedure

Recruiting and conducting the interviews and focus groups.

The relevant permissions were attained from the Heads of Faculties, Heads of Schools, and the Department Course Coordinators to contact first year students at USQ for focus groups and interviews. Methods of contact included an announcement on the front webpage of current students' home page (UConnect[4]), attending lectures and talking to first year students in the first 15 minutes of lectures at about 6 weeks into the course (for some students it was only 3 weeks). All the first-year courses offered at USQ were perused to identify courses that involved the most cross-section of students across all courses for first year undergraduate students. For example, the course STA2300 was a basic introduction to statistics, therefore students from Business, Science, Education, and Law were all required (compulsory) to complete the course. The most suitable courses were selected and it was determined for maximum exposure to students the first-year courses to speak at the following classes: Education (EDC1400), Management (MGT1200), Biology (BIO1100), Engineering (ENG1002), Psychology (PSY1020), Law (LAW (1101), Accounting (ACC1102), Marketing (MKT1001), Business (CMS1000), Data Analysis (STA2300),

As the response was high, limits were put on the number of students accepted for focus groups, and given the time impost of participation in focus groups or individual interviews, the number of students recruited for this research was stopped at 30 participants. This was deemed an acceptable number considering the researcher believed saturation (Glaser & Strauss, 2012) was achieved through the focus groups, with sufficient information gained and

[4] USQ's student portal for information and data related to courses.

examined to allow for a meaningful assessment (Mason, 2010) of Digital Apprehension. Furthermore, the literature on qualitative methods reports sufficient validity and reliability with numbers as low as 20 (Onwuegbuzie & Leech, 2007). The selected 30 participants were representative of students based on the university's demographic profile of first-year students. Semi-structured focus groups and one-on-one interviews were conducted, with groups that ranged from 6 to 2 people (n = 20) with the researcher as an active participant and observer. Ten participants were unable to attend the focus groups at specified times, and therefore elected to comprehensively answer the focus group questions via email. These respondents scanned the questions/answers, then emailed them to the researcher. All participants were given an overview of the project, guidelines for participation in a focus group, and participants were required to sign/complete the project consent form, view/read participant information sheet, and a demographics survey sheet. For the respondents who participated via Skype focus groups, or email, the questionnaire and relevant documents were emailed to them (see Appendix A for more detailed information).

Focus group meetings and interviews were expected to be no more than half an hour (30 minutes) duration, however, some went for over an hour due to interest generated during the focus groups. Feedback was provided to participants where requested, including how to access web pages, web addresses, support groups (student relationship officers, university Meet-Up information, etcetera), as well as the university learning centre contact number and web address. Furthermore, feedback of the final results of the research was offered, which was available once the aggregate data had been compiled, which ensured participant anonymity and protection. Incentives offered were credit towards their overall course mark (1%) or a USQ bookshop raffle ($500 prize) was offered as incentive. To enable re-contact for any necessary follow-up, or withdrawal of data if requested, a coding system was used (mother's maiden name), campus email address, and student number. The combination of this information enabled thorough retrieval and identification of respondents wishing to withdraw. Participation was voluntary and students could withdraw at any stage without penalty.

Focus group meetings were held in rooms allocated by the University of Southern Queensland, at previously arranged times and dates. For each focus group (Skype or in person), or interview, the researcher greeted every participant as they entered the room and read through the focus group guidelines, then asked the participant(s) to complete the consent form (if not previously done) before focus groups commenced. The researcher then distributed the demographic survey sheet to each participant, and these were completed by

respondents. Similarly, for online Skype focus groups, the researcher invited the respondents to the Skype session, asking if participants had received the consent forms, guidelines, and demographics survey sheet, and those who had not, were asked to complete the forms as soon as possible. No respondents could participate in the online focus group if they had not completed the consent form, and read the guidelines. The guidelines were then read out by the researcher, verbally agreed upon by the participants, and the focus groups commenced. The demographic survey sheet indicated participants' student number, name, mother's maiden name, campus email address, campus attending, faculty, gender, age, nationality, language, program, commencement date, duration of study to this point, residency status, employment status, etc. (for a more detailed description, see Appendix A.5 - Demographics Sheet). The researcher then read the following prologue out loud: "In the following series of questions, I will refer to the use of technology at uni. These references to technology can mean any type of electronic device, e.g., computers, iPads or other tablets, specific software programs used on your course, etc. Do you have any questions before we begin?" Participants were then asked to engage in conversation, stating honestly and openly (as time permitted) their opinions and attitudes in regard to the questions and their experiences. The researcher was interactive as a participant and observer, and guided the conversation if the groups detoured or digressed.

All interviews were audio-recorded on a mobile phone (iPhone memo) which permitted accurate transcription. The data was then transcribed by an outsourced company (Robyn Burdett Typing Services). The transcribed interviews were then examined by listening numerous times to the group/individual discussions, reading (many times) the transcriptions and the email responses, discovering key themes which were then coded accordingly (see Results). Data from the demographic survey forms, focus group and interview questions were entered into an Excel spreadsheet, and Codebooks (Project 1 Focus Group Demographics and Focus Group Questions) were created in readiness for qualitative data analyses. A unique identifier (ID) was allocated to each participant stating Focus Group Participant (FGP), alphabetical order of first name, gender, and age. A fictitious example is: A participant with the first name of Andrea, female, and aged 35 years, the participant's ID would be FGP2f35. The transcripts and spreadsheets were then uploaded into NVIVO software, where encoding, organisation, further analyses, and coordination of themes and data were executed. Similarly, all data from the demographics survey, focus group and interview questions, collected from the participants were entered into a Statistical Package for

the Social Sciences (SPSS) file, to analyse the quantitative aspect, therefore creating a complete data set for Phase 1 of the project.

Coding the data.

Coding of the data commenced with interpretation, and interpretation of the data began through the engagement with the participants throughout the initial focus groups and interviews. This was followed by listening to the audio recordings, reading of the emails and transcriptions. The process for coding the data was thorough and started with base words, moving up to small themes, then onto the bigger picture themes, and explored for specific themes relating to any attitudes towards technology in relation to its use and application to Digital Apprehension, in the higher education setting. Themes were required to be kept in close consideration to the conceptual framework of Digital Apprehension and related aspects. For example, if the word "overwhelmed" was noted more than twice in separate transcripts it was noted, investigated further for themes and nodes and then coded into NVIVO.

In addition to the focus group transcripts as a whole, the questions and answers from individual participants were input separately into NVIVO, and nodes created to ascertain groupings of answers, to give a cross-ways examination, which established foundational themes to work with. For example, there were collections of smaller nodes, such as "overwhelmed", "frustrated", "anxious", and "confused". These were collated to create the node "feelings" (negative and positive) which were then examined using individual transcripts, to understand the reasoning behind the feelings. These were then analysed to discover the thinking behind participants' feelings of frustration, for example, due to "being time poor" or "mistrust". Subsequently, data were then examined to discover the bigger picture of being time poor. This involved investigation by the researcher to discover participants' demographics, transcribed answers, and involved asking the respondents for clarification. Three participants (one male, two females) were contacted for clarification of information written in emails regarding their work status (male, 19yrs) and the source of their frustration (females, 22yrs & 42yrs). An example of coding if financial and time restrictions triggered due to the raising of a family, and participants therefore were not able to afford "the latest technology required for uni" (participant). Participants expressed that due to financial and time restrictions they were not able to buy (or learn) the latest upgrade/update. This was coded as lower socio-economically disadvantaged, producing 'NonTech-Savvy[5] (NTS)' participants. This thematic analysis gave insight into the concept of Digital Apprehension

[5] 'NonTech Savvy' means a participant who knows or understands little or nothing about technology.

experienced on the ground level by respondents. From the results of the thematic analyses, critical understanding of the concept of Digital Apprehension was clarified and defined.

Results and Discussion

Screening and Descriptive Analysis

In SPSS, the demographics survey data were screened and checked for errors using Frequencies (with Minimum and Maximum Dispersion), there were no missing or out of range data. There were some spelling mistakes which were corrected while entering data. For example, "Oline" was corrected to read Online, and "BA" and "Barts" were both categorised as BArts. For ease of analyses External and Distance (mode of study) were combined into one External category. Also for ease of analyses, an approximate age (from the year-of-birth variable) was calculated and inserted as a separate variable, and one participant who listed the double major as Law/Arts was included in Law variable. Assumptions of normality were performed using descriptive statistics with no meaningful violations identified. Outliers were retained as they may have contained meaningful information in the current data set.

Question answers (NVIVO Analyses)

It should be noted that questions were framed colloquially in order to not sound stilted and to be in students' everyday language. Respondents answers are given in a way that covers the general sentiment from the overall focus groups, and in varying ages. It should also be noted that answers from respondents are included to show not only differing points of view, but also the difference between male and female viewpoints, and to show comparisons of age (10 year spans). It is stereotypically believed that younger people do not struggle with technology and participants answers show that this may not necessarily be the case.

Question 1 asked: *How far into your course are you now?*

Participants included one respondent who had started within three weeks of the focus group session (September 2015), however, the majority (n = 28) were in their first or second semester, with one participant in the third semester.

Question 2 asked: *Can you recall your initial reaction to uni when you started*?

Students' initial reaction to university included being anxious, daunted, excited, frustrated, and confused, with most of the participants (90%) feeling overwhelmed, excited, and/or daunted.

Responses included:

Male student, 20yrs:

> *Very overwhelming. I was the first in my family, so we had no idea what we were doing.*

Female student, 21yrs:

> *I was a bit overwhelmed with all that was happening at the time as I am working as well as studying and I live out of home, so I also have home duties.*

Female student, 22yrs:

> *To begin with, I was a bit overwhelmed. However, I found my questions were answered promptly and accurately. As I have previously completed online courses I was familiar with the form, I just needed to get used to USQ online campus.*

Male student, 26yrs:

> *My initial reaction was a mixture of excitement and nervousness. The excitement was because I felt that I was beginning a new chapter of my life that would be challenging, productive and would present a challenge to me. I was also excited because of the possibilities to advance my career during and after uni.*

Male student, 32yrs:

> *It was pretty overwhelming, I mean there's a lot of different avenues you can go and a lot of the stuff you don't know exactly what their use is just yet until I start exploring it. I did do Education with USQ, I think it was about five or six years ago or maybe longer, but I have noticed that it's completely different to what it was then. Definitely my big thing is there's a lot of stuff there and obviously it's useful to you but I'm just not sure what everything is used for yet but I guess that's because I'm fresh.*

Female student, 33yrs:

> *Well for me it was excitement. I have actually done uni before but that was ten years ago so it was excitement and it was probably apprehension too because it's been a while so I was nervous about getting back into it. And yes, I'd done it before but can I do it again and also there has been changes. Even in only ten years there have been a lot of changes like study desk[6] and all that.*

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[6] Study desk is the students' university website home page for their individual courses.

Female student 42yrs:

Overwhelming and I'm still a little overwhelmed. There's a lot, huge learning curve, a lot to take on board and already you're not only doing orientation you're learning how to find information on where to go and who to speak to and where your classrooms are if you're on campus, where things are to access if you're online. But there's also that need that there is the classes started on campus so, there were on campus classes, there was online information I needed to take in and find an access, there was you're actual application, all online. So, there's this huge learning curve as well as assignment due dates, as well as information. So, every day there was just a lot of stuff to take in.

Female student, 51yrs:

Freaked out.

Male student, 61yrs:

It was a little daunting but exciting because I was finally doing it after considering for some time.

Male student 62yrs:

No, I didn't have any major issues at all like my peers. If you couldn't find anything on the student centre or wherever you were looking on the study desk you'd simply post something onto the forums and you would always usually get an answer. I'm worried about the new format.

It is interesting to note that this was an older male, stereotypically someone who may be seen to be a prime candidate for Digital Apprehension. Also, there were no females in their 60s, however, out of 30 participants there were three that were in their 60s.

Question 3 asked: *When you first started uni, did you have many challenges in other areas of your life to get through before you could get on with study*?

Challenges (or problems) faced when first starting university included being time-poor, personal issues, financial issues and family issues. Responses included:

Female student, 25yrs:

Yes, I work in the military fulltime, which sometimes involves going away and working overnight, so it was initially hard to organise everything. My husband and I were also planning our overseas wedding, building a house interstate, and organising our interstate move for later on this year. It was pretty busy!

Male student, 26yrs

Yes, I was working nearly fulltime as well as studying four subjects in my first semester. Combine this with nearly no sleep between working nights and driving to and from university from a distance for classes four times a week and the results speak for themselves at the end. So, my time table was probably the most trying of all my issues. Also, battling depression and anxiety on and off for the past three years really made motivation an issue and as a result of this I always opted for the easiest way of doing things which not surprisingly is not the best for your results at uni.".

[It should be noted that the depression was from a personal issue, not from apprehension with technology.]

Male student, 31yrs:

I was initially worried about my writing because I didn't put much time into English at school. I was moving back to Australia from Thailand but in the meantime, I lived in Cambodia, and then there was the process of moving and setting up a new house. I was worried about time.

Female students, 35yrs:

I think my main concern was how this was going to affect my home, work and social life. My sister is studying full time at UQ Ipswich and I see how time poor she is. I am a single mum and have part time care of my son (12) and almost full-time care of my daughter (15). I considered how this was going to affect them as I know that the workload can be a little heavy at times.

Female student, 42yrs:

I was starting over as a single mum of a 2, 4 and an 8-year-old, and separating from my husband of 14 years.

Female student, 51yrs:

I suppose not only problems but I work full-time so working full-time and studying is sometimes, [participant paused] can cause some issues because you've got to work around that and you've got to work around life as well.

Male student, 60yrs:

I'll be very brief. I was in a same sex relationship for 38 years, an abusive relationship, my partner always considered me to be dumb, stupid, couldn't be educated. I'm indigenous as well, so that compounded the situation. That failed

about 18 months ago quite dramatically. That person actually does suffer from major mental health issues.

Male student, 62yrs:

No, I don't believe so [researcher's name]*, I've got the same problems as everybody else, the cattle property, I live sixty kilometres out of town, my office, I've got a fairly sizeable cattle property, it has all the things that you've got to do on a daily basis, battle with fences and things. I've also got work where I come to every day and up until a while ago I was actually caring for my ninety-year-old mum who's got dementia. It had its own challenges.*

Question 4 asked: *If so, how much did those issues affect your ability to get on with study? And how much did those issues affect how easily you adapted to the use of technology at uni*?

Female student, 33yrs:

My study was placed on the backburner until our youngest child reached school age. I have tried to keep up with technology; however, I was very nervous submitting my first assignment via EASE[7]*. I had my husband sit with me while I attached the file to make sure I was sending the correct document. Sounds silly now, but I had worked really hard and did not want to blow it at the last hurdle*".

Male student, 62yrs:

The lack of sleep and motivation made me not really want to engage in new technology when I started, however having realised later that I really had to adapt or be left behind I soon got into gear. Simply put, I was just not interested in the way it worked when I started. The technology was not what I was used to and came across very intimidating at times. I mean the use of Microsoft office was good, but the use of SPSS and databases felt like it was beyond me at the time.

Question 5 asked: *Can you rate the level of difficulty you faced at the time, where 1 equals 'it was pretty easy' and 10 equals 'I thought it'd never get sorted out*'.

Twenty-one participants answered with a 5 or more. It was determined from being a participant and observer in the focus groups, then listening to the recordings, then reading the transcripts of the recordings that responses of 1-4 were generally positive, whereas responses

[7] EASE was an in-house online assignment lodging tool that USQ no longer uses.

of 5 or more were generally negative responses. Due to this categorisation, it was deemed that answers of 5 or more would represent a negative answer. Examples of answers include:

Female student, 22yrs:

2 – it was easy, I just needed to get used to the layout of the online campus.

Female student, 25yrs:

5 - I won't lie; I was freaking a bit. But many phone calls to the uni and many hours spent trawling the USQ websites helped me out. I find that I still don't know a lot of things even now at the end of the semester.

Male student, 26yrs:

10, I really did think I would never get it and had lost hope at times about catching on to the use of technology. I found myself looking for ways around its use instead of asking for help.

Male student, 31yrs:

It's probably about a 4, there was definitely a learning curve with the system. My wife had previously studied here so she would often show me little … Yes, about a 4, it wasn't too bad.

This implies a positive, but leaning towards the negative.

Female, 42yrs:

I'd say a 10, I thought I wasn't going to get it, I thought I might as well drop out now. Why am I doing this?

Male, 61yrs:

I never thought that I wouldn't sort it out but then I guess I didn't know what I didn't know. Ok well probably four.

Some students rated higher than 10, for example:

Female student, 35yrs:

12. It's affecting my performance because then you watch it and then you go into the labs and try to do it and you've been watching with no instructions.

Question 6 asked: ***How easy was it to connect up with your fellow students when you started?***

Answers were mostly positive (70%), for example:

Male student, 26yrs:

Very easy. I have found that without connecting with fellow students outside of compulsory events you will struggle. I think that there should be more emphasis

on group work at uni because we all engage in it outside of class. Doing study together or other things.

Female student, 45yrs:

Very easy via email and forums set up by faculty staff for each course.

However, nearly a third were negative in their responses, such as:

Male student, 23yrs:

It was a big challenge due to not knowing the system and not having anyone around that I could get to show me what to do. It was a lot of trial and error to find the right area for certain things.

Female student, 42yrs:

Hard, I think Semester 1 was difficult not enough information give to help people know where to start.

Male student, 60yrs:

I'm finding it a bit isolating because of my age. It's a bit daunting. No disrespect to the young people, but there just seems to be a very [here the participant pauses] *the university doesn't seem to be geared towards a mature age student.*

Question 7 asked: *What were your initial reactions to using the technology associated with the uni and your program/courses?*

Analyses revealed that while some (five) students were not concerned with using the technology, most of the participants were confused with the technology encountered, and included the following responses:

Male student, 23yrs:

Very good and compatible. Of course, they are hard systems and some of the lectures and tutors struggled a bit, but the whole concept is very smart.

Female student, 45yrs:

I was not concerned. I spent some time prior to the beginning of the Tertiary Preparation Program. I participated in on the study desk finding my way around.

However, the consensus was negative in content, for example:

Female student, 33yrs:

Slightly apprehensive, a bit overwhelmed by all the different things to navigate through, and frustrated. If I was already stressed about getting a particular assignment done and it has to work because this feels like it's my last resort to get a decent job and that kind of thing and then I can't find this thing on study desk. Oh, where is it? It just adds to it and it gets worse.

Some found it more stressful than others and noted:

Male student, 26yrs:

Daunting! I found the use of some technology very exhausting and frustrating, not only because of it being new but because it was such a huge component of some of my subjects and assessments.

Female student, 54yrs:

I was confused by the layout of the university site, and the study desk. Each course is laid out differently and key components, such as study schedules, were in different places and called different things. For example, I didn't find the 'modules' for one course for several weeks. This was the actual written component which the lectures and tutorials were based on. So, I was very confused. I was engaging with the course extensively but there was so much information I didn't know what I'd read where.

Question 8 asked: *Did you feel that if you expressed concern about using technology at uni that people would think you were 'dumb'*?

The majority of participants answered with a no. For example:

Female student, 45yrs:

No. If I needed help I called my SRO[8]*. Always helpful*.

Female student, 46yrs

I think there has been a few instances in the forums where people have asked for advice on how to navigate, find stuff. But either the lecturer jumps in to assist or other students. I don't think anyone would be labelled as 'dumb'. They may feel it, but often their request provides answers for others.

It was surprising however, that more than a few (8) participants did answer yes, such as:

Female student, 24yrs:

I think especially though, like, I rang up a few times when I was having trouble, especially enrolling in my courses was impossible, but I felt like the people on the other end were frustrated with me like, "You're an idiot".

Male student, 26yrs:

Yes, I did for a while and still do sometimes. I don't know why, because usually I have no problem asking for help, but I think it is the environment. Being at a

[8] SRO = Student Relationship Officer.

university with some really smart cookies in your class can be intimidating. Knowing that these guys are doing what you wanted to do straight out of high school but you could not for some reasons, but these guys can make it look so easy sometimes and to sit there and ask them for help or an educator for help in front of them makes you feel less equal and sometimes not deserving of being at uni.

Female student, 33yrs:

Particularly the younger people probably. Particularly the other students …… we were given iPads once. I do have an iPhone but I'm not really familiar. I was struggling a bit and I was having trouble logging in and there were all these young people in there already and I did feel embarrassed.

Question 9 asked: *Did you feel that everyone was watching what you were doing when you were using technology at uni*?

The majority (80%) of respondents again answered in a positive way, with a "*no*" or "*not really*". However, some students did perceive they were under scrutiny with answers such as:

Female student, 35yrs:

It's the only place I felt like someone was watching me, in technology.

Question 10 asked: *Did you feel connected to a certain group of people*?"

Participants answers included positive responses:

Male student, 23yrs:

One of my assessment pieces was a group assignment and I did feel connected to them due to the technology and being able to use the systems.

Male student, 26yrs:

Yes, I have developed a very good group of friends at uni, most of which are about 5 years younger than me so it's kind of refreshing and is keeping me energised.

However, 70% of respondents replied in the negative for various reasons. Some examples include:

Female student, 21yrs:

Not really, but I was very pleased with how friendly everyone was.

Female student, 22yrs:

I did find it difficult though to get people to interact with each other and put in the same level of commitment than if it were face-to-face. Though I understand

that most, if not all, of the people in my group hadn't had much experience with online learning and may not have had the same level of discipline I have.

Male student, 31yrs:

When I was external there wasn't really too much contact with other students.

Question 11 asks: *What would have helped you with your use of technology when you started uni*?

The overall response was to attend a workshop or classes to help them understand the technology. Generally participants' responses included areas involving the consistency of technology could be improved, or being pre-informed, for example:

Female student, 21yrs:

Possibly a heads up with how much of the courses use the online services, forum posts etc.

Female student, 22yrs:

I think it would be good to have a 'dummy' site where students can play around without having to worry about making mistakes, for students with little to no experience in online learning.

Male student, 23yrs:

Someone explaining what all the systems are used for to understand exactly what to do, especially with submitting assignments.

Male student, 26yrs:

I think perhaps more step by step training documents for programs and applications. Making them accessible on your study desk for every student would help reduce the worry of people seeing that you need a little help at times.

Female student, 42yrs:

A little bit more of a know how introduction, on what and where to look, perhaps some more Blackboard tutorials

Question 12 asked: *What specific strategies did you use to help you manage your use of technology when you started uni*?

This resulted in varying strategies, for example, early completion of tasks, exploration, notetaking, orientation, time management, and YouTube videos. Example answers included:

Female student, 21yrs:

I either phoned in or asked my friend but then again, it's all well and good to click here and see what that does but that's a waste of time for me.

Male student, 23yrs:

The only strategy I used was to try and take extra time out to learn the system so I knew what I was doing so I could find my lectures and attend tutes [tutorials]

Male student, 26yrs:

Jump in and hope for the best result possible at first, but now it is a very careful step by step approach. I make an adjustment and check and double check to make sure I am on the right track. I do not want to get so far into some work and have made a mistake at the start. Also, watching step by step videos on YouTube is widely used by all the students I study with. It is easier to be able to stop, pause and rewind instructions from another source because sometimes the context of instructional videos from USQ is irrelevant to your requirements or just simply hard to understand.

Male student, 31yrs:

I spent a lot of time with it I guess at first and devoted a lot of time to it, made sure I was organised as much I could be.

Female student, 33yrs:

Just touching on technology, I didn't know you could use. I don't know what it's called. It's in the student area where you can plan all of your subjects in advance depending on what semester they're available in and all that sort of stuff. I didn't know that that was available and if I had I probably would have used that to plan my time a bit better because I was planning on doing subjects that weren't offered when I wanted to do them.

Female student, 45yrs:

I always tried to complete these a few days before the due date in case of internet or computer issues.

Question 13 asked: *If you had to start uni again, how would you manage your use of technology? Would it be different to what you've done this time*?

Result indicated that most students learnt in retrospect, with the top answer revealing that knowing which technology was necessary to achieve results was important. Example answers included:

Female student, 21yrs:

If I was able to start over, I would look into how much online usage and technology was involved with my studies and make sure I understood it all.

Male student, 23yrs:

I wouldn't have done anything differently as I found everything I needed to very quickly and learnt quickly on how to use some of the systems and also helped some of the tutors with these systems.

Female student, 24yrs:

Don't be afraid to ask because it will save them time.

Male student, 26yrs:

I would take as many notes as I could and early on in the semester I would make sure I was confident in all the applications required. I would also place emphasis on the practice questions in most subjects.

Female student, 45yrs:

I would have ditched my Mac earlier in the first semester. It took me a while to realise I needed to use technology I was comfortable with. It was not the time to be learning how to use a new computer.

Male student, 60yrs:

I faked it until I made it.

Question 14 asked: ***Is there anything else you'd like to share with me about your experience with technology when you began your uni studies*?"**

There was a consensus where participants included the following answers:

Male student, 26yrs:

I think that emphasis should be placed on its importance early on in semesters by lecturers and perhaps detail how many percent of their marks will be reliant on the use of technology. I don't think that you have a clear view even as you start assignments as to what extent you will be on a computer or using technology of some point. I was under the impression that I would be most using books and printing things off Microsoft Word, however it is probably just me.

Female student, 42yrs:

That the lecturers need to know how to use the same technology.

Female student, 35yrs:

There's a lady, a student on our placement, who's probably around ten years older than I am, probably about your age X. She said, "I struggle to read anything digitally." So she has been printing out hundreds and hundreds of pages and journal articles that she needs to read, she said, "I just can't read it on a computer.

Female student, 35yrs:

> *I think one thing I really struggled with was, I'd been doing … and no-one told me that if you do it on campus it's so easy because they take you, in your tutorials, you do step by step in your assignments. Whereas externally, because I wasn't allowed to do it internally this semester, you learn all these case studies and then they just hit you with something that you don't know. I think information like that with courses, even if they just had, like, student forums to say, like, you tackle this course this way.*

Summary of qualitative answers from Focus groups/Interviews

Overall there was consensus among the participants (N = 30) for the existence of Digital Apprehension. Beneficial insights were given for future help for students (YouTube videos, workshops, ask questions, seek help, etc.). The layout of the course websites was also noted as confusing, and not consistent. Another area included lecturers' knowledge with technology needed to be improved to enable lecturers to guide students.

Word cloud analyses.

A word cloud analyses using NVIVO software revealed mainly negative answers including words such as frustrated, consuming, time, overwhelming, and apprehensive (see Figure 5.1).

Figure 5.1. NVIVO word cloud 1.

The top ten most used words were examined that described participants' response to using technology during their time so far at university. Results revealed 9 negative words and only 1 positive (see *Figure* 5.2).

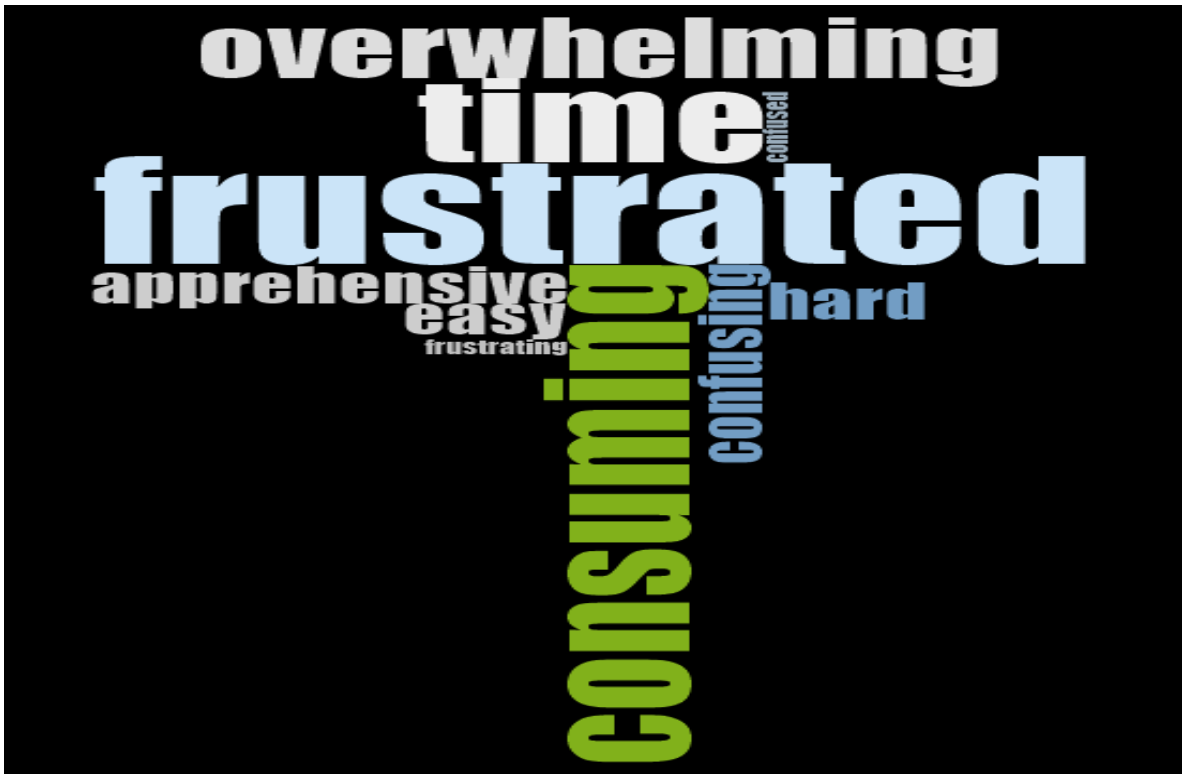

Figure 5.2. NVIVO word cloud 2.

NVIVO Text Query

As the word clouds reveal, the two most common negative words were frustrated and overwhelming. To understand the context of where these words were used, text queries for the words 'frustrated' and 'overwhelming' were performed with the following word tree results. (Figure 5.3).

Figure 5.3. NVIVO word tree for the word 'frustrating' and 'overwhelmed'.

NVIVO cluster analyses.

Furthermore, to ascertain if there was a relationship between the first question "*How far into your course are you now*?", and question 5 - "*Can you rate the level of difficulty you faced at the time, where 1 equals 'it was pretty easy' and 10 equals 'I thought it'd never get sorted out?'*" were analysed using the NVIVO cluster analysis tool. NVIVO was used to analyse quantitative data to examine if there was any difference between the types of analyses, namely NVIVO and SPSS. The NVIVO results indicated a medium to large negative correlation (r = -.41). This indicated the further a respondent was, in their course, the less level of difficulty was perceived for first year participants.

The overall results showed that at least two-thirds of participants (68%) felt apprehension, overwhelmed, and/or frustrated while using the technology associated with the university site and course homepages.

Discussion: Phase 1

The aim of this phase of the research was to identify Digital Apprehension as a viable concept among first year university students. This was accomplished by conducting focus groups and one-on-one interviews. This required transcription of these interviews, coding, undertaking a thematic analysis, and finally the development of the initial phase of the research. An initial12 item instrument, the Digital Apprehension Questionnaire (DAQ) was then developed which measured the concept of Digital Apprehension to be used in Phase 2, in accordance with the project's aim and objectives.

Digital Apprehension Concept and Discussion

After thematic analyses using NVIVO software, and cross-checking of the data, the concept of Digital Apprehension was refined. During the analysis of the 14 questions asked in the focus groups/interviews/written answers, there were four main factors found that incorporated and described the reasons respondents experienced Digital Apprehension – *Low Confidence* (LC), *NonTech-Savvy* (NTS), *English as a Second Language* (ESL), and *Non-Compliance* (NC). Participants in the LC factor experienced doubts and became apprehensive toward technology and therefore were reluctant to use it. Participants in the NTS factor were perceived to have little or no knowledge of technology, or were not experienced in technology due to various reasons. This was then categorised into two groups, *Disadvantaged* (D) and M*ature Aged* (MA). Disadvantaged, then again, fell into three groups, *Geographical* (Geo), *Cultural* (Cul), and *Socio-Economic* (SE). Geographical included people who were incarcerated or those who lived in remote areas. Cultural NTS participants were apprehensive due to lack of access for cultural reasons, for example, being

female in Islamic countries or Amish (Al-Kahtani & Jefferson, 2005). Socio-economic NTS includes those who, due to their socio-economic status, were not able to afford the technology and therefore became apprehensive when faced with technology. A significant positive relationship was found between mature aged participants and apprehension.

The next factor, English as a second language, involved those participants who became apprehensive due to the time-consuming task of translating, and understanding commands and instructions. Lastly, this research uncovered a rather surprising factor, which has been named Non-compliant, where participants in this category refused to use the digital tools or technology offered. Non-compliant participants then fell into three minor groups – *privacy*, *mistrust*, and *indifference*. Privacy incorporated mainly the younger participants who did not like their privacy intruded on, for example, they did not want their lecturer on their Facebook page, and therefore became apprehensive and so just did not comply. The mistrust factor included those people who believe that technology was some sort of conspiracy plot. The last minor grouping of non-compliance was indifference, participants who were indifferent to what was going on around them, always doing their own thing, despite the technology helps available to them. Below is a diagrammatic representation of the concept of Digital Apprehension (see Figure 5.4)

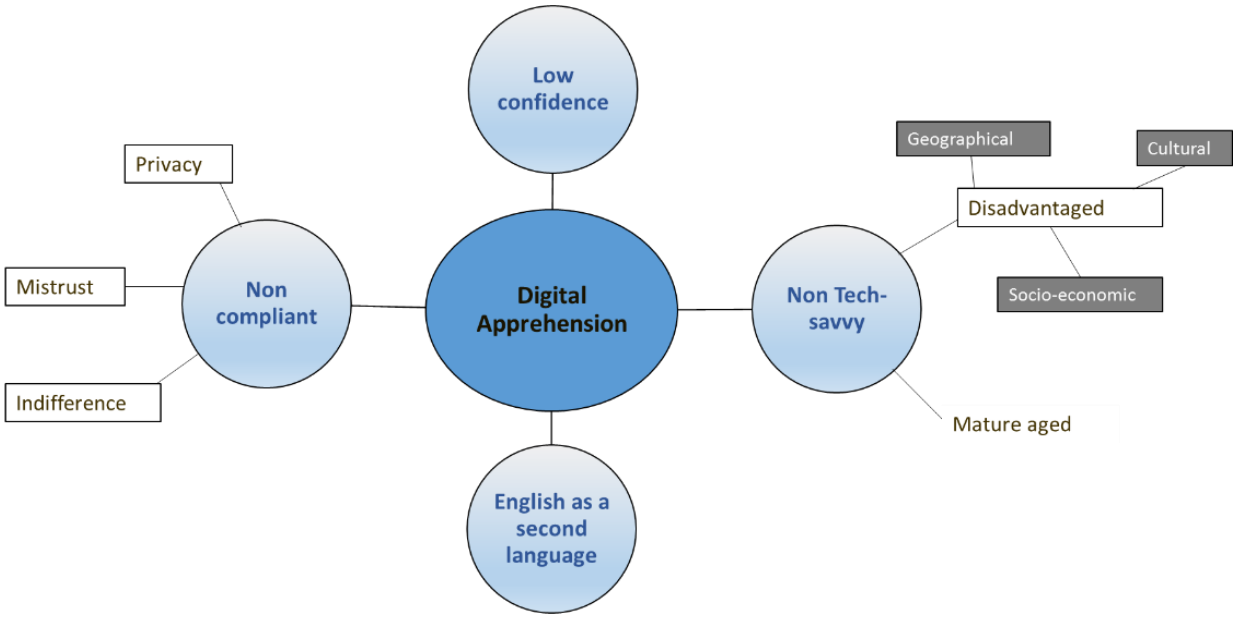

Figure 5.4. Diagrammatic representation of Digital Apprehension.

Chapter Summary

The objective of the first phase of the research was broken into three parts. The first, identified Digital Apprehension and its viability as a concept among first year university students. This involved conducting semi-structured focus group interviews, one-on-one interviews, and (email) written answers to focus groups questions, followed by the transcription of the interview data collected. Second, the coding and thematic analyses of the data gathered from the interviews was undertaken. Third, the development of a questionnaire derived from two main areas - the literature, specifically pointing to the nature of Digital Apprehension; and the information gathered from transcriptions. Considering the qualitative analyses that has been carried out for this project, and the resulting formation of the concept of Digital Apprehension, the concept of Digital Apprehension was formed into a 12-item Digital Apprehension Questionnaire (based on the answers analysed during the 14 focus group questions,) in preparation for Phase 2 of the project, the initial phase of the research.

CHAPTER 6 – Initial Phase

Introduction

This chapter examined the data from the initial phase (Phase 2), and created the composite measure for Phase 3 of this project. This was achieved by the investigation and reporting of the method, results, and discussion of the data analyses performed. Specifically, the relationships between key variables, the examination and formation of the final Digital Apprehension Questionnaire, and the exploratory factor analysis of the problem-solving and expected transition questionnaires. The final questionnaire was then structured in readiness to move to Phase 3 (the final survey), in accordance with the project's aim and objectives.

Method: Phase 2

Objective

The objective of the Phase 2 was the further refinement and administration of the initial questionnaire to all first year USQ students, that enabled the presence and prevalence of Digital Apprehension to be assessed. This was accomplished by a composite instrument made up of three measures, two that had been previously used in the higher education sector, and the Digital Apprehension Questionnaire (initial), together making up the psychometric instrument of Digital Apprehension. Specifically, the initial Digital Apprehension instrument consisted of the Digital Apprehension Questionnaire (DAQ), Student Transition Scale-Revised-Adapted (STS-R-A) and the Problem-solving Inventory-12-item (PSI-12; Beccaria & Machin, 2010). As noted before, the initial DAQ was constructed from focus group data collected and analysed from Phase 1. Administration of the initial study gave a baseline profile as well as descriptive statistics for the PSI-12 and STS-R-A (*Time 1*). Following this, preliminary tests of reliability and construct validity (exploratory factor analysis) of the composite measure were conducted. Further tests examined the data, and ascertained which constructs correlated, and created a meaningful composite measure leading to Phase 3 of the project.

Participants

A convenience sample total of 766 (out of a possible 9,575) first year students, 18 years and older, from across the range of faculties at USQ (Toowoomba, Springfield, Ipswich, and Fraser Coast) participated, giving an approximate 8% response rate. The representative sample comprised of external, online and on-campus USQ students who were approached (including those who had participated in the initial interviews and focus groups) and asked to participate in the survey. An incentive to participate was offered through course credit (1% where the course allowed) or entry into a raffle for a USQ bookshop prize of $500. Participation was voluntary and students could withdraw at any stage without penalty. As for

Phase 1, the same coding system was used (mother's maiden name) to enable re-contact for follow-up participation in Phase 3.

The majority of participants were female (78%), with 2 participants not stating their gender, Australian (87%) and had English as their first language (93%). Other nationalities that were represented included Indigenous Australian, British, and New Zealand (approximately between 1 - 1.5%), with Canadian, Chinese, Congolese, Fiji Indian, Filipino, Indonesian, New Zealand, Russian, South Sudanese, South African, Taiwanese, Turkish, Vietnamese, Welsh, and Spanish (less than 1%). Participants were aged between 18 - 65 years (M = 29.83, SD = 10.64), with 3 participants not stating their age. Participants were from all the USQ campuses including: Toowoomba (39%), External/Online (33%), Springfield (18%), Fraser Coast (7%), and Ipswich (3%), and there were no missing values. Participants ranged from seven schools: 35% from Science (n = 267), 16% from Health (n = 127), 16% from Education (n = 125), 12% from Business (n = 94), 8% from Arts (n = 61), 5% (approx.) from Engineering (n = 42), and 5% (approx.) from Law (n = 39), with 11 participants not stating which school they belonged to. There were four modes of study, on-campus (39%) - where students lived and attended lectures on the physical campus, off-campus (37%) - where students attended lectures on the physical campus, but did not live on-campus, online (14%) - where students studied through the internet and online lectures and tutorials, and blended (10%) - where any combination of the above, of which 64% were full-time students. The majority of participants had been out of school more than 5 years (89%) and were employed (68%) and worked an average of 30 hours a week.

Measures

Digital Apprehension questionnaire.

To assess Digital Apprehension in this current study the initial Digital Apprehension Questionnaire (DAQ) from Phase 1 was used. The initial DAQ consisted of 12 questions created by the data from Phase 1. The instrument consisted of one question that had a one-word answer (Q1), one yes/no question (Q11), two questions measured on a scale of 1 to 10 (Q3 & Q7), and seven open-ended questions (Q2, Q4, Q5, Q6, Q8, Q9, Q10, & Q12). The scaling questions were on a scale between 1 and 10, with Question 3 having scores ranging from 1 – 10 with higher scores indicating a higher level of Digital Apprehension, and lower scores indicated less Digital Apprehension. Question 7 also had scores ranging from 1 - 10, with higher scores indicating a lower level of technological understanding, and lower scores indicated a higher level of technological understanding. The scoring of the two scaling questions of the initial DAQ was supported and enabled understanding by the respondents'

answers to the open-ended questions. This, in turn not only provided support to the answers but also offered insight into the reasoning behind why the respondents answered as they did. As this is a new psychometric instrument, the questions will be examined in turn. Therefore, the summary of the questions listed below have included the logic of the questions asked, and the perceived benefit of each question:

1. *What one word would you use to describe the technology you are required to use at university?* This question was asked to enable qualitative analysis of respondents' reaction to technology, and for comparison analyses. This also aided in the understanding of the interpretation of question three, one of the scaling questions.
2. *Can you describe why you chose that word? (in a sentence or two).* This question was asked to determine and support understanding of the one-word answer to the first question.
3. *Can you rate the level of difficulty you faced with technology, where 1 equals 'it was pretty easy' and 10 equals 'I thought it'd never get sorted out'*? This was asked to determine the Digital Apprehension level of the respondent. The logic being, the more difficulty the respondent experienced, the more apprehension would be experienced. This also allowed for quantitative analyses to understand the levels of difficulty respondents experienced.
4. *What were your feelings about your experience with technology? (in a sentence or two).* This question was asked to determine participants' emotional reaction experienced while using technology.
5. *Can you explain why? (in a sentence or two).* The question is to provide clarification of question four in regard to participants' feelings towards technology.
6. *What strategies do you use, or know about, that might help you use technology at university? (in a sentence or two).* This question gives insight into participants' understanding of their strengths and weaknesses experienced, and how participants overcame (or not) any difficulties experienced. Examination of this question also gave suggested supports and possible time-wasting issues, that could be instigated or negated.
7. *How would you describe your level of understanding of how university technology operates, where 1 equals 'it was pretty easy to understand' and 10 equals 'I thought I would never understand it'*? This question was created out of the discussion from participants in Phase 1 of this research. It became clear that there was a difference between participants that found technology difficult to operate and participants who did or

did not understand how to use the technology. This question determined respondents' perceived level of prior understanding, and also allowed for comparison to participants' perceived level of difficulty of technology. The logic behind this question reveals the possible source of apprehension, whether technology, service providers, or other areas.

8. *Can you say why you responded in the way you just did? (in a sentence or two)*. This question was asked to give further clarification of question seven with regard to participants' perceived level of understanding of technology specific to the university.
9. *In what way could the university improve your experience of technology? (in a sentence or two)*. This question allowed for participant suggestions of supports to be realised and initiated, as well as some pitfalls that may befall the uninitiated student.
10. *Thinking about your answers, is there anything else that you can think of that would help you to navigate the university's technology*? This question was a general question to cover anything that had not been covered with the previous questions,
11. *Would you attend a couple of classes/workshops dedicated to basic computer/technology that is needed when you first start university*? This question was asked as a result of the focus group suggestions, that classes or workshops would alleviate apprehension and stress.
12. *When would be the best timing of these classes/workshops - Orientation week, 2 weeks after Orientation week, 4 weeks after or 6 weeks after*? This question was to recognise when participants preferred to attend possible workshops. This question also helped with clarification of the importance of workshops or extra training.

As this was a new measure, and mainly qualitative, with only two questions that provided a scaled answer, there were no previous reliability results to report. In consideration of this, an adaptation of the concept of 'method triangulation' was used to ensure the reliability of the questionnaire (Carter, Bryant-Lukosius, DiCenso, Blythe, & Neville, 2014; Golafshani, 2003). Carter et al. (2014) noted that method triangulation purports "the use of multiple methods of data collection about the same phenomenon" (p. 545). This current study adapted the method triangulation in two ways. First, both qualitative and quantitative questions were contained in the questionnaire, creating more than a singular data source of information. Second, the two quantitative (scaling) questions (Q3 & Q7) in combination with the remaining 10 qualitative questions created the triangulation of data, and qualitative questions revealed and supported the reasoning behind the answers to the two scaling questions. In addition, the data collection method was varied, using focus groups, interviews, written answers, and then underwent thematic analyses, which enhanced collaboration (not

just one account by one person) and this further boosted the reliability assessment. Specifically, as the 10 qualitative questions supported the reliability of the 2 scaling questions (with all answers derived from various data sources) this gave credence to the reliability of the scaling questions.

Problem-solving appraisal.

To assess problem-solving appraisal in this current study, the Problem-Solving Inventory-12-item questionnaire (PSI-12; Beccaria & Machin, 2010) was used. The PSI-12 was a self-report, 6-point Likert scale ranging from 1 (*strongly agree*) to 6 (*strongly disagree*), and consisted of four subscales, each with three items, as follows.

Problem-solving self-efficacy (PSSE) consisted of three positively worded items. This measured students' appraisal of their ability to self-manage problems as they arose in an efficacious manner. An example question is "*When faced with a novel situation, I have confidence that I can handle problems*". As there are three questions in this subscale scores can range from 3 – 18 with lower scores indicating a perceived strength in problem-solving self-efficacy, with higher scores indicating a lack of ability to self-manage problems as they arose (Beccaria & Machin, 2010; Smith & Burton, 2013).

Impulsive/haphazard problem-solving (IHPS), consisted of three negatively worded items. This measured students' appraisal of their propensity to be impulsive and initiate the first idea that comes to mind when faced with problems. An example is "*When considering solutions to a problem, I do not take the time to assess*". As there are three questions in this subscale scores can range from 3 – 18, and are recoded due to the negative wording so that lower scores indicated a perceived lack of impulsive haphazard tendency, with higher scores indicating respondents were more likely to be impulsive and/or haphazard in their behaviour when faced with problems (Beccaria & Machin, 2010; Smith & Burton, 2013).

Planned rational problem-solving (PRPS), consisted of three positively worded items. This measured students' appraisal of their ability to be carefully planned and logical when faced with problems. An example question is "*After following a course of action to solve, I compare the outcomes*". As there are three questions in this subscale scores can range from 3 – 18 with lower scores indicating a perceived strength in rationally planned problem-solving appraisal, with higher scores indicating a lack of planning and rationalisation when faced with problems (Beccaria & Machin, 2010).

Overwhelmed problem-solving (OPS), consisted of three negatively worded items. This measured students' appraisal of being overwhelmed or burdened when faced with problems. An example question is "*There are times when I become so emotionally charged*

that I can no longer see alternatives". As there are three questions in this subscale scores can range from 3 – 18 and are recoded due to the negative wording so that lower scores indicated a perceived lack of feeling burdened or overwhelmed by problems, with higher scores indicating respondents feeling more overwhelmed when faced with problems (Geytenbeek, 2011; Smith & Burton, 2013).

The PSI-12 is a recent revision (measure) for Australian populations and evidence for its validity is steadily growing (Beccaria & Machin, 2010; Geytenbeek, 2011; Smith & Burton, 2013). However, according to the author of the measure, the subscale OPS had questionable reliability under testing. Subsequently, a new PSI-9 () had been created that involved the omission of the OPS, leaving nine questions (Beccaria, personal communication, 2014). This limitation was investigated and was taken into consideration during construct validation of the questionnaire for Phase 3. The question arose, that if found to be problematic during analyses, then the new PSI-9 (Beccaria & Machin, 2013) would be used. It should be noted however, that during the factor analysis in this phase of the study, it was deemed non-problematic, as a new measure was formed, the problem-solving questionnaire (PSQ). However, this current phase used the full PSI-12 (Beccaria & Machin, 2010), with the PSQ being initiated with new factor formations and subscales in the final phase of this study (see Chapter 7). Reliability results in previous research was acceptable with PSSE (α = .92), IHPS (α = .70), PRPS (α = .68), OPS (α = .73), as found in Smith and Burton (2013).

Student transition scale.

To assess expected student transition in this current phase of the study the Student Transition Scale - Revised - Adapted (STS-R-A) was used. The STS-R-A was based on Lizzio's (2006) Student Transition Scale (STS), which comprised a 73-item self-report scale, which consisted of five subscales (or five 'senses' of success). The measure uses a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The five senses, capability, resourcefulness, connectedness, purposefulness, and academic culture, will be described in turn next.

The capability subscale measured students' task and role clarity, participation in community, as well as perceived academic competence (Lizzio & Wilson, 2006). An example question is "*Being able to appreciate the abilities and experiences I already have had before coming to study at university*" (Lizzio, 2006). Scores could possibly range from 21 – 105 with high scores showing students feel capable in their role, and lower scores indicated that students perceived they did not feel very capable in their role.

The resourcefulness subscale measured students' perception of the balance between study, personal life and the strategies involved in applying the necessary discipline to achieve the desired result (Lizzio & Wilson, 2006). An example question is "*Being told where you can get support with managing the everyday activities of 'being a student*". Scores range from 19 – 95 with high scores indicating a strong sense of resourcefulness, with lower scored indication a perceived lack of the ability to be resourceful (Sharrock, 2011).

The connectedness subscale examined how students perceived they 'fitted in' or connected with the university community, fellow students, as well as professional and academic staff (Lizzio, 2006). An example question is "*Made personal connections with other students by getting involved with social activities and introduce yourself to people*" (Lizzio, 2006; Sharrock, 2011). Scores could possibly range from 16 – 80, with high scores reflecting that students feel connected, and lower scores intimated the students did not feel a connection.

The purposefulness subscale examined students' goal-setting, direction, and the perceived validation of their choice of course or program (Lizzio & Wilson, 2006). An example question is "*Have a sense of where this degree will take you because you have had opportunities to meet successful graduates and role models*" (Lizzio, 2006). Scores could possibly range from 12 – 60 with high scores showing that students have a high sense of purpose, and lower scores indicated a perception of a lack of purpose (Sharrock, 2011).

The academic culture subscale measured students' perception of university confidence and 'know-how', culture, and what is acceptable at 'their' university (Lizzio, 2006). An example question is "*Being helped to understand what is required for you to have respectful and effective interactions with other students and staff*" (Lizzio, 2006). Scores can range from 5 – 25 with high scores showing a strong sense of academic culture, and low scored indicating a lack of a sense of academic culture (Sharrock, 2011). The reliability for the five subscales was deemed satisfactory with estimates ranging from .80 to .93 (Chester et al., 2013; Sharrock, 2011; Smith & Burton, 2013).

Further to this instrument, Lehane (2013) analysed and revised the scale to a 30-item questionnaire, the student transition scale-revised (STS-Rev). With an acceptable (MacCallum, Widaman, Zhang, & Hong, 1999) sample size (N = 140) it was ascertained that a valid, reliable five-factor measure consisting of 30 items was created (α ranging from .74 to .89 for the five factors). The 30 items of the STS-Rev retained (from the original 73 items) were worded the same as Lizzio's (2006) original STS items. Since the STS-Rev was designed to be administered once a student has had some exposure to the university

environment, its inclusion in the present study would be affected by timing. Therefore, for this current study, Lehane's measure was then adapted and reworded to personalise and future tense the items, to gain an understanding of respondents' perception of their expected transition. For example, a question that was worded "*Being helped to understand what is required for you to have respectful and effective interactions with other students and staff*" was changed to "*I expect to be helped to understand what is required of me to have respectful and effective interactions with other students and staff*". Consequently, the STS-Rev items were adapted to ensure their relevance in the composite measure, as well as generalisability beyond the context of the present study, and the instrument was then amended to the STS-Revised-Adapted (STS-R-A). Two factors now came into play, first, the need to keep things current and consistent in regard to the STS-R-A, and second, the previously mentioned instability of the overwhelmed problem-solving (OPS) subscale, which needed to be examined and determined before completing the final instrument for Phase 3 of the study. Therefore, it was decided to conduct an exploratory factor analysis (EFA) to include the STS-R-A and Beccaria & Machin's (2010) PSI-12, questionnaires. As a side note, the initial DAQ was not included in the factor analysis as the majority (10 out of 12 questions) were open ended, therefore qualitative. The EFA resulted in the creation of the expected transition questionnaire (ETQ) and the problem-solving questionnaire (PSQ).

Procedure

Students were recruited to participate in Phase 2, the initial study, by three methods. An alert was placed on the students' home page (UConnect) once they logged in, with an announcement which described the study, asked for participants, and gave information about the incentive and requirements; students were also sent an email by the Deputy Vice-Chancellor (Students & Communities) and asked to participate in the pilot survey (see Appendix A.6); and students who had previously participated in the focus groups and individual interviews (Phase 1) were also approached, to determine their continued availability and interest in the project.

With regard to the composite measure, the refinement and further development of the Digital Apprehension, Problem-Solving, Expected Transition (DAPSET) psychometric instrument was initiated. Data from Phase 1 was used to create the initial Digital Apprehension Questionnaire (DAQ) which included the development of a series of 12 questions to capture Digital Apprehension (*Time 1*). The questionnaire was administered online (see Appendix B.5) and/or by pen and paper if requested. Once the data had been collated and screened, preliminary testing of the data, reliability and construct validity

analyses were carried out using exploratory factor analysis (EFA), specifically with the concern in regard to the OPS subscale of the PSI-12. As the expected transition measure (STS-R-A) was based on the STS (Lizzio, 2006), this was included in the EFA to facilitate currency of the measure. The initial DAQ was then examined in detail to ascertain the relevance of all the questions. Finally, the refinement and completion of the final DAPSET psychometric instrument was realised in preparation for Phase 3 of the project. To establish a logical order of sequence of the three-part questionnaire, the following results included in the analyses were reported in the following order, screening, reliability, correlations (Digital Apprehension, problem-solving, and expected transition), and examination and refinement of the Digital Apprehension questionnaire survey questions.

Screening of the Data

The first 439 respondents' data were coded in date of birth (DOB), which made it time consuming and difficult to perform analyses in regard to age, therefore, the survey was adjusted to substitute the variable 'Age-in-years' for the variable DOB. Subsequently, the responses that included the variable DOB were re-coded by subtracting the year of birth from the current year (e.g., 2015-1997 = 18) and transformed from date of birth to the age-in-years variable. Eleven cases were deleted as the participants were under 18 years of age and ethics approval involved participants 18 years and over. Data were then screened for spelling mistakes, as well as words that were the same but different case (upper, sentence, etc.), and spelling was corrected and all changed to lower case, except for names of campuses. For example, "fraser coast and frazer coast" were all changed to Fraser Coast. As the collection of the school variables were in separate entries for each school, for example, a new variable was created which combined the different schools and given the name 'School'.

The following were manually transposed from the individual school variables and put into the new School variable and values were coded as follows: Arts and Communication; Commerce; Law and Justice; Management and Enterprise; Teacher Education and Early Childhood; Agricultural, Computational and Environmental Sciences; Civil Engineering and Surveying; Health, Nursing and Midwifery; Mechanical and Electrical Engineering; Psychology and Counselling; and Health and Wellbeing were all coded to the new variable 'School' with the following values:

1 = Arts and Communication into Arts

2 = Law and Justice into Law

3 = Management and Enterprise, and Commerce, into Business

4 = Teacher Education and Early Childhood into Education

5 = Civil Engineering and Surveying; and Mechanical and Electrical Engineering into Engineering

6 = Health, Nursing and Midwifery; and Health and Wellbeing into Health

7 = Agricultural, Computational and Environmental Sciences; and Psychology and Counselling to Science.

A frequency analysis of surnames, email address and student number was then performed to check for duplicates. With regard to email addresses, where data was missing it was attained from participants' student number, as students' email is studentnumber@umail.usq.edu.au. There were: 1 missing, 1 question mark, 3 invalid email addresses, 1 unknown, and 2 unsure, as well as incorrect format of the email name. The correct email addresses were found and entered into the participants' demographic survey data. Frequencies for other variables were checked using Student Number as the identifying variable, and there were no duplicates found. Data was screened and there were no missing data that would negatively affect the outcomes. Any missing data that was not relevant was either left out of the analysis (pairwise) or if appropriate the average was substituted. The sample size met the basic rule of thumb as there were a total number of 766 participants, with 54 variables, meeting the minimum ratio of 5 participants to every variable (Gorsuch, 1983; Barrett & Kline, 1981). Further preparation of the data included the reverse coding of the OPS and IHPS subscales of the PSI-12, and calculating and creating subscale total variables, as well as scale totals, and the data were entered. The data was now considered ready for assessment.

Results: Phase 2

Reliability Analyses of Measures

Internal reliability analyses for the current phase of the study, the initial survey (N = 766), were performed using SPSS (v22), resulting in acceptable to excellent internal reliability (Cohen's, 1992), as shown in Table 6.1. The scale totals were as follows: DA α = .83, PSI-12 α = .85, STS α = .94, and as an entire measure, the reliability was observed with an α = .88. The reliability for the DA required consideration of appropriate reliability for two items (Eisinga, Grotenhuis, & Pelzer, 2013). Accordingly, in addition to the Cronbach's Alpha, a Spearman-Brown's coefficient analysis was performed with the result of .83.

Table 6.1

Summary Statistics and Cronbach's alpha of key variables.

Scale	M	SD	α
PSI-12			
OPS	10.77	3.66	.79
IHPS	9.19	3.39	.76
PRPS	9.56	2.84	.62
PSSE	7.22	2.93	.90
STS			
Capability	28.60	4.02	.82
Resource	27.01	4.86	.90
Connect	25.09	5.73	.92
Purpose	21.13	3.34	.88
AcademicCul	17.58	2.38	.87

Note. PSI-12 = problem solving inventory 12-item; OPS = overwhelmed problem-solving; IHPS = impulsive/haphazard problem-solving; PRPS = planned rational problem-solving; PSSE = problem-solving self-efficacy; STS = student transition scale; Resource = resourcefulness; Connect = connectedness; Purpose = purposefulness; AcademicCul = academic culture.

Frequency Analyses

A frequency analysis was performed using SPSS (v22) on level of difficulty scores. The level of difficulty scores indicated that as the scores increased, the perceived level of difficulty increased, with 5 or above rated as Digital Apprehension. The frequency analysis for level of difficulty scores revealed that 36% of participants (n = 766) scored 5 or above (M = 3.82, SD = 2.49). Results also revealed that 25% of male (n = 171) participants rated 5 or above (M = 3.34, SD = 2.29), and at least 39% of females (n = 595) rated 5 or more (M = 3.96, SD = 2.53) on the level of difficulty scores.

Correlational Analyses

Pearson's product-moment correlations, at the alpha level of .05, were performed on the initial survey (N = 766) among key variables. Included in the analyses were age in years (M = 29.83, SD = 10.64), level of difficulty, (M = 3.82, SD = 2.49); level of understanding (M = 3.86, SD = 2.33), overwhelmed problem-solving, impulsive/haphazard problem-solving, planned/rational problem-solving, problem-solving self-efficacy, capability, resourcefulness, connectedness, purposefulness, and academic culture. They were reported in the following order, Digital Apprehension, problem-solving, and expected transition. As shown in Table

6.2, a Pearson's product-moment correlation revealed several significant results between level of difficulty and level of understanding scores, and key variables. Male and female separate correlational scores were also examined.

Table 6.2
Correlation Matrix Between Digital Apprehension and Key Variables (including male and female)

Scale	LOD			LOU		
	Male	Female	Both M&F	Male	Female	Both M&F
LOD	1	1	1	.71**	.71**	.71**
AGE	.33**	.16**	.20**	.23**	.18**	.20**
OPS	*ns*	.18**	.17**	*ns*	.20**	.18**
IHPS	*ns*	.11*	.10**	*ns*	.14**	.10**
PRPS	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
PSSE	*ns*	*ns*	.10**	.18*	*ns*	.10**
CAP	-.17*	-.12**	-.12**	*ns*	-.14**	-.10**
RES	-.26**	-.30**	-.29**	-.16*	-.32**	-.28**
CON	-.16*	*ns*	-.08*	*ns*	*ns*	-.07*
PURP	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
CULT	-.19*	*ns*	*ns*	-.21**	*ns*	-.10**

Note. LOD = level of difficulty; LOU = level of understanding; Age = age in years; OPS = overwhelmed problem-solving; IHPS = impulsive/haphazard problem-solving; PRPS = planned rational problem-solving; PSSE = problem-solving self-efficacy; CAP = sense of capability; RES = sense of resourcefulness; CON = sense of connectedness; PURP = sense of purposefulness; CULT = sense of academic culture. Both MF = male and female.
* denotes significance at the .05 level
** denotes significance at the .01 level

Digital Apprehension.

***Level of difficulty*.** There was a large significant positive correlation between level of difficulty and level of understanding scores ($r = .71$, $p < .001$). With level of difficulty, higher scores indicated higher difficulty with technology, and with level of understanding, higher scores represented participants understanding technology to a lesser degree. Therefore, the results indicated that as participants' level of difficulty with technology increased, participants' level of understanding technology decreased. There was a small to medium significant negative correlation between level of difficulty and resourcefulness scores ($r = .29$, $p < .001$), which revealed that the more difficulty participants perceive with technology, the less resourcefulness will be shown. A small significant positive correlation was found between level of difficulty scores and age in years ($r = .20$, $p < .001$), revealing that as participants' age in years increased, so did participants' level of difficulty.

Furthermore, a small significant positive correlation between level of difficulty and overwhelmed problem-solving scores ($r = .17$, $p < .001$), which revealed that as the perceived

level of difficulty rose, so did the respondents' tendency to feel more overwhelmed when faced with problems. A small significant negative correlation was found between level of difficulty and capability scores (r = -.12, p = .001), indicating that as the level of difficulty went up, the level of capability went down. A small significant positive correlation was also found between level of difficulty and impulsive/haphazard problem-solving scores (r = .10, p = .008). This indicated that as the level of difficulty rose, so did the participants' propensity to become impulsive or haphazard when faced with problems. There was also a small significant positive correlation between level of difficulty and problem-solving self-efficacy scores (r = .10, p = .008). This result indicated that as level of difficulty rose, a lack of ability to self-manage problems as they arose was more likely. Similarly, a small negative correlation between level of difficulty and connectedness scores (r = -.08, p = .023) revealed that as the scores on the perceived level of difficulty went up, respondents sense of connectedness went down.

Males: Significant positive correlations ($p < .001$) were found between level of difficulty scores, and level of understanding (r = .71), and age in years (r = .33), scores, respectively. That is to say as age in years increased level of difficulty scores increased, and struggle to understand technology increased. Also, small significant negative correlations were found between level of difficulty scores and capability, resourcefulness, connectedness, and culture, r = -.17 (p = .024), r = -.26 (p =.001), r = -.16 (p = .036), and r = -.19 (p = .012), scores respectively. That is to say, as the level of difficulty increased, so did the lack of capability, resourcefulness, connectedness, and culture.

Females: Significant positive correlations were found between level of difficulty scores and age in years, level of understanding, overwhelmed problem-solving, and impulsive/haphazard problem-solving, r = .16 ($p < .001$); r = .71 ($p < .001$), r = .18 ($p < .001$), r = .11 (p = .011) scores, respectively. Also, significant negative correlations were found between level of difficulty scores and capability and resourcefulness, r = -.12 (p = .003), r = -.30 ($p < .001$) scores, respectively. That is to say, as the level of difficulty increased, the capability and resourcefulness scores decreased, which indicated a perceived lack of capability and resourcefulness.

Level of understanding. As high scores on level of understanding indicated a lower level (or poorer understanding) of technology, the following results were observed. A small significant positive correlation was found between level of understanding scores and age in years (r = .20, $p < .001$), suggesting that as participants age in years went up, participants' level of understanding technology decreased. A small significant positive correlation was

also revealed between level of understanding and overwhelmed problem-solving appraisal scores (r = .18, p < .001), which revealed as participants' level of understanding scores increased (representing participants' level of understanding technology decreased) overwhelmed scores increased. In addition, a small significant positive correlation was found between level of understanding and impulsive/haphazard problem-solving scores (r = .11, p = .008). This indicated that as participants' level of understanding scores rose (that is participants' level of understanding technology decreased), so did the propensity to be impulsive or haphazard when faced with problems. There was also a small significant positive correlation between level of understanding and problem-solving self-efficacy scores (r = .10, p = .005). Therefore, as participants' level of understanding scores increased, so the scores on problem-solving self-efficacy increased. Small significant negative correlations were found between the level of understanding scores and resourcefulness (r = -.28, p < .001), capability (r = -.10, p = .001), culture (r = -.10, p = .008), and connectedness (r = -.07, p = .047) scores, respectively. This indicated that as level of understanding technology scores increased, scores on the senses of resourcefulness, capability, culture, and connectedness decreased. That is to say participants who had a lack of understanding of technology found it more difficult to be resourceful, feel capable. Also participants perceived they understood the university culture less, and felt less connected to the university.

Males: Significant small positive correlations were found between level of understanding scores and age in years (r = .23, p = .003), problem-solving self-efficacy (r = .18, p = .016) scores, as well as small significant negative correlations between level of understanding scores and resourcefulness (r = -.16, p = .042), and culture (r = .21, p = .006) scores. That is to say that as level of understanding scores increased, so did age in years and problem-solving self-efficacy scores. Also, that as level of understanding scores increased, scores on resourcefulness and culture decreased. This indicated that the level of understanding of technology had an negative effect on participants ability to be efficacious in problem solving, to be resourceful in university study, as well as understanding the university culture.

Females: Positive significant correlations were found between level of understanding and age in years scores (r = .18, p < .001), and overwhelmed PS (r = .20, p < .001), and impulsive/haphazard PS (r = .14, p = .001) scores. Also, significant negative correlations were found between level of understanding scores and capability (r =-.14, p = .001), and resourcefulness (r = -.32, p < .001) scores. That is to say, as level of understanding scores increased, so did overwhelmed problem-solving and impulsive/haphazard scores. Also, as

level of understanding scores increased, scores on capability and resourcefulness decreased. This indicated that a lack of understanding technology negatively affected participants' perceived ability to be capable and resourceful while studying.

Problem-solving.

Pearson's product-moment correlations, at an alpha level of .05, were performed between overwhelmed, impulsive/haphazard, planned/rational, and self-efficacy problem-solving scores and key variables. Included in the analyses were age in years, capability, resourcefulness, connectedness, purposefulness, and academic culture. As shown in Table 6.3, the Pearson's product-moment correlation revealed several significant results between problem-solving and these key variables.

Table 6.3

Correlation Matrix Between Problem-Solving and Key Variables (including male and female)

Scale	OPS			IHPS			PRPS			PSSE		
	M	F	MF	M	F	MF	M	F	MF	M	F	MF
OPS	1	1	1									
IHPS	.64**	.61**	.61**	1	1	1						
PRPS	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	1	1	1			
PSSE	*ns*	.31**	.26**	*ns*	.32**	.23**	.49**	.26**	.32**	1	1	1
AGE	*ns*	-.16**	-.14**	*ns*	-.23**	-.20**	*ns*	*ns*	-.08*	*ns*	-.17**	-.16**
CAP	-.16*	-.19**	-.18**	-.19*	-.12**	-.14**	*ns*	-.13**	-.13**	*ns*	-.26**	-.22**
RES	-.26**	-.29**	-.28**	-.16*	-.22**	-.21**	*ns*	*ns*	*ns*	*ns*	-.25**	-.21**
CON	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	-.09*	-.07*	*ns*	-.11**	-.08*
PURP	-.16*	-.10*	-.10**	*ns*	-.10*	-.10**	*ns*	-.10*	-.08*	*ns*	-.17**	-.13**
CULT	-.18*	-.09*	-.10**	-.19*	-.18*	-.18**	*ns*	-.13**	-.11**	*ns*	-.26**	-.22**

Note. OPS = overwhelmed problem-solving; IHPS = impulsive/haphazard problem-solving; PRPS = planned rational problem-solving; PSSE = problem-solving self-efficacy; Age = age in years; CAP = sense of capability; RES = sense of resourcefulness; CON = sense of connectedness; PURP = sense of purposefulness; CULT = sense of academic culture; M = male; F = female; MF = male and female.
* denotes significance at the .05 level
** denotes significance at the .01 level

Overwhelmed PS. A large positive significant correlation was found between overwhelmed problem-solving and impulsive/haphazard problem-solving scores ($r = .61$, $p < .001$), which indicated that as overwhelmed problem-solving increased, so did impulsive/haphazard problem solving. Small significant negative correlations were also revealed between the scores of overwhelmed problem-solving and resourcefulness ($r = -.28$, $p < .001$), problem-solving self-efficacy ($r = -.26$, $p < .001$), capability ($r = -.16$, $p < .001$), age

in years (r = -.14, p < .001), purposefulness (r = -.10, p = .004), and culture (r = -.10, p = .007) respectively. These results indicated as overwhelmed problem-solving increased, resourcefulness, problem-solving efficacy, capability, age in years, purposefulness, and culture decreased. That is to say participants who displayed OPS were more likely to display IHPS, as well as a lack of resourcefulness, PSSE, capability, purposefulness, and the ability to understand university culture.

Males: A large significant positive correlation was found between overwhelmed scores and impulsive/haphazard r = .64 (p < .001) scores. That is to say, as overwhelmed scores increased, so did impulsive/haphazard scores. Also, small negative correlations were found between overwhelmed scores and resourcefulness (r = -.26, p = .001), culture (r = -.18, p = .022), capability (r = -.16, p = .040) and purposefulness (r = -.16, p = .044) scores, respectively. That is to say that as overwhelmed scores increased, scores for resourcefulness, culture, capability, and purposefulness decreased. This indicated that male participants who displayed OPS were less likely to be resourceful, adjust to the university culture, perceive themselves to be capable in their study, and have less purpose in their study.

Females: A large significant positive correlation was found between overwhelmed and impulsive/haphazard scores (r = .61, p < .001), indicating that as overwhelmed scores increased, so did impulsive/haphazard scores. A medium significant positive correlation was found between overwhelmed and self-efficacy (r = .31, p < .001), which indicated that as overwhelmed scores increased, so did self-efficacy scores. A small negative significant correlation was found between overwhelmed scores and resourcefulness (r = -.29, p < .001), capability (r = -.19, p < .001), age in years (r = -.16, p < .001), purposefulness (r = -.10, p = .017), and culture (r = .09, p = .035) scores, respectively. That is to say as overwhelmed problem-solving scores increased, scores of resourcefulness, capability, age in years, purposefulness, and culture decreased.

Impulsive/haphazard PS. Results also revealed a small significant positive correlation was found between impulsive/haphazard and problem-solving efficacy scores (r = .23, p < .001). As higher scores on problem-solving efficacy indicate a lack of planning and rationalisation when faced with problems. Results revealed that as impulsive/haphazard problem-solving increased, the lack of problem-solving efficacy also increased. A small significant negative correlation was found between impulsive/haphazard and resourcefulness scores (r = -.21, p < .001), which indicated that as impulsive/haphazard increased, the scores on resourcefulness decreased, revealing a lack of resourcefulness. A small significant negative correlation between impulsive/haphazard problem-solving scores and age in years (r

= -.20, $p < .001$). This indicated that as age in years increased, impulsive/haphazard problem-solving decreased when faced with a problem. Furthermore, a small negative correlation was revealed between impulsive/haphazard and culture scores ($r = -.18$, $p < .001$), which indicated that as impulsive/haphazard scores increased, culture scores decreased. A small negative correlation was found between impulsive/haphazard and capability scores ($r = -.14$, $p < .001$). This indicated that as impulsive/haphazard scores increased, capability scores decreased. Additionally, a small negative correlation was revealed between impulsive/haphazard scores and purposefulness ($r = -.10$, $p = .004$), which indicated that as impulsive/haphazard scores increased purposefulness scores decreased representing a lack of purpose.

Males: A small negative significant correlation was found between impulsive/haphazard and capability ($r = -.19$, $p = .013$), culture ($r = -.19$, $p = .012$), and resourcefulness ($r = -.16$, $p = .036$) scores. That is to say, as impulsive/haphazard scores increase, capability, resourcefulness, and culture scores decrease. This indicated that male participants who perceived themselves to display IHPS were less likely to perceive themselves as capable, resourceful, or understanding the culture of the university.

Females: A medium positive significant correlation was found between impulsive/haphazard and self-efficacy ($r = .32$, $p < .001$) that indicated as impulsive/haphazard scores increased, so did self-efficacy scores. Also, small significant negative correlations were found between impulsive/haphazard scores and age in years ($r = -.23$, $p < .001$), resourcefulness ($r = -.22$, $p < .001$), culture ($r = -.18$, $p < .001$), capability ($r = -.12$, $p = .005$), and purposefulness ($r = -.10$, $p = .011$). That is to say, as impulsive/haphazard scores increase, scores for age in years, resourcefulness, culture, capability and purposefulness decrease. This indicated that female participants who perceived themselves to display IHPS were more likely to be older, less likely to be self-efficacious, resourceful, and less likely to adapt to university culture. They were also less likely to perceive themselves as capable or purposeful in their study.

Planned/rational PS. A medium significant positive correlation was found between planned/rational problem-solving and problem-solving self-efficacy scores ($r = .32$, $p < .001$). This indicated that as planned/rational problem-solving scores increased, so did problem-solving self-efficacy scores. There was also a small significant negative correlation between planned/rational problem-solving scores and age in years ($r = -.08$, $p = .020$), which indicated as participants planned/rational problem-solving scores increased, age in years decreased. Small negative correlations were also revealed between planned/rational problem-solving

scores and capability (r = -.13, p < .001), connectedness (r = -.07, p = .041), purposefulness (r = -.08, p = .034), and culture (r = -.11, p = .003), respectively, which indicated that as scores with planned/rational increased, the scores on the senses of capability, connectedness, purposefulness and culture decreased. That is to say that participants who perceived themselves to be rational problem solvers also perceived themselves to be self-efficacious problem solvers, whereas those participants who displayed PRPS were more likely to perceive themselves (in respect to their study) as capable, connected, purposeful and understanding of university culture.

Males: A medium significant positive correlation was found between planned/rational scores and self-efficacy scores (r = .49, p < .001), which indicated that as planned/rational scores increased, so did scores for self-efficacy.

Females: A small significant positive correlation was found between planned/rational scores and self-efficacy scores (r = .26, p < .001), indicating that as planned/rational scores increased, so did self-efficacy scores. Small negative significant correlations were revealed between planned/rational scores and capability (r = -.13, p = .002), culture (r = -.13, p = .002), purposefulness (r = -.10, p = .014), and connectedness (r = -.09, p = .038). That is to say, as planned/rational problem-solving scores increased, scores for capability, culture, purposefulness, and connectedness, decreased.

Problem-solving self-efficacy. A small significant negative correlation was found between self-efficacy scores and capability (r = -.22, p < .001), resourcefulness (r = -.21, p < .001), connectedness (r = -.08, p = .020), purposefulness (r = -.13, p < .001), and culture (r = -.22, p < .001) scores respectively, which indicated that as self-efficacy scores increased, capability, resourcefulness, connectedness, purposefulness, and culture scores decreased. A small significant negative correlation was found between problem-solving efficacy scores and age in years (r = -.16, p < .001), which indicated that as age in years increased, participants' self-efficacy scores decreased, denoting a strength in the area. That is to say a low score in PSSE denotes a strength and a high score in capability, resourcefulness, connectedness, purposefulness, and culture also indicates a strength.

Males: There were no significant correlations for males between problem-solving self-efficacy.

Females: Small negative significant correlations were found between self-efficacy and capability (r = -.26, p < .001), culture (r = -.26, p < .001), resourcefulness (r = -.25, p < .001), purposefulness (r = -.17, p < .001), and connectedness (r = -.11, p = .009) scores, which

indicated that as self-efficacy scores increase, capability, culture, resourcefulness, purposefulness, and connectedness scores decrease.

Expected transition.

Pearson's product-moment correlations, at an alpha level of .05, were performed between the five senses of success, that is: Capability, resourcefulness, connectedness, purposefulness, and academic culture scores and age in years. The correlations were also split into male and female and examined for any differences between the two. As shown in Table 6.4, the Pearson's product-moment correlation revealed several significant results.

Table 6.4

Correlation Matrix Between Expected Transition and Age (including male and female)

Scale	CAP			RES			CON			PURP			CULT		
	M	F	MF	M	F	MF	M	F	MF	M	F	MF	M	F	MF
CAP	1	1	1												
RES	.67**	.56**	.58**	1	1	1									
CON	.47**	.43**	.43**	.49**	.44**	.45**	1	1	1						
PURP	.57**	.56**	.56**	.56**	.49**	.50**	.55**	.48**	.49**	1	1	1			
CULT	.53**	.55**	.55**	.48**	.46**	.47**	.41**	.39**	.39**	.66**	.68**	.68**	1	1	1
AGE	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	-.28**	-.14**	-.17**	*ns*	*ns*	-.08*	*ns*	*ns*	*ns*

Note. Age = age in years; CAP = sense of capability; RES = sense of resourcefulness; CON = sense of connectedness; PURP = sense of purposefulness; CULT = sense of academic culture. M = male; F = female; and MF = male and female.

* denotes significance at the .05 level

** denotes significance at the .01 level

The five senses. Medium to large significant ($p < .001$) positive correlations were found between capability and resourcefulness ($r = .58$), purposefulness ($r = .56$), academic culture ($r = .55$), and connectedness ($r = .43$) scores respectively. Therefore, as participants scores on capability increased, so did the scores for resourcefulness, purposefulness, academic culture, and connectedness. Medium to large significant positive correlations ($p < .001$) were also revealed between the scores for resourcefulness and purposefulness ($r = .50$), culture ($r = .47$), and connectedness ($r = .45$) respectively, which indicated that as the scores for resourcefulness increased, so did the scores for purposefulness, culture and connectedness. Medium significant positive correlations were revealed between the scores of connectedness and purposefulness ($r = .49$), and culture ($r = .39$), which indicated that as scores of connectedness increased, so did scores on purposefulness and culture. A small

significant negative correlation was also found between connectedness scores and age in years (r = -.17, p < .001), which indicated that as scores for connectedness increased, age in years decreased. A large positive correlation was revealed between purposefulness scores and culture scores (r = .68, p < .001), which indicated that as scores on purposefulness increased, so did scores on culture. A small negative correlation was found between purposefulness and age in years (r = -.08, p = .031), which indicated that as scores on purposefulness increased, age in years decreased. That is to say as people aged their sense of purposefulness decreased.

Males and females: With regard to the scores of males and females, most of the five senses of success were comparable to the combined correlations, except a significant negative correlation was found between male scores of age in years and connectedness (r = .28, p < .001) scores, which was nearly twice the size of the correlation for female age in years score and connectedness (r = .14, p = .001) scores. This indicated that as males and females age in years increased the connectedness scores decreased, and more significantly with the male cohort. That is to say that as participants aged their sense of connectedness to the university was not as strong.

Binary Logistic Regression

Binary logistic regression is performed in order to assess the goodness of fit of the model, and to ascertain importance of each variable as a predictor variable. The WALD statistic explains the particular variables that are of significant predictive ability to the model.

A binary logistic regression was performed with DA regressed on the following predictors: problem-solving subscales (OPS, IHPS, PRPS, & PSSE); and expected transition subscales (CAP, RES, CON, PURP, & CULT), age in years, and gender (Table 6.5).

Table 6.5
Simple logistic regression of Digital Apprehension and key variables.

	B	*SE*	*Sig.*	*Exp(B)*	*95% CI (Exp B)*	
					Lower	*Upper*
CAP	-.01	.03	.749	.99	0.95	1.05
RES	-.13	.02	.000	.89	0.84	0.92
CON	-.01	.02	.496	.99	0.98	1.05
PURP	.02	.04	.668	1.00	0.95	1.10
CULT	.07	.05	.160	1.11	0.97	1.18
OPS	.07	.03	.016	1.08	1.03	1.06
IHPS	-.01	.03	.885	.97	0.93	1.05
PRPS	.02	.03	.448	1.01	0.96	1.09
PSSE	.03	.03	.305	1.03	0.98	1.11
Age	.04	.01	.000	1.01	1.03	1.06
Gender	.63	.22	.004	1.89	1.22	2.90
Constant	.10	.89	.009	.07	-	-

Note. CAP = sense of capability; RES = sense of resourcefulness; CON = sense of connectedness; PURP = sense of purposefulness; CULT = sense of academic culture; OPS = overwhelmed problem-solving; IHPS = impulsive/haphazard problem-solving; PRPS = planned rational problem-solving; PSSE = problem-solving self-efficacy; Age = age in years; Constant = digital apprehensive.

There were 766 cases included for analysis and there were no missing cases. From analysis of the qualitative data, it was deemed that scores of 1-4 were encoded as non-apprehensive, and scores of 5-10 were coded as apprehensive. Therefore, coding was non-apprehensive (NDA) as 0, and apprehensive (DA) as 1. The basic model predicting that all the results would show DA without the OPS, IHPS, PRPS, PSSE, Capability, Resourcefulness, Conscientiousness, Purpose, Culture, and Age variables was 67 %.

The variables CAP, RES, CON, PUR, OPS, PSSE, show they would be significant predictors of DA. The model that includes two of the four problem-solving appraisals, and four of the five senses of success is a better predictor of Digital Apprehension, χ^2 (10) = 94.66, $p < .001$. With the added predictors, the ability to predict Digital Apprehension using these variables increases from 67% to 71%. Significance of each component of the logistic regression is seen by the Wald statistic. They are Resourcefulness ($W = 30$), $p < .001$; OPS, ($W = 6$), $p = .016$; and Age in years, ($W = 27$), $p < .001$, and Gender ($W = 8$), $p = .004$. The logit value is 0 at the point where the prediction changes from NDA to DA, which was computed with $aX + b$. Therefore, results revealed through these computations that participants who score less than 14.6 on the Resourcefulness score (as higher score represents a strength), more than 22.17 on the OPS score (as lower scores indicate a strength), and/or those participants who are more than 41.81 years of age, will be more likely to have Digital Apprehension.

Examination of the DAPSET measure

Digital Apprehension questions: Investigation.

Each question was individually examined, and the logic, flow, and steps undertaken to create the final DAq measure were investigated. It should be noted that the initial DAQ, used in the second phase of the research contained 12 items, and the final DAq[9] used in the third phase of the study contains 9 items.

Questions 1 and 2. Question 1 (Q1) asked: *What one word would you use to describe the technology you are required to use at university?* Question 2 (Q2) then asked: *Can you describe why you chose that word? (in a sentence or two).* Using Q2 to give an understanding and rationale of the participants' response, Q1 was coded into a number to represent a positive or negative response. A positive response was coded as one, and negative response was coded as two. Therefore, Q1 was coded as either 1 (*non-apprehensive*) or 2 (*apprehensive*). For example, if in Q2 participants expressed a sense of experience with technology as helpful, everydayness, happy, or if participants wrote the word 'good', giving a positive connotation, it was coded as Non-apprehensive (NDA~1). An example response is, "*Technology comes easy to me, as a part of a younger generation where I have been surrounded with it*". Whereas, when participants expressed in Q2 a sense of feeling lost, confused, annoyed, frustrated, giving a negative connotation, it was coded as Apprehensive (DA~2). An example response is, "*I was overwhelmed and I panicked thinking I would never get a handle on where everything was and how to submit things in the correct format etc.?*"

Where the apprehension was due to the actual university website and not the technology per se, further investigation was required with participants' answers to Q4 and Q5. For example, if participants responded with "regular" as their one-word answer, with a low DA score, the response to Q4 was "*Sometimes I found the interface with the USQ website frustrating*", it was coded as NDA, as there was only minor frustration with the actual university webpage. Although this does infer there is apprehension present, there is not enough to warrant coding as apprehensive toward the technology. This, however, indicates that the original wording and only Q2 as a rationale were sufficient to enable understanding and give correct coding. Those who expressed neutral feelings toward technology were

[9] The difference should be noted between the survey instruments' acronyms. Specifically, to differentiate between the initial and the final instruments created, the initial phase surveys all have upper case 'Q' whereas the final phase surveys have a lower case 'q', for example, DAQ and DAq; PSQ and PSq, ETQ and ETq.

coded as NDA as there was no inference of apprehension present in their responses to questions 2, 4, or 5.

Further examination of participants' responses revealed that DA could be seen in several different aspects. For instance, aspects revealed included those who were apprehensive because they believed technology was not to be trusted, for example, "*One day technology will all come crashing down, due to viruses or terrorism. We rely on it so much in our daily lives that when it stops working we will realise our mistake in pursuing such a digitalised world"*. Some participants revealed familiarity with technology, but found it frustrating, and were indifferent, and responded with "*I am very ok with using technology but the campus ones is just frustrating. Most of the time it's old technology and doesn't work*". However, there were those participants who, while they were not very tech-savvy, still had no apprehension and responded with "*I am not very technology savvy but find all the necessary functions usable*". Others experienced apprehension with the layout "*It is too cluttered and lacks user friendliness*". Examples of respondents' reasoning behind some of the apprehension included, "*Because I didn't grow up with technology. I am a busy Mother with three children, a husband who works long hours; I work three school hour days and I am study[ing] a full-time university load. So, the idea of expending mental energy to get my head around the Uni web site and accessing everything I need to for my study is overwhelming and daunting.*" Other examples include, "*Very unpleasant as I have never been interested in technology, I would much rather do things like they did a couple years ago*."

Finally, with Q1 and Q2 it was necessary to note that some participants may have been confused regarding the scoring. However, these were not enough to skew the data, but need mentioning. For example, some participants put a score of 7 or 8 for the question "*Can you rate the level of difficulty you faced at the time, where 1 equals 'it was pretty easy to understand' and 10 equals 'I thought I would never understand it*'". Yet responded to Q4 and Q5 concerning their feelings and explanation of their feelings, with "*I chose a word that best describes ease of use*" and "*Easy to navigate, fault finder friendly*" which implies there was no apprehension present, and these were coded as NDA. As this instrument is intended to be applied in not only the education sector, but also the business sector, the questions will be organised to enable flexibility to adapt. For example, Q1 could be reworded to enable application in business/industry sector to "*What one word would you use to describe the technology you are required to use at work?*"

Question 3. *Can you rate the level of difficulty you faced with technology, where 1 equals 'it was pretty easy' and 10 equals 'I thought it'd never get sorted out'?* This question is the main question dealing with the apprehension score, and gives a score out of 10, with a minimum of 1 and a maximum of 10, with the higher the score, the more digitally apprehensive.

Questions 4 and 5. Question 4 (Q4): *What were your feelings about your experience with technology? (in a sentence or two) and Question 4 (Q5): 5. Can you explain why? (in a sentence or two)* were examined. These questions gave an indication of the negativity or positivity of the one word and enabled a more precise coding. This question was examined and decided that it was not required, as this question was for rationale of Q1 and Q2, and it was discovered that Q2 gave enough insight into the one-word answer to negate these two questions.

Question 6. This question: *What strategies do you use, or know about, that might help you use technology at university? (in a sentence or two),* was used for insight into possible future strategies, to help whoever is seeking clarification on Digital Apprehension to understand ways in which to help/support those in need. Consequently, this question was retained as an open-ended question.

Question 7. This question: *How would you describe your level of understanding of how university technology operates, where 1 equals 'it was pretty easy to understand' and 10 equals 'I thought I would never understand it'?* was to differentiate between those struggling because they do not understand technology, and those who are familiar with technology. This question is the level of difficulty score, and gives a score out of 10, with a minimum of 1 and a maximum of 10, with the higher the score, the more difficulty the participant has with understanding how (university) technology works.

Question 8. This question asked: *Can you say why you responded in the way you just did? (in a sentence or two).* After thorough analyses of respondents' answers to this question, it was determined that this question was not required, as this was for the rationale of previous questions, and enough depth and insight was gained without this question. For example, the rationale behind Q1 and Q2 encouraged the discussion of understanding and difficulty with technology. Furthermore Q9, Q10, and Q11 also gave adequate insight to possible solutions to help understanding technology.

Question 9. This question asked: *In what way could the university improve your experience of technology? (in a sentence or two).* The question was reworded to "*In what*

way could your experience of technology be improved?" to enable application in any setting. The question may be altered to adapt to whichever scenario it would be used for.

Question 10. This question asked: *Thinking about your answers, is there anything else that you can think of that would help you to navigate the university's technology?* Some beneficial information was obtained regarding support and how to help people, the same as Q6, therefore, this question was retained for insight.

Question 11. This question: *Would you attend a couple of classes/workshops dedicated to basic computer/technology that is needed when you first start university?* was kept with a note to reword to when applied in a business/industry sector to "*Would you attend a couple of classes/workshops at our expense dedicated to computer/technology uses in the workplace?*"

Question 12. This question asked: *When would be the best timing of these classes/workshops - Orientation week, 2 weeks after Orientation week, 4 weeks after or 6 weeks after?* It was needed to understand the timing to enable the best participation of the classes/workshops to support those who were struggling. The question should be reworded when applied in business/industry sector to "*When would the best timing for you if you wanted to attend these workshops?*"

Problem-solving and Expected Transition Investigation

In consideration of the reported instability of the overwhelmed problem-solving (OPS) factor of the PSI-12, and the low reliability score of the PSSE ($\alpha = .62$), in addition to the need to keep things current, it was deemed prudent to conduct an exploratory factor analysis (EFA) that included the PSI-12 and the STS-R-A questionnaires. The final DAq was not included in the factor analysis as the questions were examined and those showing unnecessary duplication of information were rejected, and also, the majority of questions were open ended (qualitative). The interpretation of the factors was based on previous research with transition and problem-solving appraisal (Beccaria, 2010; Lizzio & Wilson, 2006) in a higher education setting. The seven factors revealed in the EFA were grouped into two main categories, Problem Solving (PS) and Expected Transition (ET). The PS group consisted of three factors, Emotive Problem-Solving (EPS, 6 items), Confident Problem-Solving (CPS, 3 items), and Analytic Problem-Solving (APS, 3 items). The ET group consisted of four factors, Insightful Transition (IT, 9 items), Relational Transition (RelT, 7 items), Resourceful Transition (ResT, 7 items), and Capable Transition (CapT, 7 items). Considering the makeup of the DA, the PS, and the ET, the new instrument was called the DAPSET. Following are the results of the factor analysis.

Factor Analysis Results

Forty-two items, consisting of the PSI-12-item and the STS-R-A (30 items) questionnaires were subject to principal components analysis (PCA) using SPSS version 22. First, the sample size was inspected and deemed appropriate, as there were 766 cases, with 42 items, therefore exceeding the recommended ratio of 10 to 1 (Nunnally, 1978). Prior to performing PCA, the suitability of data for factor analysis was assessed by inspection of the correlation matrix revealing the presence of many coefficients of .3 and above. The Kaiser-Meyer-Olkin value was .92, exceeding the recommended value of .6 (Kaiser, 1970, 1974) and the Bartlett's Test of Sphericity (Bartlett, 1954) reached statistical significance ($p < .001$), supporting the factorability of the correlation matrix.

Principal components analysis revealed the presence of eight components with eigenvalues exceeding 1, explaining 11.8%, 4%, 2.8%, 2.6%, 2.2%, 1.6%, 1.3%, and 1.1% of the variance respectively (65% of total variance). Using Cattell's (1966) scree test, a break was revealed after the seventh component (see Figure 6.1), so further inspection was required to determine how many components to retain.

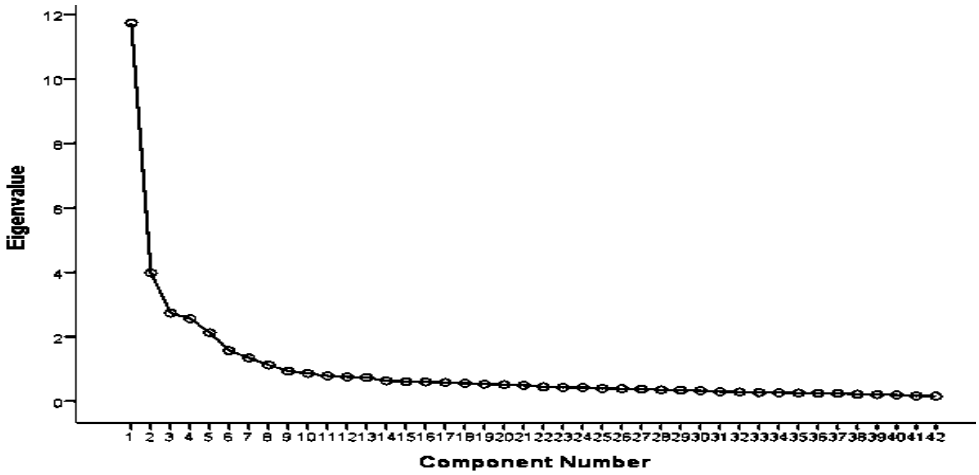

Figure 6.1. Scree Plot of PSI-12 and ET items.

A Monte Carlo PCA for parallel analysis (Watkins, 2000) was performed, where 100 random replications were generated using the same number of variables and subjects (42 variables x 766 respondents). The results showed only seven components with eigenvalues exceeding the corresponding criterion values for the randomly generated data matrix of the same size, which supported retaining only seven components, instead of eight (see *Table 6.6*).

Table 6.6.

Comparison of eigenvalues from PCA and criterion values from parallel analysis

Component	Eigenvalues	Criterion value	Variance	Decision
1	11.742	1.4817	27.96	accept
2	3.982	1.4313	37.44	accept
3	2.736	1.3892	43.95	accept
4	2.563	1.3561	50.01	accept
5	2.127	1.3238	55.12	accept
6	1.567	1.2979	58.85	accept
7	1.342	1.2695	62.05	accept
8	1.122	1.2472	64.72	reject

The seven-component solution explained a total of 62% of the variance, with Component 1 contributing 28% (.482 - .897; 9 items,), Component 2 contributing 9% (.614 - .920; 7 items), Component 3 contributing 6% (.494 - .888; 7 items), Component 4 contributing 6% (.610 - .822; 6 items), Component 5 contributing 5% (.452 - .824; 7 items), Component 6 contributing 4% (.867 - .911; 3 items), and Component 7 contributing 3% (.637 - .826; 3 items). Communalities ranged from .426 to .849 showing that all items fit well with the other items. To aid in the interpretation of these seven components, promax rotation was performed. The rotated solution revealed the presence of simple structure (Thurstone, 1947), with all components showing a number of strong loadings and variables loading substantially. For full results of Pattern and Structure Matrix, see Appendix B4.

Allocating component names

The interpretation of the factors was based on previous research including transition and problem-solving appraisal (Beccaria, 2010; Lizzio & Wilson, 2006) in a higher education setting. Furthermore, as stated before, seven factors loaded from the combined questionnaires of the PSI-12 and the STS-R-A. As this questionnaire is a combination of two questionnaires and explores participants' method of problem-solving and expected transition, it was decided to rename the factors as to which type of problem-solving and transitional stance a participant used, rather than a problem-solving appraisal, or one of the five sense of success (Lizzio &

Wilson, 2006). However, general themes from the two questionnaires were used as guidelines.

Factor 1: Insightful transition. On examining the first factor, it comprised of nine items, five from the sense of purposefulness and four from the sense of culture from Lizzio and Wilson's (2006) Student Transition Scale (STS). Due to the implication of the questions, that participants use their insight, it was decided to name the new factor 'Insightful transition'. An example is: "*See myself in my future professional role because I will have opportunities to discuss my motivations and goals for study*", "*Understand how to use information ethically by referencing correctly*" and "*Value being curious and open to new ideas*".

Factor 2: Relational transition. The second factor consisted of seven items solely from the sense of connectedness (Lizzio & Wilson, 2006), however, it was decided to name this factor 'Relational transition' as the items suggest a preference for a relationship interaction, rather than just resources, capability, or insight. For example, "*Feel a sense of fellowship with the students in my year level*" and "*Give and receive help and support from my fellow students (e.g., car-pooling, study groups)*" and "*Develop effective working relationships with fellow students in my course*".

Factor 3: Resourceful transition. The third factor consisted of seven items from only the sense of resourcefulness, so it was decided to generally retain the theme and name the third factor 'Resourceful transition'.

Factor 4: Emotive problem-solving. The fourth factor consisted of six items from both the overwhelmed and impulsive/haphazard problem-solving appraisal. It was decided to create the name 'Emotive problem-solving' due to the nature of items, which implied emotion, rather than confidence, or analysis involved, such as, "*There are times when I become so emotionally charged that I can no longer see the alternatives for solving a particular problem*" and "*I generally act on the first idea that comes to mind in solving a problem*".

Factor 5: Capable transition. The fifth factor consisted of seven items from only the STS sense of capability and therefore it was decided to generally retain the name of 'Capable transition'.

Factor 6: Confident problem-solving. The sixth factor consisted of three items only from the problem solving self-efficacy factor of the PSI-12. Due to the nature of questions, which imply confidence in participants' ability to solve problems, such as, "*I trust my ability to solve new and difficult problems*" and "*When faced with a novel situation, I have*

confidence that I can handle problems that may arise", this was named 'Confident problem-solving'.

Factor 7: Analytic problem-solving. The seventh factor consisted of three items from the planned/rational problem-solving appraisal factor, and was named 'Analytic problem-solving'. This was due to the nature of questions which imply some analysis of ideas and feelings, such as, "*When I have a problem, I think of as many possible ways to handle it as I can until I can't come up with any more ideas*" and "*When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation*"

Factor Analysis Synopsis

Following the factor analysis all items with a factor loading of .5 and above were retained. Three questions were omitted. They were "[*Did you:] Have a sense of where my degree will take me because I will have opportunities to meet successful graduates and role models*" (.482); "*Have strategies for dealing with challenges I may face in my studies*" (.494); "*Understand that any worries or concerns I have about study are normal and does not mean I'm not coping or don't belong*" (.452). These questions were not incorporated in the final measure, as there were other questions that addressed the issues just as well. For example, the question "[Did you:] *Have a sense of where my degree will take me because I will have opportunities to meet successful graduates and role models*" can be just as accurately answered with the question "*See the relevance of what I am studying to my career plan*". In addition, the question "[Did you:] *Have strategies for dealing with challenges I may face in my studies*", can accurately be answered with the question "*Know who to ask for assistance with any concerns or issues I have about my studies*". The third question can be answered accurately with "*Manage my own learning better because I will have opportunities to realistically assess my skills and capabilities*". Together these questions answer the information that would be gained from the three omitted questions. After the deletion of these questions, four expected transition factors (insightful, relational, resourceful, and capable), and three problem-solving factors (emotive, confident, and analytic) were determined to be appropriate for the completed measure.

Discussion: Phase 2

The aim of this phase of the research was to examine the data from the initial study and create the composite psychometric instrument (the DAPSET) for the next phase, the final study. This was accomplished by the investigation and reporting of the relationships between key variables, exploratory factor analysis of the problem-solving and expected transition questionnaires, with the objective to the formation of the final DAPSET in accordance with

the project's aim and objectives. Overall 36% of participants experienced Digital Apprehension. The proportion of females experiencing digital pprehension was considerably higher at 39%, compared with 25% of males.

Reliability Discussion

The point of reference regarding internal reliability used in this research is Cronbach's (1951) alpha coefficient where it is considered a reliable statistic to measure the underlying construct. The terms used in this research reflect the measures *excellent* is ≥ 0.9, but < 0.95; *good* is ≥ 0.8 to 0.89; *acceptable* is ≥ 0.7 to 0.79; *poor* is ≥ 0.5 to 0.69; and *unacceptable* is < 0.5 using Cohen's (1951) conventions. The internal reliability for the composite Digital Apprehension, problem-solving, and expected transition psychometric measure was evaluated as acceptable to excellent. Digital apprehension and problem-solving appraisal showed good internal consistency, while expected transition indicated excellent internal consistency. Looking to the individual measures and their subscales there were no major issues, apart from the problem-solving subscale of planned/rational problem-solving, which was questionable at a low level ($\alpha = .62$). Nevertheless, this was still acceptable as the inter-item mean of two of the three items ranged between .2 and .4. However, one question was just above (.51) which suggested that this question only incorporated minimal aspects of this construct (Briggs & Cheek, 1986). However, this was investigated in the final stage of this phase of the study and resolved by an exploratory factor analysis. The reliability for the total instrument (DA, STS-R-A, & PSI-12) as a whole was good with an $\alpha = .88$.

Correlations Discussion

Digital Apprehension.

The concept of digital apprehension was formed to investigate an unwillingness to participate in the use of technology and digital tools at university. The culmination of this was understood by two questions that dealt with level of difficulty (apprehension) and level of understanding experienced by students when exposed to the technology needed to use while attending higher education. The level of difficulty translated into apprehension felt, while the level of understanding translated into whether this source of apprehension was from lack of understanding technology, or some other source. The analyses revealed that a lower level of understanding technology was strongly associated with a higher level of digital apprehension. This may be addressed in the area of education specifically around the technology used in the course curriculum, with course specific technology workshops, or embedded in class time. Similarly, this study found that participants who experienced digital apprehension while using technology were less likely to find a balance in their personal and

study life, which in turn, was likely to affect their ability to be resourceful. This can become a major issue, as resourcefulness is a very strong factor for student success (Lizzio & Wilson, 2013), or surely in any field. If there is an imbalance between people's study and personal life, including strategies involved in applying the necessary discipline to achieve the desired results, there may be a strong possibility that people may be more inclined to abandon their chosen course. A significant association between digital apprehension and age was found, showing that the older participants tended to be more apprehensive than younger respondents. While this is probably common knowledge (Prensky, 2001), in this current time the results were not as strong as expected.

Digital apprehension was experienced significantly more by those respondents who felt burdened or became overwhelmed when faced with problems. Consequently, if people were enlightened as to their problem-solving appraisal type, this may be addressed before engaging with technology, or when difficulties with digital apprehension first arose. The idea of the current research is to create a psychometric instrument that will highlight people who will need support, when pressure is experienced, before the pressure has detrimental effects. A strong association between digital apprehension and the propensity to being impulsive and haphazard when faced with problems was found in this research. The ability that this measure brings to recognise the onslaught of confusion and inconsistency would greatly help support centres to recognise struggling students in need, and therefore give them crucial support before catastrophe arises. The ability to self-manage problems as they arise is an important aspect to enable the completion of any tasks, especially completing a three-year (or more) university degree. This research discovered a significant relationship that noted if respondents experienced digital apprehension they were less likely to be able to self-manage problems as they came their way. This could be alleviated by the creation of support groups to discuss how to manage problems and perceived apprehension that may occur.

Further findings revealed during this research revealed respondents inclined to be digitally apprehensive were more inclined to struggle with capability of task and role clarity in courses; participate in university community; and were more likely to perceive less academic competence. Again, workshops or classes on technology specific to their course could be a way to alleviate many of the digital apprehensiveness that compounds other factors. For instance, factors such as a sense of belonging has been shown to be an integral part of success in many situations, for the majority of people (Lizzio & Wilson, 2013). This research found that if a person was digitally apprehensive, this sense of connectedness was less likely to happen. Being connected to a university (or anything for that matter) brings

about stronger bonds, increasing the probability of completion, and could even start as early as pre-university (Briggs et al., 2012).

Understanding technology plays an important part in successfully navigating not only higher education, but any vocation in this current digital age. A significant association was found between a lack of understanding technology and older participants, leading again to apprehension within the older cohort. A significant relationship between not being able to understand the technology needed to complete a course and of feeling burdened or overwhelmed by problems when they arise was also found by these respondents. The implications of this combination could be quite detrimental, especially to first year students. The ability to flag and support students (or anyone) who may be predisposed to this combination would be invaluable. Furthermore, a significant association was found between participants experiencing difficulty understanding technology and impulsive and/or haphazard problem-solving appraisal. This means that when faced with the problem of trying to understand the technology needed for particular tasks, participants were likely to be impulsive and initiate the first idea that comes to their mind. Again, the ability to manage problems as they arise could be alleviated by the creation of support groups to discuss how to manage problems that may occur.

The ability to manage problems, and in particular self-manage, as they arise is important in being a successful autonomous student. This research found a strong relationship between participants who not only found it difficult to understand technology, but also struggled to self-manage problems in an efficacious manner as they arose. When that ability is lacking, and coupled with a high level of difficulty understanding technology, there needs to be support implemented to enable progress. Perhaps coaching in ways to self-manage problems as they arise, or proactive courses with positive ways to tackle life situations may enable good lifestyle choices. A significant relationship was found between not understanding technology and four out of the five senses of success (capability, resourcefulness, connectedness, and academic culture). Specifically, those participants who found it difficult to understand technology also found it difficult to clarify role and task responsibilities in the student community, and also struggled to feel capable in their role (capability); had difficulty finding a balance between their student identity and their personal life (resourcefulness); found it problematic fitting in or feeling connected to staff or students (connectedness); and felt a lack of knowledge in regard to the university, and how it works (academic culture). In order to successfully navigate the higher education pathway, there is a need for more than just knowledge, that relationships are not only important but should be

encouraged (Chester et al., 2013). Therefore, as Lizzio and Wilson's (2006) five senses of success are seen as an essential application to ensure students (or anyone for that matter) retain enthusiasm and progress through to completion, an important aspect that must come out of this research is to understand why people do not understand technology, the problems arising, and how to help them. Consequently, if people are prone to Digital Apprehension and problems occur, this may well amplify any negative problem-solving ability, or vice versa. Subsequently, if people believe they can grasp new concepts and technological tools easily, yet their problem-solving appraisal amplified apprehension, then support is needed when the dissonance between the ideal and the real arises.

Problem-solving.

Students' reactions to challenges often depended on their problem-solving appraisal (Lizzio & Wilson, 2013), and often, students' ability to recognise how they reacted enabled them to adjust and persevere (P. P. Heppner et al., 2004; Smith & Burton, 2013). An interesting, discovery was found when significant relationships were revealed between age and problem-solving appraisal. The significant relationships supported the perception that older participants were less likely to feel overwhelmed, impulsive or disorganised, and displayed strengths in the areas of logical planning and self-management when faced with problems. In this current research, a strong significant relationship was found between participants who felt burdened or became overwhelmed when problems arose, and those participants who were more likely to become impulsive and/or haphazard in their behaviour when faced with problems. This is important to understand, as people who react in this way definitely need strong support in the ability to complete tasks that involve new problems arising, especially in the first year of the higher education degree pathway. This pathway could be strategically engineered to enable optimal support along the way. For example, the use of Lizzio and Wilson's (2006) five senses of success survey to map students' perceptions. When faced with problems, participants who were inclined to be impulsive or haphazard in their problem-solving abilities were also inclined to irrationality when planning, as a strong association with overwhelmed and planned/rational problem-solving was revealed. Unsurprisingly, participants who were likely to feel overwhelmed when faced with problems were also not very confident in managing problems themselves when they arose, which was supported when a strong negative association was found between overwhelmed problem-solving and problem-solving self-efficacy

It was concerning to note, this research discovered that participants who had felt overly burdened or distressed when faced with problems experienced a negative effect on four out of

the five senses of success. That is, a significant relationship was found between overwhelmed problem-solving appraisal and capability, resourcefulness, purposefulness, and academic culture. Specifically, participants who experienced a feeling of being burdened or overwhelmed when problems arose also found it difficult to clarify responsibilities involved with their role and tasks, were confused with their standing in the student community, and struggled to feel capable in their role (capability); had difficulty balancing their life, work, study balance, and initiating strategic resources (resourcefulness); struggled to find direction and establish goals (purposefulness); and also felt a lack of confidence in knowing the culture of university, and how it works (academic culture). This meant that participants' ability to act with effectiveness and competency, to understand the purpose of their chosen path, or the ability to be resourceful, as well as feeling comfortable in the surrounding culture, was significantly negatively affected when problems arose.

Furthermore, a strong relationship was discovered between participants who were impulsive and random in their decision-making process, and therefore were strongly inclined to have a lack of logical planning with problem situations. Again, a significant negative relationship between problem-solving appraisal and the five senses of success was revealed. Capability, resourcefulness, purposefulness, and academic culture, all presented with strong relationships to participants being impulsive and/or haphazard in the way they faced problems. The ability to plan logically and manage problems autonomously is a valuable asset to obtain while studying at university. A strong positive relationship was found between planned/rational and self-efficacy problem-solving appraisal, and while on the positive side this ability is seen as a strength, it may have unfortunate results on the negative side. These findings support the need to gather important information to enable attention at the ground level for those students who may struggle in this area.

Predictably, significant relationships between planned/rational problem-solving appraisal and four of the five senses of success were detected. These scales were coded in opposite directions, that is to say, lower scores with problem-solving appraisal indicated a strength, whereas, lower scores with expected transition indicated a lack, or a weakness in that area. Therefore, when a significant negative relationship between planned/rational problem-solving appraisal and capability, connectedness, purposefulness, and academic culture was revealed, this translated into participants who struggled with planning solutions in a rational logical manner, would also struggle with appraising themselves as being capable in the university setting (capability); a sense of belonging (connectedness); goal-setting and purpose (purposefulness); and understanding their role in the university culture (academic

culture). Similarly, regarding the five senses of success, a strong negative relationship was found between all five senses and problem-solving self-efficacy. Specifically, higher problem-solving appraisal scores indicated participants were less likely to be proactive in solving problems, and lower scores on the senses scale indicated a lack of capability, resourcefulness, a sense of connection, or purpose, and also a lack of understanding the academic culture. With the five senses of success being a proven strategy to address student success and retention (Chandler & Potter, 2012; Radloff et al., 2011) it is essential to discover and support areas where students are likely to struggle, or even fail. Knowing how students react or respond in a pressure situation is invaluable to enable support at just the right moment.

Expected transition.

As expected, all the five senses of success had strong relationships with each other. Of all the five senses, only two had a strong relationship with age. The sense of connectedness and purposefulness was more prevalent with the younger participants. The diversity and maturity of the average university students today, may be something that needs to be investigated. It is important to have the sense of being connected, as well as the sense of being validated or accepted while at university, mastering goal-setting, knowing the direction study will take, and the perceived validation of a student's choice of course or program.

Gender.

Both males and females experienced difficulty with technology as their age increased, however, older males experienced more Digital Apprehension than older females. Older males also had slightly more difficulty understanding technology than older females. Additionally, older females were less inclined to be impulsive/haphazard when faced with problems than older males. However, the more digitally apprehension experienced by females, the more overwhelmed they became when problems surfaced. An interesting finding revealed that males who tended to have a strong sense of university culture experienced less Digital Apprehension. This was not so with females, as no significant relationship was found between the two. Also, the more Digital Apprehension experienced by males, the less connected to the university they felt. Older females had significant struggles with understanding technology if they felt overwhelmed by problems they faced. In comparison to older males younger males appeared to have a stronger sense of connectedness to the university. This may be due to the recent leaving of family connections and the need to establish their independence. Additionally, older males felt less connected than older females.

Additional Discussion.

The predictor ability of Digital Apprehension is enhanced with the addition of the PSI-12, and the STS-R-A, as the predictability has been shown to increase from 67% (using just the DA questions) to 71% using the full composite. All variables were analysed with the following CAP, RES, CON, PUR, OPS, PSSE, found to be significant predictors of DA. The investigation into Digital Apprehension needed to recognise at what point a person moves from being non-apprehensive with technology, to digitally apprehensive (the cut-off point). The ability to predict Digital Apprehension through variable scores was considered using a scientific calculation. As this formula may be complex, explained simply, a value is assigned to the point where the prediction changes from non-apprehensive to apprehensive. This value is set at 0, that is zero apprehension. Zero is then used as a baseline to compute the formula ($0 = aX + b$) to discover the cut-off point with the significant variables. Consequently, the following results were revealed. Participants who scored less than 14.6 on the resourcefulness scores (as higher score represents a strength), more than 22.17 on the overwhelmed problem-solving scores (as lower scores indicate a strength), and/or those participants who are more than approximately 41 years of age, would be more likely to have Digital Apprehension. This analysis presented a workable way to gauge Digital Apprehension, using the initial questionnaire. The final 48-item Digital Apprehension questionnaire was created, as a concise composite measure, consisting of the Digital Apprehension questionnaire, the problem-solving questionnaire, and the expected transition questionnaire. Following is the completed Digital Apprehension questionnaire.

Digital Apprehension Questionnaire (DAq)

Throughout the analyses, it was noted that participants experience Digital Apprehension from differing stances. After examining all the responses to the questions, four main factors were found. The diagrammatic representation of Digital Apprehension (as seen in Chapter 5) demonstrates engagement on four main levels: Confidence (self-efficacy, perceived behavioural control, confidence in ability to use the technology); Knowledge of technology (competence); Language (aspect of competence and of self-efficacy); and Compliance (attitudes). Each of these aspects can be seen in the completed questionnaire that resulted from the analyses and are listed below. The following questionnaire, the DAPSET, was completed after analysis of the data collected in the initial phase, and used in the final phase.

Q1: What one word would you use to describe the technology you are required to use at your university (workplace)? *Code either 1 (non-apprehensive) or 2 (apprehensive) using Q2 for rationale*.

Q2: Can you describe in a sentence or two why you chose that word?

Q3: What would you rate the level of difficulty you faced at the time, where 1 equals '*It was pretty easy' and 10 equals 'I thought it'd never get sorted out'?*"

Q4 (*initial Q6*): In a sentence or two describe what strategies you use, or know about, that might help you use technology.

Q5 (*initial Q7*): What would you rate your level of understanding of how university (work related) technology operates where 1 equals '*it was pretty easy to understand' and 10 equals 'I thought I would never understand it'*?

Q6 (*initial Q9*): In what way could your experience of technology be improved?

Q7 (*initial Q10*): Thinking about your answers, is there anything else that you can think of that would help you to navigate your university's (work's) technology?

Q8 (*initial Q11*): Would you attend a couple of classes/workshops (at our expense) dedicated to computer/technology uses (in the workplace)?

Q9 (*initial Q12*): What is the best time to hold these workshops/classes?

The completed DAq was highly correlated with the two questions level of difficulty (Q3) and level of understanding (Q5) as scaling questions for quantitative analyses. Question 3 indicates the level of apprehension recognised due to the difficulty experienced with technology, whereas Question 5 gives clarity to the apprehension in relation to participants understanding of technology.

Chapter Summary

So far, this research project has examined the presence and prevalence of the concept Digital Apprehension within first year students in the higher education setting. The first phase of this project involved focus groups which created a contemporary measure capturing respondents' perceptions when faced with apprehension from technology, problems presenting, and transition into the new domain of university. The initial questionnaire contained three separate measures which included, the Digital Apprehension questionnaire (DAQ), the 12-item problem-solving inventory (PSI-12; Beccaria & Machin, 2010), and the student transition scale (Lizzio & Wilson, 2006), revised (Lehane, 2013) and adapted (STS-R-A). This chapter has not only shown the presence of Digital Apprehension in first year university students, but a prevalence within this cohort of 36%. The chapter also found in the data analyses, that females were more inclined to experience Digital Apprehension than

males, as seen by 39% of female participants reporting Digital Apprehension compared to 25% of males. Following the analyses of the data, the initial questionnaire then went through the process of examination of the DAQ[10], the exploratory factor analysis of the transition measure, and the problem-solving measure, and created the PSq and the ETq. These together with the refined DAq, formed the DAPSET, ready to investigate the prevalence of Digital Apprehension among the wider university population in phase 3.

[10] The difference should be noted between the survey instruments' acronyms. Specifically, to differentiate between the initial and the final instruments created, the initial phase surveys all have upper case 'Q' whereas the final phase surveys have a lower case 'q', for example, DAQ and DAq; PSQ and PSq, ETQ and ETq.

CHAPTER 7: DAPSET (Phase 3)

Introduction

This chapter examined the data from the final phase (Phase 3). This was achieved by examination and reporting of the data collected in the final online questionnaire. This chapter describes and reports on the method, results, and discussion of the data analyses performed. Specifically, the relationships between key variables, the analysis of the final Digital Apprehension questionnaire. Relationships and differences were examined between *Times 1* and *2* data of the DAPSET psychometric instrument. The final questionnaire surveyed participants, university wide, as opposed to only first year university students recruited in the first two phases, in accordance with the project's aim and objectives.

Method: Phase 3

Objective

The objective of the Phase 3 was the administration of the final questionnaire to USQ students, to assess the prevalence of Digital Apprehension, and confirm the reliability of the new measure. This was accomplished by a composite instrument made up of the three measures, previously constructed in the first two phases. These three measures were: The 9-item Digital Apprehension questionnaire (DAq), the 12-item problem-solving questionnaire (PSq), and the 27-item expected transition questionnaire (ETq). The PSq was adapted from the PSI-12 (Beccaria & Machin, 2010). The main objective of this phase was to evaluate the effectiveness of the psychometric measure, and explored if Digital Apprehension was a unique first year phenomenon or university wide. Specifically, this was accomplished by surveying respondents across the whole of the university, and not just first year students. This involved confirming the relationships between the constructs, cross-validation of the new Digital Apprehension measure from *Time 1* to *Time 2*, and examining differences.

Participants

A convenience sample of 1407 (out of 10,050) students 18 years and older, from across the range of faculties at USQ (Toowoomba, Springfield, Ipswich, and Fraser Coast) participated, giving an approximate 14% response rate. The sample comprised of a representative of off-campus/distance/online, and on-campus students who were approached and asked to participate in the survey. An incentive to participate was offered through course credit (1% where the course allowed) or entry into a raffle, a prepaid visa card (supplied by USQ) of $100. Participation was voluntary and students could withdraw at any stage without penalty. The same coding system was used as for the first two phases (mother's maiden name) to enable re-contact for any reason.

The majority of participants were female (73%), Australian (98%) and had English as their first language (92%). Participants were aged between 18 - 79 years (M = 32.22, SD = 10.92). Participants were from all the USQ campuses including: Toowoomba (72%), Springfield (17%), Ipswich (7%), and Fraser Coast (4%), with no missing values. Participants ranged from seven schools, including, 23% from Education (n = 325), 20% from Health (n = 285), 16% from Business (n = 228), 16% Science (n = 224), from Engineering 10% (n = 145), 9% from Arts (n = 124), and 6% from Law (n = 76). There were two modes of study, on-campus (33%%), and off-campus/distance/online (67%), of which 55% were full-time students. The majority of participants had been out of school more than five years (97%) and were employed (69%). Those participants who were employed varied in their work hours in that 33% worked more than 30 hours per week, 21% worked between 15 to 30 hours per week, 11% worked 6 to 14 hours per week, and 4% worked less than 6 hours per week. The majority of respondents were undergraduates (79%), with 18% being postgraduate, and 2% being tertiary preparation students, with one participant not stating their status. Of the undergraduate participants, 596 (42%) were in their 1st year, 24 % were in their 2nd year, 16% were in their 3rd year of study.

Additional analyses were performed on those participants who answered the questionnaire for *Time 1* and *2* (the initial and final phase). There were 224 participants from across the range of schools: Science 30%; Health & Art, both 15%; Education 14%, Business 10%, Engineering 9%, and Law 7%. Of these participants, 84% were female (n = 187), Australian (99%), and had English as their first language (97%). Participants were aged between 18 and 61 years (M = 30.46, SD = 10.00), 67% were employed, 62% were off-campus, online or distance, with 60% being full-time students and 93% of participants had been out of high school more than five years.

Measures

Digital Apprehension questionnaire.

To assess Digital Apprehension in this phase, the Digital Apprehension Questionnaire (DAq) was used. The DAq consisted of a 9-item psychometric instrument created during the first two phases of this research. The measure consisted of one question that had a one-word answer (Q1), two questions measured on a scale of one to ten (Q3 & Q5), four open-ended questions (Q2, Q4, Q6, Q7), one yes/no question (Q8), one multiple choice (N/A, before orientation, during orientation, after orientation, and other) question asking the best time to hold workshops (Q9). The scaling questions were on a scale between 1 and 10, with Question 3 having scores ranging from 1 – 10 with higher scores indicated a higher level of

Digital Apprehension, and lower scores indicated less Digital Apprehension. Question 5 also had scores ranging from 1 - 10, with higher scores indicating a lower level of technological understanding, and lower scores indicating a higher level of technological understanding. As this is a new measure, reliability is still in the early stages of assessment and validation. For all of this current research however, reliability for the DAq incorporated the method of triangulation (Carter et al., 2014) as mentioned previously. That is to say, the reliability included the scoring of the two scaling questions of the DAq, which was further supported and enabled understanding by the respondents' answers to the open-ended questions. As this was a new measure, the only previous internal consistency results were for the initial phase (N = 766), and this was found to be good ($\alpha = .83$). For this research, while the strictness of Cronbach's alpha designates below or equal to 0.8 as good, the internal reliability for both studies was comparable, and for Phase 3 it was acceptable, $\alpha = .79$. It should be noted that the internal reliability judgements were measured as follows: '*Excellent*' is ≥ 0.9, but < 0.95; '*good*' is ≥ 0.8 to 0.89; '*acceptable*' is ≥ 0.7 to 0.79; '*poor*' is ≥ 0.5 to 0.69; and '*unacceptable*' is < 0.5 using Cohen's (1951) conventions.

Problem-solving appraisal.

To assess problem-solving appraisal in this phase of the research, the problem-solving questionnaire (PSQ) was used. This 12-item questionnaire was a self-report, 6-point Likert scale ranging from 1 (*strongly agree*) to 6 (*strongly disagree*), and was adapted from Beccaria and Machin's PSI-12 (2010). However, due to the reported instability of the overwhelmed problem-solving subscale, an exploratory factor analysis was performed. This resulted in three subscales of problem-solving (PS). The first subscale, emotive problem-solving (EPS), consisted of six negatively worded items. This measured participants' appraisal of the emotional capability of dealing with problems as they arose. An example question is, "*There are times when I become so emotionally charged that I can no longer see alternatives for solving a particular problem*". Scores can range from 6 - 36 with lower scores indicating a perceived strength in the emotional handling of problems as they arose. The second subscale, confident problem-solving (CPS), consisted of three positively worded items. This measured perceived confidence in their ability to solve problems as they arose. An example question is, "*When faced with a novel situation, I have confidence that I can handle problems that may arise*". Scores can range between 3 - 18 with lower scores indicating a perceived strength in confidence of dealing with problems as they arose. The third subscale, analytic problem-solving (APS) consisted of three positively worded items. This measured participants' ability to analyse feelings and ideas as problems arose. An

example question is, "*When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation*". Scores can range from 3 - 18 with lower scores indicating a perceived strength in the ability to analyse problems when they arose.

With regard to the reliability of the PSQ, there were some areas of concern, as one of the subscales had poor internal consistency. This concern was in regard to the internal reliability of the problem-solving subscales. Two of the subscales had acceptable levels of internal consistency EPS $\alpha = .77$, CPS $\alpha = .75$, however the APS subscale had a poor internal reliability score of $\alpha = .50$. While EPS and APS were acceptable, the subscale of APS was poor. However, as there were only three items, this was taken into consideration and, therefore, it was still considered as acceptable for two reasons. First, by way of the mean inter-item correlation, which was .3, which is within the acceptable range between .2 and .4, and second, the internal consistency for the PSQ as a whole was acceptable at $\alpha = .75$. . When PSQ was combined with the other measures, the composite measure showed good internal consistency ($\alpha = .85$).

Expected transition

To assess expected student transition in this current phase of the research, the expected transition scale (ETQ) was used. The ETQ was based initially on Lizzio and Wilson's (2006) Student Transition Scale (STS), which comprised of a 73-item self-report scale, and consisted of five subscales (or five 'senses' of success). For succinctness, Lehane's STS-Rev (2012) was used in the first phase, the initial. This measure consisted of 30 items. The data from the initial phase was then examined (with the PSI-12) using an exploratory factor analysis (EFA). The results revealed four factors which were then named insightful, relational, resourceful, and capable transition respectively, and uses a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

The insightful subscale consisted of eight items and measured participants' ability to show insight with regard to the critical thinking, understanding of courses, structure, motivations, future possibilities, and motivations of chosen pathways. An example question was "*See critical thinking as important*", and scores could range from 8 to 40 with higher scores indicating a strength in insightful transition. The relational subscale consisted of seven items and measured participants' ability to interact on a relational level, make personal connections, give and receive support, and develop effective relationships. An example question was, "*Develop effective working relationships with fellow students (e.g., car-pooling, study groups)*". Scores could range from 7 to 35 with higher scores indicating a strength in relational transition. Resourceful transition comprised of six items and measured

participants' ability to have knowledge about raising concerns, asking for assistance, key procedures, support services and staff. An example question was, "*Know who to ask for assistance with any concerns or issues I have about my studies*". Scores could range from 6 to 30 with higher scores indicating a strength in resourceful transition. Capable transition comprised of six items and measured participants' ability to be proficient in taking charge of academic development, assess skills and capabilities, and understand the effort needed for success. An example question was "*Manage my own learning better because I will have opportunities to realistically assess my skills and capabilities*". Scores could possibly range from 6 to 30 with higher scores indicating a strength in capable transition.

The reliability of the previous STS (Lizzio & Wilson, 2006), and the STS-Rev (Lehane, 2013) have been shown to be good to excellent ranging from .80 to .93 (Chester et al., 2013; Sharrock, 2011; Smith & Burton, 2013), and for this phase of the current research were excellent at $\alpha = .93$.

Procedure

Participants from Phase 1 and Phase 2 were again recruited. Students were recruited to participate in Phase 3, the final phase, by the same three methods as for Phase 2. An alert was placed on the students' home page (UConnect) and, once they logged in, an announcement described the research, asked for participants, and gave information about the incentive and requirements; students were also sent an email by the Deputy Vice-Chancellor (Students & Communities) and asked to participate in the initial survey (see Appendix C.6); and students who had previously participated in the focus groups and individual interviews (Phase 1) were also approached via email, to determine their continued availability and interest in the project.

With regard to the composite measure, the refinement and further development of the Digital Apprehension, Problem-Solving, Expected Transition (DAPSET) psychometric instrument was completed in the second phase. Data from Phases 1 and 2 were used to create the Digital Apprehension Questionnaire (DAq) which included the development of a series of nine questions to capture Digital Apprehension (*Time 2*). The survey was administered online (see Appendix C.5) and/or by pen and paper if requested. Once the data had been collated and screened, preliminary testing of the data, reliability and factor structure analyses were carried out using confirmatory factor analysis (CFA), specifically with the intent to test the construct structure. To establish a logical order of sequence of the three-part questionnaire, the following results included in the analyses were reported in the following order, screening, reliability, correlations (Digital Apprehension, problem-solving, & expected

transition), and examination and DAPSET. Specifically, with the DAPSET, the open-ended (qualitative) questions were subject to qualitative analyses through NVIVO software, to allow for interpretation of data. Prior coding of participants' information enabled further quantitative analyses to examine *Time 1* to *Time 2* score differences.

Screening of the Data

After downloading the data from the site, the data was inspected and screened. A frequency analysis of surnames, email address and student number was performed to check for duplicates. With regard to email addresses, where data was missing, it was attained from participants' student number, as students' email is studentnumber@umail.usq.edu.au, and all duplicates were removed with the first entry retained, and all subsequent entries were deleted. There were two missing, four question marks, five invalid email addresses, seven unknowns, and four unsure, as well as 125 with incorrect format of the email name. The correct email addresses were found and entered into the participants' demographic survey data using lower case sentence. Any upper-case data (except proper nouns) were also changed to lower case. Frequencies for other variables were checked using Student Number as the identifying variable, and any duplicates found were deleted, retaining the first instance. Those respondents who were under the age of 18 years were deleted, as the survey had ethics clearance for participants 18 years or older.

All spelling mistakes were corrected, and uniformity of the data were created for easier analyses. Some examples included: "*fraser coast*" and "*Fraser-Coast*" it was all corrected to "Fraser Coast"; "*alot*" and "*lots*", to "lots"; "*Confusing!!*", "*confusing*" or "*confusion*", was changed to "confusing"; "*OK*", "*okay*", and "*ok*", were changed to "ok". Also, where the survey asked the question "*At what stage are you at in your university course*", for simplicity of analyses, and to keep the data uniform, it was expected that an undergraduate degree was for three years, with honours being the fourth year of study and postgraduate the fifth and sixth year of study (unless otherwise stated), and all answers were corrected to just one number, for example "*Year 1 of 3*", was corrected to 1. Some examples are: "*1/3; first semester of year two*"; "*3 out of 4*"; "*final year*"; "*final semester*". With the examples of final year or semester, it was corrected to either 3, 4, or 6, depending on whether the participant had stated their status as undergraduate (3), honours (4), or postgraduate (6). If a respondent put first year - undergraduate, it was coded as 1, if a respondent put first year - postgraduate, it was coded as a 5, as it was expected that the respondent had completed at least three years at a university, and allowing for the four-year degrees available. In the case where respondents noted they were doctorate, final year, the number 8 was inserted. This was to

account for respondents who may have completed Masters (2 years) as well as those who may not have completed Masters, but still completed at least four years of study. This also enabled differentiation between first year respondents and the those who had not attended university previously. Similarly, for ease of analyses, where data exceeded the numerical answer asked for in Question 3 of the DAq - "*What would you rate the level of difficulty you faced at the time, where 1 equals 'it was pretty easy' and 10 equals 'I thought I'd never get it sorted out'*" any answer given by respondents that was greater than 10, was put to 10, for example, "*20!!*" was changed to 10.

The remaining data was then further screened and there were no missing data that would negatively affect the outcomes. Any missing data that was not relevant was either left out of the analysis (pairwise) or, if appropriate, the average was substituted. The sample size met the basic rules of thumb as there were a total number of 1407 participants, with 51 variables, meeting the minimum ratio of 5 participants to every variable (Gorsuch, 1983; Barrett & Kline, 1981). Power was not assessed due to the large sample size (Stevens, 1996). Further preparation of the data included the reverse coding of the OPS and IHPS subscales of the PSI-12, and calculating and creating subscale total variables, as well as scale totals, and the data were entered. The data was then de-identified with the exception of student number. The dataset of 1407 participants was now considered ready for assessment.

Results: Phase 3

Reliability Analyses

Internal reliability analysis for the current phase of the research, the final survey (N = 1407), was performed using SPSS (v22), resulting in acceptable to excellent internal consistency (Cohen, 1992), as shown in Table 7.1. The scale totals were as follows: DA α = .79, PSQ α = .75, and ETQ α = .93. The total DAPSET internal reliability was good with α = .85.

Table 7.1
Summary Statistics and Cronbach's alpha of key variables.

Scale	M	SD	α
PSQ			
EPS	19.50	5.97	.77
APS	9.09	2.81	.50
CPS	6.44	2.41	.75
ETQ			
CapT	23.20	4.10	.83
ResT	22.82	4.58	.91
RelT	23.69	6.04	.92
InsT	34.39	4.66	.90

Note. PSQ = problem-solving questionnaire; EPS = emotive problem-solving; APS = analytic problem-solving; CPS = confident problem-solving; ETQ = expected transition questionnaire; CapT = capable transition; ResT = resourceful transition; RelT= relational transition; and InsT = insightful transition.

Frequencies Analyses

Frequency analyses were performed on Time 2 (*T2*) data, followed by those participants who completed both *T1* (n = 112) and *T2* (n = 112) surveys. The level of difficulty scores indicated that as the scores increased so the perceived level of difficulty increased, with 5 or above rated as Digital Apprehension. The results for *T2* were as follows: The frequency analysis for level of difficulty scores revealed that 40% of participants (n = 1407) rated 5 or more (M = 3.94, SD = 2.60) on the level of difficulty scores. At least 35% of males (n = 384) rated a score of 5 or above (M = 3.71, SD =2.45), and at least 42% of females (n =1023) rated 5 or more (M = 4.03, SD = 2.65) on the level of difficulty scores.

Furthermore, a frequency analysis for participants who completed both *T1* and *T2* surveys (n = 224) revealed that 33% of participants' scores were 5 or greater (M = 3.61, SD = 2.34) for *T1*, and 37% of participants' scores were 5 or greater (M = 3.77, SD = 2.44) for *T2*. The results also revealed that for *T1*, 11% of males (n = 18) rated the level of difficulty at 5 or above (M = 2.56, SD = 2.15), and that at least 37% of females (n = 94) rated the level of difficulty at 5 or above (M = 3.81, SD = 2.33). Results for *T2* revealed that at least 37% of males (n = 19) had scores of at least 5 or more (M = 3.74, SD = 2.40), and 37% of females (n = 93) had scores of 5 or more (M = 3.77, SD = 2.46) on the level of difficulty.

Correlational Analyses

Pearson's product-moment correlations, at the alpha level of .05, were performed on the DAPSET survey (N = 1407) on key variables. Included in the analyses were age in years (M

= 32.22, *SD* = 10.92), level of difficulty, (*M* = 3.94, *SD* = 2.60); level of understanding (*M* = 3.73, *SD* = 2.38), emotive problem-solving, analytical problem-solving, confident problem-solving, capable transition, resourceful transition, relational transition, and insightful transition scores. These correlations will be reported in the following order, Digital Apprehension, problem-solving, and expected transition. As shown in Table 7.2, a Pearson's product-moment correlation revealed several significant results between level of difficulty and level of understanding scores, and key variables. Males (*n* = 384) aged between 18 - 75 years (*M* = 33.03, *SD* = 11.58) and females (*n* = 1023) aged between 18 - 79 years (*M* = 31.91, *SD* = 10.66) separate correlational scores were also examined.

Table 7.2
Correlation Matrix Between Digital Apprehension and Key Variables

Scale	LOD			LOU		
	M	F	MF	M	F	MF
LOD	1	1	1	.53**	.70	.67**
EPS	.13**	.18**	.17**	.13**	.18**	.17**
APS	*ns*	*ns*	*ns*	*ns*	.07*	.06*
CPS	.19**	.19**	.20**	.18**	.24**	-.23**
CapT	*ns*	-.11**	-.08**	*ns*	-.11**	-.07**
ResT	-.14**	-.26**	-.23**	*ns*	-.26**	-.21**
RelT	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
InsT	*ns*	-.11**	-.10**	*ns*	-.11**	-.10**
Age	*ns*	.23**	.18**	-.11*	.21**	.18**

Note. LOD = level of difficulty; LOU = level of understanding; EPS = emotive problem-solving; APS = analytic problem-solving; CPS = confident problem-solving; CapT = capable transition; ResT = resourceful transition; RelT= relational transition; and InsT = insightful transition; Age = age in years; M = male; F = female; MF = both male and female.
* denotes significance at the .05 level
** denotes significance at the .01 level

Digital Apprehension.

***Level of difficulty*.** There was a large positive significant correlation found between level of difficulty and level of understanding scores ($r = .67$, $p < .001$). That is to say as level of difficulty scores increased, so did the scores for the level of understanding. It should be noted that with level of difficulty scores, the higher the score, the higher the level of difficulty with technology experienced. However, when level of understanding scores increase, this shows a lack of understanding. There were small significant positive correlations found between level of difficulty scores and confident transition ($r = .20$, $p < .001$), age in years ($r =$

.18, $p < .001$), and emotive problem-solving ($r = .17$, $p < .001$) scores. That is to say, as level of difficulty scores increased, so did the scores for confident transition, emotive problem-solving, and age in years. Also, small negative correlations were found between level of difficulty and resourceful transition ($r = -.23$, $p < .001$), insightful transition ($r = -.10$, $p < .001$), and capable transition ($r = -.08$, $p = .003$).

Males: The correlations were comparable for the male cohort as with the overall cohort, with some differences. There were no significant correlations found in the male cohort, between level of difficulty scores and relational, insightful, or age in years. Also, the level of difficulty and resourcefulness scores, found a much smaller significant result ($r = -.14$, $p = 005$) for males than for females.

Females: Similarly, for females the correlations were comparable with the overall cohort, with one difference to the male cohort. There was a small significant positive correlation between level of difficulty scores and age in years' scores ($r = .23$, $p < .001$). That is, as age in years increased, so the scores for level of difficulty increased.

***Level of understanding*.** It should be noted that with level of understanding, when scores are high (or increased), this shows a lack of understanding. There were several small significant positive correlations found between level of understanding and confident problem-solving ($r = .23$, $p < .001$), age in years ($r = .18$, $p < .001$), emotive problem-solving ($r = .17$, $p < .001$), and analytical problem-solving ($r = .06$, $p = .021$). That is to say, as the level of understanding scores increased, so did the scores for confident, emotive, and analytical problem-solving. There were also several small negative correlations found between level of understanding and resourceful transition ($r = -.23$, $p < .001$), insightful transition ($r = -.10$, $p < .001$), and capable transition ($r = -.07$, $p = .012$). That is to say, as the scores on level of understanding increased, the scores for resourceful, insightful, and capable transition decreased.

Males: Compared with females - there were only four significant correlations found on the level of understanding for males. The correlations were comparable to the overall scores, and included significant positive correlations between level of understanding and level of difficulty, emotive transition, confident transition and age in years.

Females: A small significant positive correlation was found between level of understanding scores and confident problem-solving ($r = .24$, $p < .001$), age in years ($r = .21$, $p < .001$), emotive problem-solving ($r = .18$, $p < .001$), and analytic problem-solving ($r = .08$, $p = .019$) scores. Also, small negative correlations were discovered between level of

understanding and resourceful (r = -.26, p < .001), capable (r = -.11, p < .001), and insightful transition (r = -.11, p < .001).

Problem-solving.

Pearson's product-moment correlations, at the alpha level of .05, were performed between emotive, analytical, and confident problem-solving scores and key variables. Included in the analyses were age in years, capable transition, resourceful transition, relational transition, and insightful transition. As shown in Table 7.3, the Pearson's product-moment correlation revealed several significant results between problem-solving and these key variables. Male and female scores were also examined. It should be noted for all the problem-solving subscales (emotive, analytic, and confident) scores, low scores indicated a strength. That is to say, if scores increased, this would be seen as a lack or a weakness in the particular subscale. Specifically, if a high score was found in confident problem-solving, this indicated a lack of confidence when faced with problems.

Table 7.3.

Correlation Matrix Between Problem-Solving and Key Variables (including male and female)

Scale	EPS			APS			CPS		
	M	F	MF	M	F	MF	M	F	MF
EPS	1	1	1						
APS	*ns*	.07*	.07**	1	1	1			
CPS	.38**	.36**	.37**	-.30**	.26**	.26**	1	1	1
CapT	-.15**	-.26**	.22**	*ns*	*ns*	-.06*	-.10*	-.15**	-.12**
ResT	-.17**	-.29**	-.26**	*ns*	-.07*	-.07**	*ns*	-.17**	-.14**
RelT	*ns*	-.08**	-.06**	-.17**	-.11**	-.13**	*ns*	*ns*	*ns*
InsT	-.17**	-.21**	-.19**	*ns*	-.12**	-.10**	-.16**	-.20**	-.18**
Age	-.18**	-.21	-.21**	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*

Note. EPS = emotive problem-solving; APS = analytic problem-solving; CPS = confident problem-solving; CapT = capable transition; ResT = resourceful transition; RelT= relational transition; and InsT = insightful transition; Age = age in years; M = male; F = female; and MF = both male and female.
* denotes significance at the .05 level
** denotes significance at the .01 level

Emotive problem-solving. A medium significant positive correlation was found between emotive and confident problem-solving scores (r =.37, p < .001), which indicated that as emotive scores increased, so did confident scores. Also, a small positive correlation was found between emotive and analytic problem-solving scores (r = .07, p = .008), which indicated that as emotive scores increased, so did analytic scores. Several small significant

negative correlations were revealed between emotive scores and resourceful (r = -.26, p < .001), capable (r = -.22, p < .001), age in years (r = -.21, p < .001), insightful (r = -.19, p < .001), and relational (r = -.06, p = .025). That is to say, as the scores for emotive problem-solving increased, the scores for resourceful, capable, insightful, relational transition, and age in years decreased.

Males: The correlations were comparable to the full cohort, with a couple of exceptions. There was no correlation between emotive and analytical problem-solving or relational transition; and capable had a smaller significance with r = -.15 (p = .004).

Females: Most of the scores were comparable with the full cohort of combined males and females. There was a medium significant positive correlation between emotive and confident problem-solving (r = .36, p < .001); a small positive correlation between emotive and analytical (r = .07, p = .017). Small negative correlations between emotive and resourceful (r = -.29, p < .001), capable (r = -.26, p < .001), age in years (r = -.21, p < .001), insightful transition (r = -.21, p < .001), and relational transition (r = -.08, p = .009) occurred. That is to say, as scores increased with emotive, scores also increased with confident problem-solving scores, and decreased with age in years, resourceful, capable, and insightful transition. An interesting result is despite non-significant results separately, on both male and female cohorts, between analytical problem-solving and capable transition, when the group is combined, there is a small significant negative correlation.

Analytical problem-solving. A small positive significant correlation was found between analytical and confident problem-solving (r = .26, p < .001), which indicated as scores on analytical increased, scores on confident increased. Small significant negative correlations were found between analytic and resourceful (r = -.07, p = .025), relational (r = -.12, p < .001), and insightful (r = -.12, p < .001). This indicated that as scores on the analytical problem-solving increased, scores on resourceful, relational, and insightful decreased.

Males: There were only two significant correlations compared to four with females. A significant medium positive correlation between analytical and confident problem-solving (r = .30, p < .001), and a small significant negative correlation between analytical problem-solving and relational transition (r = .17, p = .001).

Females: The scores for females were comparable with the full cohort of combined males and females.

Confident problem-solving. Small significant negative correlations were found between confident problem-soling and insightful (r = -.20, p < .001), resourceful (r = -.17, p

< .001), and capable transition (r = -.15, p < .001), which indicated that as confident problem-solving scored increased, insightful, resourceful and capable also increased. A strength in problem-solving is signified by lower scores, whereas, a strength in transition is represented by higher scores. Therefore, an increase is considered a lack, or weakness.

Males: Two small significant negative correlations were found between the scores of confident problem-solving and insightful (r = -.16, p = .002), and capable transition (r = -.10, p = .048), which were comparable to the total scores.

Females: Scores were also comparable to the full cohort of both males and females. Small significant negative correlations were found between confident problem-solving and insightful (r = -.20, p < .001), resourceful (r = -.17, p < .001), and capable transition (r = -.15, p < .001).

Expected transition.

Pearson's product-moment correlations, at the alpha level of .05, were performed between capable, resourceful, relational, and insightful transition scores and remaining key variables. Included in the analyses were age in years, capable transition, resourceful transition, relational transition, and insightful transition. As shown in Table 7.4, the Pearson's product-moment correlation revealed several significant results between problem-solving and these key variables. Male and female scores were also examined.

Table 7.4.
Correlation Matrix Between Expected Transition and Key Variables (including male and female)

Scale	CapT			ResT			RelT			InsT		
	M	F	MF	M	F	MF	M	F	MF	M	F	MF
CapT	1	1	1									
ResT	.45**	.49**	.48**	1	1	1						
RelT	.31**	.34**	.33**	.30**	.41**	.38**	1	1	1			
InsT	.41**	.48**	.46**	.48**	.49**	.49**	.33**	.43**	.40**	1	1	1
Age	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	-.07	*ns*	*ns*	*ns*	*ns*

Note. CapT = capable transition; ResT = resourceful transition; RelT= relational transition; and InsT = insightful transition; Age = age in years; M = male; F = female; and MF = both male and female.
* denotes significance at the .05 level
** denotes significance at the .01 level

There were medium significant positive correlations found between all the expected transition scores. That is between the scores of capable and resourceful (r = .48, p < .001), insightful (r = .46, p < .001) and relational (r = .33, p < .001); between resourceful and

insightful (r = .49, p < .001) and relational (r = .38, p < .001); and relational and insightful (r = .40, p < .001). Surprisingly, age in years was only correlated with relational transition, with a small significant negative result (r = -.06, p = .025). This was due to the significant correlation in the female participants (r = -.07, p = .023).

Males and females: Significant positive correlations for male participants were revealed between capable and resourceful (r = .45, p < .001), insightful (r = .41, p < .001) and relational (r = .31, p < .001); between resourceful and insightful (r = .48, p < .001) and relational (r = .30, p < .001); and relational and insightful (r = .33, p < .001). Similarly, significant positive correlations for female participants were revealed between capable and resourceful (r = .49, p < .001), insightful (r = .48, p < .001) and relational (r = .34, p < .001); between resourceful and insightful (r = .49, p < .001) and relational (r = .41, p < .001); and relational and insightful (r = .43, p < .001).

Further Analyses

An independent samples *t*-test was conducted to compare the level of difficulty scores for male and female participants. There was a significant difference revealed in scores for males (M = 3.71, SD = 2.45) and females (M = 4.03, SD = 2.65). As the two sample sizes were uneven and the Levene's test for equality was less than .05, the 'equal variances not assumed' data were used, therefore the results were, $t(740) = -2.16$, p = .031 (two-tailed). The mean decrease in level of difficulty scores was .35, with a 95% confidence interval. The eta squared statistic (.08) indicated a moderate effect size.

A one-way between-groups analysis of variance was conducted to explore the impact of age on level of difficulty. Participants were evenly divided (visual binning) into three groups according to their age (Group 1: 18 - 22; Group 2: 23 - 33; and Group 3: 34 - 80). There was a statistically significant difference at the p < .05 level in Digital Apprehension for the three age groups: $F(2, 760) = 12.05$, p < .001. The effects size, calculated using eta squared, was considered small (.03). Post hoc comparisons using the Tukey HSD test indicated that the mean scores for Groups 2 (M = 3.54, SD = 2.47), and 3 (M = 4.47, SD = 2.61) were significantly different. Group 1 (M = 3.52, SD = 2.30) did not differ significantly from either Group 2 or 3.

Binary Logistic Regression

Binary logistic regression is performed in order to assess the goodness of fit of the model, and to ascertain importance of each variable as a predictor variable. The WALD statistic explains the particular variables that are of significant predictive ability to the model.

Binary logistic regressions were performed on the final phase (*T2*), with the following results for Digital Apprehension, problem-solving, and expected transition (*T1*), which are displayed in Table 7.5.

Table 7.5
Simple logistic regression of Digital Apprehension and key variables.

	B	*SE*	*Sig.*	*Exp(B)*	*95% CI (Exp B)*	
					Lower	*Upper*
Age	-.03	.01	.000	.97	.96	0.98
EPS	-.04	.01	.001	.96	0.94	0.98
APS	.05	.02	.027	1.05	1.01	1.10
CPS	-.11	.02	.000	.89	0.85	0.94
CapT	-.01	.02	.669	.99	0.96	1.03
ResT	.11	.02	.000	1.12	1.08	1.16
RelT	-.03	.01	.019	.97	0.95	1.00
InsT	-.01	.02	.781	1.00	0.97	1.03
Gender	-.24	.13	.070	.79	0.60	1.02
Constant	1.03	.67	.059	3.562	-	-

Note. Age = age in years; EPS = emotive problem-solving; APS = analytic problem-solving; CPS = confident problem-solving; CapT = capable transition; ResT = resourceful transition; RelT= relational transition; and InsT = insightful transition; Gender = male and female.

There were 1407 cases included for analysis and there were no missing cases. Encoding was the same as for *T1*, non-apprehensive (NDA) as 0, and apprehensive (DA) as 1. The basic model predicting that all the results would show DA without the problem-solving subscales of emotive (EPS), analytical (APS), and confident (CPS), and the expected transition subscales of capable (CapT), resourceful (ResT), relational (RelT), insightful (InsT), age in years, and gender variables was 60%. Of all the variables computed, age in years, EPS, APS, CPS, ResT, show they would be significant predictors of DA. The full model with all the predictors was statistically significant χ^2 (9) = 157.31, $p < .001$, indicating that the model was able to determine those participants with Digital Apprehension. With the added predictors, the ability to predict Digital Apprehension using these variables increased from 60% to 68%. Significant components of the logistic regression were seen by the Wald statistic, and included: Age ($W = 32$), $p < .001$; EPS ($W = 12$), $p = .001$; APS ($W = 5$), $p = .027$; CPS ($W = 17$), $p < .001$; ResT, ($W = 48$), $p < .001$; and RelT, ($W = 6$), $p = .019$. The logit value is 0 at the point where the prediction changes from NDA to DA, which was computed with $aX + b$. Therefore, the conclusions reached through these computations are that participants who are approximately 33 years of age, score more than 27 on the EPS, score more than 21 on the APS, score more than 9 on the CPS, score less than 9.17 on the ResT, and less than 39.54 on the RelT, are more likely to have Digital Apprehension. This

means that the DAPSET is a good model for the prediction of Digital Apprehension by way of analysing participants scores. For example, participants who are approximately 33 years of age or older are more susceptible to DA; participants who are more inclined to be emotive problem-solvers are more susceptible to DA; participants who are less inclined to be analytical problem-solvers are more susceptible to DA; participants who are less inclined to be confident problem-solvers are more susceptible to DA; those participants who are less inclined to be resourceful during transitional stages are more susceptible to DA; and those participants who are less inclined to be relational problem-solvers are more susceptible to DA.

Discussion: Phase 3

The aim of this final phase of the research was to investigate and report the relationships between key variables, with the objective to administer the final questionnaire to assess the prevalence of Digital Apprehension, and confirm the reliability of the composite psychometric instrument, the DAPSET. The initial phase of this research surveyed first year students only, whereas this third phase surveyed the whole of the university. This was accomplished by the investigation and reporting of the relationships between key variables, by analyses of the data collected in phase three, in accordance with the project's aim and objectives. Overall, 40% of the 1,407 participants who completed the survey (with the total number of students contacted to participate in the survey being 10,050) experienced Digital Apprehension. It was found that males and females differed in the prevalence of Digital Apprehension, with 42% of females, compared to 35% of males experiencing Digital Apprehension. It was also found that as participants continued on in their study, more experienced Digital Apprehension.

Data analysed from the initial survey (Phase 2) and final survey (Phase 3) revealed that out of the respondents who completed both surveys (n = 224), more participants noted they experienced Digital Apprehension the second time (*T2*, final phase), and the further into their courses they were. Specifically, of the same respondents in the initial survey (*T1*), 33% reported they experienced Digital Apprehension, whereas in the second survey, 37% of participants (*T2*) survey (the same participants) experienced Digital Apprehension. That is an increase of 4% in a 9-month period experienced by the same people.

Reliability Discussion

The point of reference regarding internal reliability used in this research is Cronbach's (1951) alpha coefficient where it is considered a reliable statistic to measure the underlying construct. Reliability judgements are the same as before - '*excellent*' is ≥ 0.9, but < 0.95;

'*good*' is ≥ 0.8 to 0.89; '*acceptable*' is ≥ 0.7 to 0.79; '*poor*' is ≥ 0.5 to 0.69; and '*unacceptable*' is < 0.5 using Cohen's (1951) conventions. The DAPSET was found to have acceptable to excellent internal consistency in line with the findings of the previous phases. In the two earlier phases of this research, triangulation was used to establish reliability due to the differing sources of the data and the qualitative questions from the DAq (Carter et al., 2014), thus giving a reliable response for Digital Apprehension, seen with the two quantitative questions. This final stage has also given support for this, and revealed a strong association between participants' perceived difficulty with technology and the understanding of technology, giving rise to Digital Apprehension. Specifically, internal reliability results of the three measures were: Digital Apprehension showed acceptable to good (α = .79); problem-solving appraisal showed acceptable (α = .75); and expected transition indicated excellent internal consistency (α = .93), with the reliability for the total instrument (DA, PS, ET) as a whole was good with an α = .85. There was concern over the reliability of the analytical problem-solving subscale, which was poor (α = .50). All other subscales ranged from α = .75 to .92, revealing good overall internal reliability for the measure to capture Digital Apprehension.

Correlation Discussion

The process of identifying the prevalence of Digital Apprehension among university students includes a need to understand key relationships. To this end, this phase of the research examined the relationships between Digital Apprehension and key variables. Results revealed significant relationships between the problem-solving subscales (emotive, analytic, and confident) and the expected transition subscales (capable, resourceful, relational, and insightful). Significant relationships were also found between the difficulty experienced when dealing with technology and confident problem-solving. That is to say, as participants struggled more with technology their perceived ability to confidently address problems as they arose decreased. Participants also became more emotional when problems arose, and this was experienced more so by older participants (34 - 80 yrs). When difficulty was experienced with technology, participants tended to be less resourceful, less insightful, less capable, and again, this occurred more so with female participants. An interesting discovery is that older female participants were more inclined to be digitally apprehensive.

Supporting people with ways to help understand technology was also found as a way of creating positive paths for those who experience Digital Apprehension (Mikal et al., 2013). This research found that a lack of understanding technology was significantly related to finding technology difficult, and therefore encouraging Digital Apprehension. It was also

discovered that a lack of understanding technology undermined participants' confidence when faced with problems, they became more focussed on emotions, and the ability to analyse the situation was lessened. This was more so with the older participants aged between 34 and 80 years old. The ability to understand technology can have positive and negative effects, which can be far reaching (Powell, 2013). The ability to be resourceful when problems arise, for example, through frustration with not understanding the technology, is not only preferable, but also practical. This research found that when Digital Apprehension is heightened the ability to be resourceful decreases, together with the capacity to critically understand the choices and motivations necessary to make sound decisions throughout higher education. Digital Apprehension did not only negatively affect the relationships between these basic requirements for success during university, but also a significant association was found between those participants who struggled understanding technology and the ability to be proficient in taking charge of their academic development, assess their skills and capabilities, and understand the effort needed for success.

Successful completion of courses in higher education requires knowledge of how to overcome issues, possibly even foresee them before they arise. Many students are faced with problems throughout the higher education journey (Briggs et al., 2012). The ability to be level headed, insightful, and strategic in planning during university is often seen as desirable to succeed. This research found that participants who allowed emotions to influence decisions also struggled with resourcefulness, and the ability to understand key supports and assistance needed when undertaking study. The capacity to not become over-emotional is seen as constructive in success as a student (James et al., 2010). This research also found the results of becoming preoccupied with emotions had a detrimental effect on participants' capacity to be confident as problems arose, as well as the ability to critically analyse the situation.

However, these significant relationships were only present among females of this cohort, not with males. Older participants in this research reported struggling with their emotional ability more than younger participants. An interesting discovery made during this research was that the ability to understand technology was positively affected if participants showed insight regarding the structure of courses and the motivations behind these choices. Furthermore, when problems arose, if participants analysed and considered ideas regarding the situation, this also enhanced the ability to try and understand technology. Furthermore, female participants experiencing Digital Apprehension found the more capable they perceived themselves to be, the less Digital Apprehension was experienced.

As participants struggled with the ability to analyse feelings and ideas as problems arose, participants not only felt a lack of confidence in solving the issues, but also, struggled to interact on a relational level, make personal connections, and develop effective relationships necessary to transition to university. The ability to problem-solve positively is fundamental for a successful transition to any situation, and specifically university (Smith & Burton, 2013). This research discovered that if female participants struggled with the ability to analyse problems as they arose, they were particularly susceptible to struggling with finding support and assistance with any issues that arose. However, this was not the case for male participants. Feeling confident about the ability to successfully engage when problems arise is another positive factor when undertaking university studies (Lizzio & Wilson, 2013). There were strong associations detected in this research between confidence and insightfulness and capability, for all participants. Namely, participants who struggled with feeling confident about decisions they made when faced with problems, also struggled with insight into motivational decisions to do with their courses, and their perceived capability to perform. While this was the case for all participants, females also struggled with the ability to show resourcefulness in regard to their studies when their confidence was negatively affected, whereas males did not.

Additional Discussion.

The predictor ability of Digital Apprehension was again analysed with binary logistic regression. Analysis of the DAPSET revealed that the predictor ability of the DAq was enhanced by the addition of the PSq and the ETq. There was an increase from 60% (only DAq) to 68% using the full composite. Results revealed that significant predictors of Digital Apprehension included resourceful and relational transition, all the subscales of the PSq, and participants' age. The same formula used in the initial phase ($0 = aX = b$) to compute the cut-off points for the significant predictors was used with the following results. For the transition subscales of resourceful and relational, higher scores represented a strength, therefore if participants scored less than 39 on the relational, or less than 9 on the resourceful transition Digital Apprehension was more likely to be present. Conversely, with the PSq subscales lower scores represented a strength, therefore if participants scored more than 27 on the EPS, more than 21 on the APS, more than 9 on the CPS, Digital Apprehension was more likely to be present. Finally, participants who were approximately 33 years of age were more susceptible to Digital Apprehension.

Chapter Summary

This chapter presented the DAPSET instrument which indicated good reliability to measure what it proposed to measure, Digital Apprehension. This was supported by the analyses involving the predictors of Digital Apprehension, which showed the DAq was enhanced by the addition of the PSq and the ETq. Significant predictors of Digital Apprehension were calculated and results indicated that the PSq, resourceful and relational transition scores, and age, were all significant predictors of Digital Apprehension. This chapter also revealed overall 40% of participants (N = 1407) reported Digital Apprehension, an increase of 4% from the initial phase performed nine months previously. This chapter also revealed that more females experienced Digital Apprehension than males, with 42% females, compared to 35% males. An interesting but not surprising discovery, included the finding that females reported an importance with interpersonal relationships to support any female participants experiencing Digital Apprehension. However, a surprising result when relationships and differences were examined between *T1* and *T2* of the data (n = 224), included the finding that Digital Apprehension became more prevalent as participants continued in their study.

Up to now, this research examined the presence and prevalence of the concept of Digital Apprehension using the newly created psychometric instrument, the DAPSET, within first year students for the first and second phases, then explored the whole of university, in this current third phase. This brings the research to the final part of the project, the general discussion of the research as a whole, the similarities and differences between the phases, the significance these have, including limitations and future directions.

CHAPTER 8 - Overall Discussion, Significance, and Conclusions

Overall Discussion

The aim of this research was to understand the barriers experienced by university students in relation to use of technology for their studies. This thesis has explored the self-reported reactions to technology and digital supports by examining the relationships between the attitudes and behavioural intentions of first year (followed by whole of university) students at a regional Australian university. This research also proposed a way to measure this by creating a diagnostic psychometric instrument to identify the presence and prevalence of the new concept, Digital Apprehension, as well as self-reported problem-solving appraisal and expected transition. The measurement of these combined constructs would enable targeted intervention at a crucial time from the University (or any institution or business that uses technology).

A basis for Digital Apprehension

In human-computer interaction there is considerable scope for problems to occur due to faulty or inappropriate tasking of technology, inability of the user, and psychological barriers, to name a few. It is particularly important for students in higher education to be able to use digital technology effectively for their studies. The existing constructs alone do not help to develop the interventions that are needed. Therefore, the DAPSET was constructed as a way of measuring what needs to be measured concerning higher education students using computers in contemporary higher education.

Due to the inadequate explanation of students' negative behaviour towards technology in universities, the concept was developed by drawing upon relevant existing constructs to provide a conceptual basis for an instrument. Therefore, focus group questions were formed, seeking students' evaluations of their thoughts and reactions to technology during their first year. The focus group questions consisted of 14 items asking participants to make various observations in their experience with technology, their courses, problems encountered, and their expectations. Throughout the analyses, it was noted that participants experienced Digital Apprehension from a range of different theoretical perspectives. The concept engaged on four main levels: Confidence (self-efficacy, perceived behavioural control, confidence in ability to use the technology); language (aspect of competence and of self-efficacy); compliance (attitudes); and knowledge of technology (competence). These levels are seen in the TPB and the development of the DAPSET is influence by this perspective. The final DAPSET thus has a conceptual basis to a number of theories as well as grounded in students' own perceptions and understanding.

Developing a tool for measuring Digital Apprehension

Following the formation of the concept, and analyses of the data, came the development of the Digital Apprehension questionnaire. There were three stages involved in the construction of the DAPSET measure. Initially, first year students were consulted, discussing their ideas, their fears, and their strategies in regard to technology and university. Specifically, the semi-structured focus groups (online and face-to-face), one-on-one interviews (face-to-face), and written answers (emails), produced valuable data which were examined and developed into a contemporary measure capturing respondents' perceptions, which then became the initial survey that included the DAQ[11]. According to Stevens (2002) when the sample size is larger than 100, power is not an issue. That is to say that due to the rich data collected with over 1400 participants, this has sufficient power to have confidence in the validity of the instrument. However, there are potential challenges to the generalisability and replicability of the research, which will be discussed further in the Limitations section.

The DAPSET represents a significant development. There has already been diverse interest, for example, universities - in the form of results and reports generated from this research; a Technology Program Delivery Manager from an international mining company; and a request for the completed DAPSET from a regional library teaching ICT to the public. The reason for this is that universities and businesses alike recognise that they are lacking the tools required to identify students who are struggling due to their relationship with technology in such a way that they can then intervene to support. The DAPSET claims to provide such a tool, although it lies outside the scope of this research to test the ability to intervene. This would be a beneficial foundation for future work.

Limitations and Future Directions

Limitations of this research included the representativeness of the sample, as there were considerably more females than males who completed the surveys, which may not give an overall gender perspective from the general population of university courses. There are more females enrolled in Australian universities than males, with 52% being female (ABS) and for all three phases of this research there was at least 70% females (*Phase 1* - 70%; *Phase 2* - 78%; and *Phase 3* 73%). Any self-report survey has limitations in the accuracy and truthfulness of respondents' answers, however, answers were thoroughly checked for

[11] *Note.* DAQ is the initial questionnaire (12 questions), and the DAq is the final refined questionnaire (9 questions).

seemingly nonsensical or fabricated answers. Considering the limitation of self-report surveys the focus group and interview questions themselves may have limitations. For example, engaging the participants with some questions may have been challenging and may not have produced discussion due to participants' reluctance to answer. Also, one person answering a question may influence another participant's answer in a group discussion. As the initial Focus Group and Interview questions were the starting point for the next two phases a limitation may be the wording of some of the questions. Furthermore, males may have self-report bias as they may have not wanted to appear socially inept, or may not report their discomfort or difficulty (Chrisler & McCreary, 2010). Additionally, respondents for the second survey may have been more keenly aware of the survey questions if they had previously completed the survey and this may have led to bias. A possible limitation may also have been the reliance on a single University (albeit with three campuses) as opposed to many universities and/or businesses, used in the research, where contextual factors may have influenced the results. The latter due to the constant shifts in technology that may influence results. Another limitation may have been the 'newness' of the concept and measure which limits validity, however, further research may involve validation studies and ways in which this research can be taken to the next level. Future research may also involve taking this research into the business sector, and investigating the effect the survey instrument may have.

This research has revealed limitations and unexpected results which become fuel for future research. Digital Apprehension can have many applications wherever technology is used. This means the DAPSET can be implemented in areas such as the business sector and therefore opens a field for research toward the investigation of the effect in that sector; a surprising factor revealed that at least 33% of participants experienced Digital Apprehension in their first year, and that figure increased to 37% in subsequent years. It was anticipated that as participants became more familiar with the technology at university, participants would be more at ease and less apprehensive. Future studies may investigate the accountability factor, whether there are any confounding variables that have not shown in this research, such as the further into a course the more complex, and therefore more difficulty may be experienced. The limitation concerning the reliability of the analytical problem-solving subscale, which was poor ($\alpha = .50$) also opens an area for further investigation. Furthermore, the recognition of the diversity and maturity of current university students reveals that Digital Apprehension may be something that needs to be further investigated.

Prediction of Digital Apprehension using the following formula creates potential for further investigation. The variable scores were considered with a scientific calculation that

uses a value assigned to the point where the prediction changes from non-apprehensive to apprehensive. This value is set at 0, that is zero apprehension. Zero is then used as a baseline to compute the formula ($0 = aX + b$) to discover the cut-off point with significant variables.

Implications of Digital Apprehension

To know who is affected and how widespread something as negating as Digital Apprehension is should be seen as invaluable to enable effective support. From this research, we do know that overall the DAPSET instrument revealed 40% of participants ($N = 1407$) reported Digital Apprehension, which is consistent (an increase of 4%) with the initial phase performed nine months previously. Several differences should be noted between the two studies. First, the number of participants was almost doubled in the final phase, and second, the final phase also included the whole of university, not just first year participants.

Analyses revealed that more females experience Digital Apprehension than males, with 42% females, compared with 35% males, and older participants (34 - 80 yrs) experienced Digital Apprehension more than younger respondents (less than 34 yrs), however, this was more prevalent in older females than older males. An interesting but not surprising discovery included the finding that females reported a significant connection with interpersonal relationships and Digital Apprehension. If help or support was offered on the interpersonal level to females experiencing Digital Apprehension, it may be seen as a way to have positive effects on Digital Apprehension.

Communication and confidence are seen as important aspects of being successful in dealing with apprehension (Blume, Baldwin, & Ryan, 2013; Lizzio & Wilson, 2013). When relationships and differences were examined between *T1* and *T2*, it was surprising to find that Digital Apprehension became more prevalent as participants continued in study. At least 33% of participants experienced Digital Apprehension in their first year, and that figure increased to 37% in subsequent years. This was surprising to discover, as it was anticipated that as participants became accustomed to using the technology at university, it would become less difficult. However, this may be accounted for in that as courses unfold they become more complex, and therefore more difficulty may be experienced. Participants who experienced Digital Apprehension also struggled with feeling confident during problem times, and became more emotional in this situation, which was especially noticeable for older participants. When Digital Apprehension is experienced with technology, participants tended to be less resourceful, less insightful, less capable, and this was more evident with female respondents. Likewise, older female respondents were more inclined to be digitally apprehensive.

The understanding of technology is also seen as a way of creating positive paths for those who experience Digital Apprehension. This research found that a lack of understanding technology was significantly related to finding technology difficult and encouraged Digital Apprehension. It was discovered that a lack of understanding technology undermined participants' confidence when faced with problems, they became more emotional, and the ability to analyse the situation was lessened. Again, this became more definite with older participants. Digital Apprehension seemed to be experienced more by older participants than their younger counterparts, with older females more inclined to be digitally apprehensive than older males. However, this may be due to the large female sample, and male's tendency to not report weaknesses (Chrisler & McCreary, 2010). A disturbing discovery was that participants' ability to act with effectiveness and competency, to understand the purpose of their chosen path, or the ability to be resourceful, as well as feeling comfortable in the surrounding culture were significantly negatively affected when Digital Apprehension was present or problems arose. On a positive note, older participants were less likely to feel emotional (overwhelmed or impulsive) or disorganised, and displayed strengths in the areas of logical planning and self-management when faced with problems.

Significance and Conclusions

Approximately 40% of students in this research were negatively affected by Digital Apprehension, with females experiencing more Digital Apprehension more than males, and with older respondents experiencing Digital Apprehension more than younger respondents. The significance of this knowledge implies that an ability to predict Digital Apprehension is instrumental to enable support before problems arise, especially in any high stress situation. Having even a small amount of knowledge regarding how students react or respond in a pressure situation is invaluable to enable support at just the right moment. The full model of DAPSET, with all the predictors was statistically significant (χ^2 (9) = 157.31, $p < .001$) indicating that the model was able to determine those participants not only with Digital Apprehension, but also negative problem-solving appraisal, and negative transition expectations. Specifically, significant predictors included resourceful and relational transition, all the subscales of the PSQ, and participants' age. It should be noted with the expected transition subscales of resourceful and relational, higher scores represented a strength, therefore if participants scored less than 39 on the relational, or less than 9 on the resourceful expected transition, Digital Apprehension was more likely to be present. Conversely, with the PSQ subscales lower scores represented a strength, therefore if participants scored more than 27 on the EPS, more than 21 on the APS, and/or more than 9

on the CPS Digital Apprehension was more likely to be present. Finally, participants who were at least 32 years of age were more susceptible to Digital Apprehension.

Digital Apprehension can become a catalyst for a downward spiral, and be involved in creating a lack of insight, capability, resourcefulness, and especially so with older female participants. The ability that this measure brings to recognise the onslaught of confusion and inconsistency would greatly help support centres to recognise those struggling and in need, and therefore enable crucial support before difficulties occur. When that ability may be lacking, and this, coupled with a high level of difficulty understanding technology confirms the need for supports to be implemented to enable positive, effective, and successful progress. Conceivable ways to minimise these effects may include coaching those who are negatively affected by Digital Apprehension in ways to self-manage problems as they arise, or proactive courses with positive pathways programs, and supporting ways to tackle life situations.

Universities and other higher education institutions understand the importance of enabling students and empowering them with relevant digital tools. It is now commonly accepted that the ability to operate and navigate computers and digital tools is essential in higher education (Burton et al., 2013; James et al., 2010; D. Kennedy & Fox, 2013). Supporting students in their use of technological tools within education is at the forefront of research today (Hagel, Carr, & Devlin, 2012; Lizzio & Wilson, 2013). Factors that generate obstacles and disruption to quality experiences, not only in the first-year, but also whole of university experience need further observation and research. Furthermore, given the diversity of student populations, the technology involved, and the Digital Apprehension involved, such research should include experiences of digital tools. This project uncovered strong support that students identify with the new concept, Digital Apprehension, in order to name and raise understanding about why at least one third of students have difficulty during their first year of university, despite the digital tools available to them.

The effectiveness of digital tools to support learning is often underpinned by students' desire to interact with these tools. However, as the experience is not equal for all, this project uncovered relevant factors that trigger students to turn away in frustration, and to fail in their use of the tools available to them. This research gathered important information that enabled the creation of the new tool, the DAPSET. This research has usefulness for not only the higher education sector, but also the business sector, and any area that uses technology. Organisations and industry will benefit, perhaps using the instrument for induction screening, changeover maintenance, retention or engagement management, or simply supporting struggling employees. The DAPSET has the ability to reveal areas where people are limited

because of the apprehension they experience in their engagement with digital tools. The project contributes to the current body of literature by opening an area with potential for further research, especially considering the number of new digital tools now available and still emerging, not only in the educational sector, but also the workplace or corporate sector - anywhere that employs technology.

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Appendices

Appendix A

1. A short overview of the research.
2. Participant's consent for focus groups/interviews and online or pen and paper surveys.
3. Guidelines for participation in focus groups/interviews.
4. DA focus groups, interviews, and surveys participant information sheet.
5. Demographic questionnaire.
6. Email letter to first year students from the Deputy Vice-Chancellor (Students & Communities).

Appendix B - Initial Questionnaire

1. Digital Apprehension
2. Problem-solving 12-item
3. Student transition (revised-adapted)

Appendix C - DAPSET

Appendix D - Factors

Appendix E - Full pattern and structure matrices.

Appendix A

A.1 A Short Overview of the Study

Title of Study

Evaluation of first year university students' Digital Apprehension, problem solving appraisal, and transition to higher education (H14REA136).

Reason for Study

Students who now attend university are not only from many different walks of life, but there is also a need for them to know how to use different types of technology to enable them to complete their courses. Many students feel overwhelmed or confused by the technology that they have to learn how to use, and this can affect their studies in different ways. To help students become confident in using these tools, and to enable USQ to help support students' adjustment to university, this study will look at ways in which to understand why students do or do not like to use the technology available.

What is the duration of the study and what participation is required by me?

The study will be conducted throughout 2014 to 2016, and involve first-year students. Focus groups and individual interviews will be conducted, and are expected to last no more than 30 minutes. The interviews will be audio recorded. Then, participants will be asked to participate in a second study that will involve a questionnaire created from information collected in the focus groups/interviews. Finally, participants will be asked to complete a smaller questionnaire, developed from the first two studies.

What reward do I get for participating?

Students who choose to participate will get to help students who are having difficulty and to see their progress during their first year of university. They will also have the opportunity to go into a draw for a $500 USQ book voucher.

Are there any risks?

There are no more risks involved than you would usually encounter when completing a questionnaire.

Confidentiality

All information collected is confidential and will be stored in a password-encrypted computer and only accessed by the researchers of the project. Any published information will, only include aggregated data to ensure that individual anonymity is preserved.

What is the voluntary nature of participation in this study?

Participation in this study is totally voluntary and any participant can withdraw at any stage without any penalty or bad feelings. If a participant wishes to withdraw, all unprocessed data will be erased from the study regarding that participant. Please notify the researcher if you decide to withdraw from this project.

Researcher
Heather Smith
BSc (Hons) - Psychology
School of Psychology, Counselling and Community
with the Australian Digital Futures Institute (ADFI).
Heather.Smith2@usq.edu.au

A.2 Participant's Consent for Focus Groups/Interviews and Online or Pen and Paper Surveys.

1. I have had the project explained to me, and I have read the information sheet

2. I agree to participate in the research project as described (tick all that you are willing to participate in)

   ☐ I agree to participate in pen & paper (written) surveys.
   ☐ I agree to participate in online surveys.
   ☐ I agree to be interviewed and audio recorded as part of a focus group.
   ☐ I agree to be interviewed and audio recorded on a one on one (individual) basis.
   ☐ I agree to be interviewed and audio recorded online.

3. I acknowledge that:

   (a) I understand that my participation is voluntary and that I am free to withdraw from the project at any time, and any unprocessed data previously supplied will be withdrawn if requested.
   (b) I understand that any audio recordings will be retained until the details can be transcribed and evaluated, then kept in a secure location where only the researchers will have access.
   (c) I confirm that I am over 18 years of age.
   (d) The project is for the purpose of research. It may not be of direct benefit to me and the data collected may be used in future research.
   (c) The privacy of the personal information I provide will be safeguarded and only disclosed where I have consented to the disclosure or as required by law.
   (d) The security of the research data will be protected during and after completion of the study. The data collected during the study may be published, and any information which will identify me will not be used.

Participants Consent

Name of Participant _____

Student Email _____

Signed _____ Date _____

If you have any ethical concerns with how the research is being conducted or any queries about your rights as a participant, please feel free to contact the University of Southern Queensland Ethics Officer on the following details.

Ethics and Research Integrity Officer
Office of Research and Higher Degrees
University of Southern Queensland

West Street, Toowoomba 4350

Ph: +61 7 4631 2690

Email: ethics@usq.edu.au

A.3 Guidelines for Participation in Focus Groups/Interviews.

There are a few general guidelines that will help the flow of the discussion and encourage everyone to feel free to contribute in a meaningful way. It is expected that discussion will go for around 30 minutes' duration.

- Everyone treats the others with respect
- Discussion needs to stay on the topic
- Everyone needs to listen (even when disagreeing)
- People to speak one at a time
- There will be a break if needed for people to calm down
- People can leave if they don't feel comfortable.

If at any time the participant feels they need further guidance or advice, an opportunity will be offered by the researcher to have a private consultation.

If participants are not willing to adhere to these guidelines they are welcome to withdraw their participation from the research at any time, without any penalty or negative repercussions. If participants breach these guidelines, they will be asked to withdraw, without any penalty or negative repercussion.

Thank you very much for your contribution to this research, your opinion is valuable.

Heather Smith
BSc (Hons) - Psychology
School of Psychology, Counselling and Community
with the Australian Digital Futures Institute (ADFI).
Heather.Smith2@usq.edu.au

A.4 DA Focus Groups, Interviews, and Surveys Participant Information Sheet

Dear Student

I am writing to invite you to participate in a study involving first year students at the University of Southern Queensland. I am seeking students who want to be part of a ground-breaking study to pioneer a new tool to help first-year students adjust to university. I am conducting focus groups, individual interviews, and surveys, to discover your points of view regarding the technology that you encounter as you enter university. Three studies will be conducted, the first involves focus groups/interviews, the second a 20 minute online (or pen & paper) survey, and the third, a 10-15 minute online (or pen & paper) survey. It is preferred (but not necessary) if you are involved in all three studies, to help understand your journey better.

A focus group is a small-group discussion guided by a trained leader or researcher. It is used to learn about opinions on a designated topic, and then to guide future action. You can choose to participate in either a focus group (30 minutes' duration) or an online/face-to-face individual interview (20 minutes' duration), and then at a later date, continue on to complete an individual survey. Focus groups and interviews will be held during August/September, at USQ Toowoomba, Springfield, and Fraser Coast campuses, during the hours of 10am to 2.30pm, or as arranged between participant and researcher, at the students' convenience. Please note that these interviews will be recorded by audio, solely for the purpose of aiding interview transcription, and will remain confidential. If you wish to participate in the focus groups, or would prefer a one-one-one interview, please fill in the forms, or email me at Heather.Smith2@usq.edu.au (don't forget the number 2 after my name, otherwise it will go to the wrong person!) with your expression of interest.

Your participation in this study is completely voluntary, and you can withdraw at any time without penalty, and any unprocessed data will not be used in the analysis and publication of this research. You just need to arrange a private interview with the researcher for this to happen. It should also be noted that information from these studies may be used in the future for further study, if you do not wish for this to happen, private consultation with the researcher is available. If you are also willing to participate in the surveys, you will be able to go into the draw for a $500 USQ bookshop voucher.

I have attached a short overview of the study with this sheet so that you can see the direction and benefits of this study. If you have any questions or clarification, please don't hesitate to contact me on Heather.Smith2@usq.edu.au (don't forget the number 2 after my name, otherwise it will go to the wrong person!)

Let me welcome you to USQ, and wish you well for a journey that is interesting, challenging, and that enables you to succeed in your goals.

Kind regards

Heather Smith
BSc (Hons) - Psychology
School of Psychology, Counselling and Community, with the Australian Digital Futures Institute (ADFI).
Heather.Smith2@usq.edu.au

If you have any ethical concerns with how the research is being conducted or any queries about your rights as a participant please feel free to contact the University of Southern Queensland Ethics Officer on the following details: Ethics and Research Integrity Officer, Office of Research and Higher Degrees, University of Southern Queensland, West Street, Toowoomba 4350. Ph: +61 7 4631 2690. Email: ethics@usq.edu.au

A.5 Demographics Sheet

Demographic Information (please circle, bold, or highlight where appropriate)
Please enter your student number: _____
Please enter your surname: _____
Please enter your mother's maiden name: _____
Campus email address:
_____
USQ Campus you are attending: _____
Please circle, bold, or highlight which Faculty (if unsure, just write in 'Other' which you think)

Business Education Law Arts Health Engineering & Surveying Sciences
Other (specify):_____
What is your gender? Female Male
What is your year of birth? _____
What is your nationality?
_____
Is English your first language? (please circle or highlight) Yes No
What is your program of study? For example: Program: Bachelor of Science. Major: Psychology
Program: Major:
Please circle, bold, or highlight your main mode of study:
On campus Off campus (External/Distance) Online A Mixture (Blended)
Please circle, bold, or highlight whether you are: Part-time Full-time
In what year did you first start your current study? _____
How many years/semesters of your current study have you completed?
_____
Do you live in Australia? Yes No
If yes, in what city or town in Australia do you live now?
_____
If no, what city and country do you live now?
_____
In what city or town have you lived for most of the past 5 years?
_____
Did you leave high school in the last 12 months? Yes No
If you completed Year 12, what was your final result (e.g. ATAR/OP or equivalent)?
_____
Are you currently employed as well as studying? Yes No
If yes, how many hours do you work each week? _____
Thank you for completing the demographics information.

A.6 Email to first year students.

Hi (Student Name),

Want to be a part of a ground-breaking study that explores student views on technology at USQ and go in the draw to win a $500 USQ book voucher?

USQ PhD student, Heather Smith is conducting research into Students use of technology in the first year survey which is looking at first-year student Digital Apprehension, problem-solving and the transition to University. You have been especially selected as part of a group who are either near the beginning or near the end of their first year at USQ and whose input and honesty has the capacity to make a difference.

We'd like to hear about **your** first year digital experience, your struggles, your triumphs, and where we can improve so we can better support our students adjust to uni and become confident in using technology.

If you want to contribute to this survey and go in the draw to win a $500 USQ book voucher, please complete the survey and assist us to gain an understanding of how digital tools can help, or hinder your quest for study success.

Requests for further information or questions can be directed to heather.smith2@usq.edu.au.

> Kind regards
> **Carl Rallings**
> Deputy Vice-Chancellor (Students & Communities)

Appendix B - Initial Questionnaire

B.1. Digital Apprehension

B.2. Student Transition Scale - Revised - Adapted

B.3. Problem-Solving Inventory 12-Item

B.4. Pattern Matrices

B.5. Online survey (initial)

B.1 Digital Apprehension (Smith, Quinn, & Kelly, 2015)

1. What one word would you use to describe the technology you are required to use at university?
2. Can you describe why you chose that word? (in a sentence or two)
3. Can you rate the level of difficulty you faced with technology, where 1 equals ‘it was pretty easy’ and 10 equals ‘I thought it’d never get sorted out’?
4. What were your feelings about your experience with technology? (in a sentence or two).
5. Can you explain why? (in a sentence or two).
6. What strategies do you use, or know about, that might help you use technology at university? (in a sentence or two).
7. How would you describe your level of understanding of how university technology operates, where 1 equals ‘it was pretty easy to understand’ and 10 equals ‘I thought I would never understand it’?
8. Can you say why you responded in the way you just did? (in a sentence or two)
9. In what way could the university improve your experience of technology? (in a sentence or two)
10. Thinking about your answers, is there anything else that you can think of that would help you to navigate the university’s technology?
11. Would you attend a couple of classes/workshops dedicated to basic computer/technology that is needed when you first start university?
12. When would be the best timing of these classes/workshops - Orientation week, 2 weeks after Orientation week, 4 weeks after or 6 weeks after?

B.2. Student Transition Scale - Revised - Adapted (STS-Rev-A; Smith, Lehane, & Quinn, 2015)

Please indicate your answer to the following questions by circling the number that best describes how you feel with the following statements.

1 (*Strongly disagree*); **2** (*Disagree*); **3** (*Neutral*); **4** (*Agree*); **5** (*Strongly agree*)

(Capability) **I expect to…**

1. Understand the level of effort involved for me to succeed in my studies.
2. Understand that any worries or concerns I have about study are normal and doesn't mean I'm not coping or don't belong.
3. Receive feedback early in a course to let me know how well I am progressing in my studies.
4. Get off to a good start in my studies because I will know what is expected of me.
5. Feel like I can take charge of my own development as a university student.
6. Manage my own learning better because I will have opportunities to realistically assess my skills and capabilities.
7. Develop as a person because the university will provide me with opportunities to do this.

(Resourcefulness) **I think I will…**

8. Know who to ask for assistance with any concerns or issues I have about my studies.
9. Find that study related assistance and advice is readily available and easy to access.
10. Know how to organise and locate information I need.
11. Know how to raise any concerns I may have about university systems (e.g., access to technology support).
12. Have key university systems and procedures that can impact on my studies explained to me.
13. Know how to connect with support services and/or support staff if help is needed.
14. Have strategies for dealing with challenges I may face in my studies.

(Connectedness) **I expect to …**

15. Make personal connections with other students by getting involved with social activities and introducing myself to people.
16. Develop effective working relationships with fellow students in my courses.

17. Feel a sense of fellowship with the students in my year level.
18. Give and receive help and support from my fellow students (e.g. car-pooling, study groups).
19. Feel like I belong in this university.
20. Feet a part of the university because I will be known or be recognised by at least one staff member.
21. Experience a positive relationship between staff in my program.

***(Purposefulness)* I hope to…**

22. See the relevance of what I am studying to my career plan.
23. Feel motivated to study because I can see how my chosen career relates to what I am studying.
24. Understand why my course is structured and organised the way it is.
25. See myself in my future professional role because I will have opportunities to discuss my motivations and goals for study.
26. Have a sense of where my degree will take me because I will have opportunities to meet successful graduates and role models.

***(Culture)* I hope to…**

27. Value being curious and open to new ideas.
28. See critical thinking as important.
29. Understand how to use information ethically by referencing correctly.
30. Work towards being independent and managing my own studies.

B.3 Problem-Solving Inventory 12-Item (PSI-12; Beccaria & Machin, 2010)

1 (*strongly agree*); **2** (*agree*); **3** (*agree somewhat*); **4** (*neutral*); **5** (*disagree somewhat*) **6** (*strongly disagree*)

1. There are times when I become so emotionally charged that I can no longer see the alternatives for solving a particular problem.
2. Even though I work on a problem, sometimes I feel like I'm groping or wandering and not getting down to the real issue.
3. I generally act on the first idea that comes to mind in solving a problem.
4. When considering solutions to a problem, I do not take the time to assess the potential success of each alternative.
5. Sometimes I do not stop and take time to deal with my problems, but just kind of muddle ahead.
6. When I have a problem, I think of as many possible ways to handle it as I can until I can't come up with any more ideas.
7. After following a course of action to solve a problem, I compare the actual outcome with the one I had anticipated.
8. When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation.
9. When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation.
10. Given enough time and effort, I believe I can solve most problems that confront me.
11. When faced with a novel situation, I have confidence that I can handle problems that may arise.
12. I trust my ability to solve new and difficult problems.

B.4 Pattern Matrices

Factors

Factor 1 - Insightful transition.

Pattern Matrix[a]

	Component						
	1	2	3	4	5	6	7
See the relevance of what I am studying to my career plan	.897						
Work towards being independent and managing my own studies	.816						
Feel motivated to study because I can see how my chosen career relates to what I am studying	.802						
See critical thinking as important	.801						
Value being curious and open to new ideas	.735						
Understand how to use information ethically by referencing correctly	.734						
Understand why my course is structured and organised the way it is	.710						
See myself in my future professional role because I will have opportunities to discuss my motivations and goals for study	.634						
Have a sense of where my degree will take me because I will have opportunities to meet successful graduates and role models	.482						

Factor 2 - Relational transition

Feel a sense of fellowship with the students in my year level		.920					
Make personal connections with other students by getting involved with social activities and introducing myself to people		.912					
Develop effective working relationships with fellow students in my courses		.911					
Give and receive help and support from my fellow students (e.g. car-pooling, study groups)		.874					
Feel a part of the university because I will be known or be recognised by at least one staff member		.807					
Experience a positive relationships between staff in my program		.640					
Feel like I belong in this university		.614					

Factor 3 - Resourceful transition

Know how to raise any concerns I may have about university systems (e.g., access to technology support)	.888
Find that study related assistance and advice is readily available and easy to access	.875
Know who to ask for assistance with any concerns or issues I have about my studies	.856
Know how to connect with support services and/or support staff if help is needed	.776
Know how to organise and locate information I need	.770
Have key university systems and procedures that can impact on my studies explained to me	.742
Have strategies for dealing with challenges I may face in my studies	.494

Factor 4 - Emotive problem-solving appraisal

reverse coded - Even though I work on a problem, sometimes I feel like I'm groping or wandering and not getting down to the real issue	.822
reverse coded - When considering solutions to a problem, I do not take the time to assess the potential success of each alternative	.761
reverse coded - There are times when I become so emotionally charged that I can no longer see the alternatives for solving a particular problem	.761
reverse coded - I generally act on the first idea that comes to mind in solving a problem	.750
reverse coded - Sometimes I don't stop and take time to deal with my problems, but just kind of muddle ahead	.749
reverse coded - When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation	.610

Factor 5 - Capability with transition

Get off to a good start in my studies because I will know what is expected of me					.824			
Manage my own learning better because I will have opportunities to realistically assess my skills and capabilities					.793			
Receive feedback early in a course to let me know how well I am progressing in my studies					.715			
Feel like I could take charge of my own development as a university student					.675			
Understand the level of effort involved for me to succeed in my studies					.508			
Develop as a person because the university will provide me with opportunities to do this					.500			
Understand that any worries or concerns I have about study are normal and does not mean I'm not coping or don't belong					.452			

Factor 6 - Confident problem-solving appraisal

Given enough time and effort, I believe I can solve most problems that confront me.=						.911		
When faced with a novel situation, I have confidence that I can handle problems that may arise						.895		
I trust my ability to solve new and difficult problems						.867		

Factor 7 - analytic problem-solving appraisal

When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation	.826
After following a course of action to solve a problem, I compare the actual outcome with the one I had anticipated	.734
When I have a problem, I think of as many possible ways to handle it as I can until I can't come up with any more ideas	.637

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.[a]

a. Rotation converged in 6 iterations.

Full Pattern and Structure Matrices

Pattern Matrix[a]

	Component						
	1	2	3	4	5	6	7
See the relevance of what I am studying to my career plan	**.897**	-.040	.000	.016	-.090	.007	.120
Work towards being independent and managing my own studies	**.816**	-.123	-.016	.034	.081	-.054	.016
Feel motivated to study because I can see how my chosen career relates to what I am studying	**.802**	.050	-.032	-.002	.008	.002	.073
See critical thinking as important	**.801**	-.043	-.027	-.026	-.003	-.097	.046
Value being curious and open to new ideas	**.735**	.057	.021	-.004	-.053	-.133	-.016
Understand how to use information	**.734**	-.008	-.039	-.014	.040	-.005	-.026

ethically by referencing correctly							
Understand why my course is structured and organised the way it is	**.710**	-.033	.132	-.001	.012	.067	-.012
See myself in my future professional role because I will have opportunities to discuss my motivations and goals for study	**.634**	.125	-.004	-.037	.089	.164	-.148
Have a sense of where my degree will take me because I will have opportunities to meet successful graduates and role models	**.482**	.293	.044	-.002	.019	.127	-.137
Feel a sense of fellowship with the students in my year level	-.038	**.920**	-.010	.030	-.007	-.054	.053
Make personal connections with other students by getting involved with social activities and introducing myself to people	-.080	**.912**	-.090	-.025	.025	-.017	.066
Develop effective working relationships	-.062	**.911**	-.057	.011	.037	-.027	.066

with fellow students in my courses							
Give and receive help and support from my fellow students (e.g. car-pooling, study groups)	-.049	**.874**	.012	.025	.007	-.014	.018
Feel a part of the university because I will be known or be recognised by at least one staff member	-.024	**.807**	.013	-.002	.010	.041	-.076
Experience a positive relationships between staff in my program	.225	**.640**	.062	-.011	-.096	-.009	-.022
Feel like I belong in this university	.163	**.614**	.075	-.036	-.009	.009	-.027
Know how to raise any concerns I may have about university systems (e.g., access to technology support)	-.061	-.003	**.888**	-.035	-.090	.078	-.125
Find that study related assistance and advice is readily available and easy to access	.035	.022	**.875**	.017	-.093	.039	.033
Know who to ask for assistance with any concerns or issues I have about my studies	.047	-.007	**.856**	.049	-.115	-.004	.044

Know how to connect with support services and/or support staff if help is needed	.056	.005	**.776**	.017	-.027	-.086	.037
Know how to organise and locate information I need	-.023	-.078	**.770**	-.012	.094	.020	-.009
Have key university systems and procedures that can impact on my studies explained to me	-.019	-.006	**.742**	.025	.089	.015	.019
Have strategies for dealing with challenges I may face in my studies	-.004	.019	**.494**	-.102	.268	-.100	.006
reverse coded - Even though I work on a problem, sometimes I feel like I'm groping or wandering and not getting down to the real issue	.134	-.038	-.045	**.822**	-.110	-.094	-.016
reverse coded - When considering solutions to a problem, I do not take the time to assess the potential success of each alternative	-.223	.027	.155	**.761**	.090	.025	.072
reverse coded - There are times when I become so emotionally charged	.128	-.018	-.047	**.761**	-.101	.017	-.015

that I can no longer see the alternatives for solving a particular problem reverse coded - I generally act on the first idea that comes to mind in solving a problem	-.163	.063	.054	**.750**	.119	-.096	.023
reverse coded - Sometimes I don't stop and take time to deal with my problems, but just kind of muddle ahead	.037	.022	-.026	**.749**	-.016	-.006	.035
reverse coded - When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation	.083	-.061	-.076	**.610**	.070	.206	-.164
Get off to a good start in my studies because I will know what is expected of me	-.032	-.021	.023	.047	**.824**	.002	.020
Manage my own learning better because I will have opportunities to realistically assess my skills and capabilities	-.069	.024	.013	-.027	**.793**	.011	-.031
Receive feedback early in a course to let	-.020	.065	-.178	.038	**.715**	.018	-.064

me know how well I am progressing in my studies							
Feel like I could take charge of my own development as a university student	.099	-.083	-.004	-.091	**.675**	-.024	.000
Understand the level of effort involved for me to succeed in my studies	.347	-.120	-.018	.049	**.508**	-.032	.078
Develop as a person because the university will provide me with opportunities to do this	.034	.262	.062	.025	**.500**	.063	-.031
Understand that any worries or concerns I have about study are normal and does not mean I'm not coping or don't belong	.133	-.009	.179	.035	**.452**	-.064	.061
Given enough time and effort, I believe I can solve most problems that confront me.	-.040	-.028	.069	-.059	-.010	**.911**	-.002
When faced with a novel situation, I have confidence that I can handle problems that may arise	.002	-.003	-.031	.014	-.003	**.895**	.056

I trust my ability to solve new and difficult problems	-.018	-.021	-.012	.042	.008	**.867**	.080
When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation	.041	.004	-.073	-.020	.023	-.027	**.826**
After following a course of action to solve a problem, I compare the actual outcome with the one I had anticipated	.018	-.040	-.037	-.013	.051	.155	**.734**
When I have a problem, I think of as many possible ways to handle it as I can until I can't come up with any more ideas	.043	.138	.109	.011	-.113	.042	**.637**

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.[a]

a. Rotation converged in 6 iterations.

Structure Matrix

	Component						
	1	2	3	4	5	6	7
See the relevance of what I am studying to my career plan	**.810**	.307	.367	-.101	.349	-.085	.014
Feel motivated to study because I can see how my chosen career relates to what I am studying	**.802**	.385	.392	-.119	.426	-.109	-.045

Work towards being independent and managing my own studies	**.798**	.264	.383	-.112	.460	-.180	-.105
See critical thinking as important	**.779**	.299	.377	-.166	.409	-.215	-.081
Value being curious and open to new ideas	**.767**	.382	.416	-.150	.400	-.253	-.154
Understand why my course is structured and organised the way it is	**.759**	.346	.470	-.128	.437	-.077	-.104
Understand how to use information ethically by referencing correctly	**.738**	.321	.356	-.124	.413	-.134	-.131
See myself in my future professional role because I will have opportunities to discuss my motivations and goals for study	**.734**	.454	.411	-.106	.467	-.008	-.228
Have a sense of where my degree will take me because I will have opportunities to meet successful graduates and role models	**.644**	.548	.418	-.064	.407	-.011	-.223
Feel a sense of fellowship with the students in my year level	.360	**.890**	.378	-.007	.319	-.069	-.083
Develop effective working relationships with fellow students in my courses	.327	**.863**	.337	-.010	.317	-.040	-.061
Give and receive help and support from my fellow students (e.g. car-pooling, study groups)	.346	**.858**	.378	-.006	.319	-.043	-.105
Make personal connections with other students by getting involved with social activities and introducing myself to people	.291	**.838**	.298	-.030	.284	-.029	-.051

Feel a part of the university because I will be known or be recognised by at least one staff member	.351	**.814**	.368	-.019	.318	-.018	-.179
Experience a positive relationships between staff in my program	.496	**.735**	.417	-.068	.310	-.079	-.138
Feel like I belong in this university	.477	**.721**	.439	-.098	.363	-.077	-.140
Find that study related assistance and advice is readily available and easy to access	.423	.388	**.837**	-.203	.393	-.104	-.032
Know how to raise any concerns I may have about university systems (e.g., access to technology support)	.347	.349	**.813**	-.230	.367	-.103	-.164
Know how to connect with support services and/or support staff if help is needed	.441	.367	**.800**	-.224	.434	-.225	-.058
Know who to ask for assistance with any concerns or issues I have about my studies	.400	.347	**.797**	-.173	.356	-.128	-.024
Know how to organise and locate information I need	.379	.295	**.774**	-.230	.468	-.144	-.073
Have key university systems and procedures that can impact on my studies explained to me	.391	.349	**.767**	-.190	.469	-.130	-.054
Have strategies for dealing with challenges I may face in my studies	.426	.350	**.692**	-.317	.580	-.275	-.101
reverse coded - Even though I work on a problem, sometimes I feel like I'm groping or wandering and not getting down to the real issue	-.072	-.062	-.262	**.811**	-.215	.138	-.045

reverse coded - There are times when I become so emotionally charged that I can no longer see the alternatives for solving a particular problem	-.073	-.046	-.257	**.779**	-.213	.231	-.020
reverse coded - Sometimes I don't stop and take time to deal with my problems, but just kind of muddle ahead	-.093	-.010	-.215	**.751**	-.150	.209	.019
reverse coded - When considering solutions to a problem, I do not take the time to assess the potential success of each alternative	-.215	-.006	-.118	**.740**	-.096	.238	.067
reverse coded - I generally act on the first idea that comes to mind in solving a problem	-.146	.037	-.126	**.708**	-.043	.104	-.019
reverse coded - When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation	-.049	-.040	-.217	**.666**	-.085	.324	-.131
Get off to a good start in my studies because I will know what is expected of me	.397	.288	.429	-.112	**.799**	-.142	-.092
Manage my own learning better because I will have opportunities to realistically assess my skills and capabilities	.377	.310	.428	-.170	**.781**	-.154	-.136
Feel like I could take charge of my own development as a university student	.437	.223	.404	-.239	**.716**	-.194	-.102
Develop as a person because the university will provide me with opportunities to do this	.438	.498	.452	-.085	**.640**	-.067	-.135

Receive feedback early in a course to let me know how well I am progressing in my studies	.300	.259	.221	-.043	**.631**	-.094	-.153
Understand the level of effort involved for me to succeed in my studies	.541	.211	.364	-.103	**.622**	-.148	-.033
Understand that any worries or concerns I have about study are normal and does not mean I'm not coping or don't belong	.456	.298	.484	-.139	**.613**	-.185	-.052
When faced with a novel situation, I have confidence that I can handle problems that may arise	-.172	-.070	-.213	.268	-.209	**.919**	.272
I trust my ability to solve new and difficult problems	-.187	-.087	-.210	.283	-.208	**.902**	.291
Given enough time and effort, I believe I can solve most problems that confront me.	-.161	-.062	-.126	.180	-.174	**.891**	.220
When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation	-.091	-.117	-.102	-.031	-.102	.166	**.817**
After following a course of action to solve a problem, I compare the actual outcome with the one I had anticipated	-.118	-.140	-.111	.018	-.109	.323	**.770**
When I have a problem, I think of as many possible ways to handle it as I can until I can't come up with any more ideas	.002	.070	.063	-.007	-.079	.184	**.627**

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

B.5 Online survey (initial)

DAPS15 Survey (copied from downloaded pdf)

Brief overview of project and Participant Consent Form

Before starting the survey, close down any menu bars or other programs that may be reducing your screen size. You should be able to read the information on the screen without having to scroll from left to right.

University study requires students to use technology and digital tools to support and help their learning. However, students' desire to interact with technology is often underpinned by their understanding, and the experience is not equal for all. The goal of this project is to attempt to discover some of the factors that trigger students to turn away in frustration, and to not use the tools available to them. It will not only indicate areas in which to support the students during their first year, but also enable a more precise understanding of how digital tools can help – and hinder – students in their quest for success.

Participation in the survey can contribute towards course credit (if available for your course), or a raffle for a $500 bookshop voucher. Your participation in this study is completely voluntary, and you can withdraw at any time without penalty and your unprocessed data erased. It should also be noted that information from these studies may be used in further study. If you wish to withdraw, or do not wish for your information to be used for further studies, please notify the researcher.

All information collected is confidential and will be stored in a password protected computer, accessed only by the researchers of the project. Any published information will only include aggregated data to ensure that individual anonymity is preserved. The questionnaire consists of 54 items and should take approximately 15 - 20 minutes. If you have any questions or clarification, please don't hesitate to contact me on Heather.Smith2@usq.edu.au.

If you have any ethical concerns with how the research is being conducted, or any queries about your rights as a participant, please feel free to contact the University of Southern Queensland Ethics Officer on the following details.

Ethics and Research Integrity Officer, Office of Research and Higher Degrees, University of Southern Queensland, West Street, Toowoomba 4350. Ph: 61 7 4631 2690. Email: ethics@usq.edu.au

By clicking the next button, you agree to the above information and wish to participate in the survey.

If you have any questions about the study please contact Heather Smith, Toowoomba. QLD. 4350 on 0746312638 or email heather.smith2@usq.edu.au. For technical concerns or difficulties accessing the survey please contact Ken Askin, University of Southern Queensland, at askin@usq.edu.au.

I declare that I am:

- 18 years or over and a student at USQ.

☐ **Click here to agree**

THANK YOU FOR YOUR PARTICIPATION

To start the survey please click on the 'Next' button below.

Demographics

Progress

Please provide us with your demographic details.

Please enter your student number

Please enter your surname

Please enter your mother's maiden name

What is your campus email address

USQ Campus you are attending

Which School/s are you with?

- ☐ Arts and Communication
- ☐ Commerce
- ☐ Law and Justice
- ☐ Management and Enterprise
- ☐ Teacher Education and Early Childhood
- ☐ Agricultural, Computational and Environmental Sciences
- ☐ Civil Engineering and Surveying
- ☐ Health, Nursing and Midwifery
- ☐ Mechanical and Electrical Engineering
- ☐ Psychology and Counselling
- ☐ Health and Wellbeing

What is your gender

- ○ Male
- ○ Female

What is your date of birth

What is your nationality?

Is English your first language?

- ○ Yes
- ○ No

What are you studying?

Program (e.g., Bachelor of Science)

Major (e.g., Psychology)

What is your main mode of study?

- ○ On-campus
- ○ Off-campus (External/Distance)
- ○ Online
- ○ Blended (A mixture)

Are you a full-time or part-time student?

- ○ Full-time
- ○ Part-time

In what year did you first start your current study?

Demographics Page 2

Progress

Please provide us with your demographic details.

How many years/semesters of your current study have you completed? (e.g., 1 year, 1 Semester)

Year

Semester

What town or city do you live in now?

Is this in Australia?

- ○ Yes
- ○ No (Please specify)

In what town/city and country have you lived for most of the past 5 years

Did you leave high school in the last 12 months?

- ○ Yes
- ○ No

If you completed Year 12, what was your final result (e.g. ATAR/OP or equivalent)?

Are you currently employed as well as studying?

- ○ Yes
- ○ No

If yes, how many hours do you work each week?

Digital Apprehension

Progress

Digital Apprehension (Smith, Quinn, & Hendry, 2015)

What one word would you use to describe using the technology required at university?

Can you describe why you chose that word? (in a sentence or two)

Can you rate the level of difficulty you faced with technology, where 1 equals "it was pretty easy" and 10 equals "I thought it'd never get sorted out"?

What were your feelings about your experience with technology? (in a sentence or two)

Can you explain why? (in a sentence or two)

What strategies do you use, or know about, that might help the use of technology at university? (in a sentence or two)

Digital Apprehension

Progress

(Smith, Quinn, & Hendry, 2015)

How would you describe your level of understanding of how university technology operates, where 1 equals "it was pretty easy to understand" and 10 equals "I thought I would never understand it"?

Can you say why you responded in the way you just did? (in a sentence or two)

In what way could the university improve your experience of technology? (in a sentence or two)

Thinking about your answers, is there anything else that you can think of that would help you to navigate the university's technology?

Would you attend a couple of classes/workshops dedicated to basic computer/technology that is needed when you first start university?

○ Yes ○ No

When would be the best timing of these classes/workshops - 2 weeks after Orientation week, 4 weeks after or 6 weeks after?

☐ 2 weeks after Orientation ☐ 6 weeks after Orientation

☐ 4 weeks after Orientation ☐ Other (please specify)

Student Transition - Revised - Adapted

Progress

(Smith, Lehane & Quinn, 2015)

Please indicate your answer to the following questions with the answer that best describes how you agree or disagree with the following statements.

I expect to ...	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Understand the level of effort involved for me to succeed in my studies.	○	○	○	○	○
Understand that any worries or concerns I have about study are normal and does not mean I'm not coping or don't belong.	○	○	○	○	○
Receive feedback early in a course to let me know how well I am progressing in my studies.	○	○	○	○	○
Get off to a good start in my studies because I will know what is expected of me.	○	○	○	○	○
Feel like I could take charge of my own development as a university student.	○	○	○	○	○
Manage my own learning better because I will have opportunities to realistically assess my skills and capabilities.	○	○	○	○	○
Develop as a person because the university will provide me with opportunities to do this.	○	○	○	○	○

Student Transition - Revised - Adapted

Progress

Please indicate your answer to the following questions with the answer that best describes how you agree or disagree with the following statements.

I think I will ...	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Know who to ask for assistance with any concerns or issues I have about my studies.	○	○	○	○	○
Find that study related assistance and advice is readily available and easy to access.	○	○	○	○	○
Know how to organise and locate information I need.	○	○	○	○	○
Know how to raise any concerns I may have about university systems (e.g., access to technology support).	○	○	○	○	○
Have key university systems and procedures that can impact on my studies explained to me.	○	○	○	○	○
Know how to connect with support services and/or support staff if help is needed.	○	○	○	○	○
Have strategies for dealing with challenges I may face in my studies.	○	○	○	○	○

STS-Revised-Adapted

Progress

Please indicate your answer to the following questions with the answer that best describes how you agree or disagree with the following statements.

I expect to ...	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Make personal connections with other students by getting involved with social activities and introducing myself to people.	○	○	○	○	○
Develop effective working relationships with fellow students in my courses.	○	○	○	○	○
Feel a sense of fellowship with the students in my year level.	○	○	○	○	○
Give and receive help and support from my fellow students (e.g. car-pooling, study groups).	○	○	○	○	○
Feel like I belong in this university.	○	○	○	○	○
Feel a part of the university because I will be known or be recognised by at least one staff member.	○	○	○	○	○
Experience a positive relationships between staff in my program.	○	○	○	○	○

STS-Revised-Adapted

Progress

Please indicate your answer to the following questions with the answer that best describes how you agree or disagree with the following statements.

I hope to ...	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
See the relevance of what I am studying to my career plan.	○	○	○	○	○
Feel motivated to study because I can see how my chosen career relates to what I am studying.	○	○	○	○	○
Understand why my course is structured and organised the way it is.	○	○	○	○	○
See myself in my future professional role because I will have opportunities to discuss my motivations and goals for study.	○	○	○	○	○
Have a sense of where my degree will take me because I will have opportunities to meet successful graduates and role models.	○	○	○	○	○
Value being curious and open to new ideas.	○	○	○	○	○
See critical thinking as important.	○	○	○	○	○
Understand how to use information ethically by referencing correctly.	○	○	○	○	○
Work towards being independent and managing my own studies.	○	○	○	○	○

Progress

PSI-12-item

(Beccaria & Machin, 2011)

Please indicate your answer to the following questions with the answer that best describes how you agree or disagree with the following statements.

	Strongly agree	Agree	Agree somewhat	Neutral	Disagree somewhat	Strongly disagree
There are times when I become so emotionally charged that I can no longer see the alternatives for solving a particular problem.	○	○	○	○	○	○
Even though I work on a problem, sometimes I feel like I'm groping or wandering and not getting down to the real issue.	○	○	○	○	○	○
I generally act on the first idea that comes to mind in solving a problem.	○	○	○	○	○	○
When considering solutions to a problem, I do not take the time to assess the potential success of each alternative.	○	○	○	○	○	○
Sometimes I don't stop and take time to deal with my problems, but just kind of muddle ahead.	○	○	○	○	○	○
When I have a problem, I think of as many possible ways to handle it as I can until I can't come up with any more ideas.	○	○	○	○	○	○

Progress

Please indicate your answer to the following questions with the answer that best describes how you agree or disagree with the following statements.

	Strongly agree	Agree	Agree somewhat	Neutral	Disagree somewhat	Strongly disagree
After following a course of action to solve a problem, I compare the actual outcome with the one I had anticipated.	○	○	○	○	○	○
When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation.	○	○	○	○	○	○
When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation.	○	○	○	○	○	○
Given enough time and effort, I believe I can solve most problems that confront me.	○	○	○	○	○	○
When faced with a novel situation, I have confidence that I can handle problems that may arise.	○	○	○	○	○	○
I trust my ability to solve new and difficult problems.	○	○	○	○	○	○

DAPS15 Data Values (copied from downloaded pdf)

DAPS15 - Demo1

Please enter your student number=StuNo_txt

Please enter your surname=Surname_txt

Please enter your mother´s maiden name=MothsMaidName_txt

What is your campus email address=Email_txt

USQ Campus you are attending=Campus_txt

Which School/s are you with?
Arts and Communication=**School01**
Commerce=**School02**
Law and Justice=**School03**
Management and Enterprise=**School04**
Teacher Education and Early Childhood=**School05**
Agricultural, Computational and Environmental Sciences=**School06**
Civil Engineering and Surveying=**School07**
Health, Nursing and Midwifery=**School08**
Mechanical and Electrical Engineering=**School09**
Psychology and Counselling=**School10**
Health and Wellbeing=**School11**

What is your gender=Gender
Male=**1**
Female=**2**

What is your date of birth=DOB_txt

What is your nationality?=Nationality_txt

Is English your first language?=English
Yes=**1**
No=**2**

What are you studying?=Program_txt,Mode_txt

What is your main mode of study?=PtFt
On-campus=**1**
Off-campus (External/Distance)=**2**
Online=**3**
Blended (A mixture)=**4**

Are you a full-time or part-time student?=BeginStudyYr01
Full-time=**1**
Part-time=**2**

In what year did you first start your current study?=BeginStudyYr02_txt

DAPS15 - Demo2

How many years/semesters of your current study have you completed? (e.g., 1 year, 1 Semester)
=Yrs_txt,Sem_txt

What town or city do you live in now?=TownCity_txt

Is this in Australia?=Australia01,Australia02_txt
Yes=**1**
No (Please specify) =**2**

In what town/city and country have you lived for most of the past 5 years=Lived5yrs_txt

Did you leave high school in the last 12 months?=LeaveHS
Yes=1
No=2

If you completed Year 12, what was your final result (e.g. ATAR/OP or equivalent)?=ResultYr_txt

Are you currently employed as well as studying?=Employed
Yes=1
No=2

If yes, how many hours do you work each week?=Hrswork_txt

DAPS15 - DA1

What one word would you use to describe using the technology required at university?=OneWord_txt

Can you describe why you chose that word? (in a sentence or two)=YUChoseWord_txt

Can you rate the level of difficulty you faced with technology, where 1 equals 'it was pretty easy' and 10 equals 'I thought it'd never get sorted out'?=LevelDiff_txt

What were your feelings about your experience with technology? (in a sentence or two)
=FeelngsTech_txt

Can you explain why? (in a sentence or two)=WhyFeelings_txt

What strategies do you use, or know about, that might help the use of technology at university? (in a sentence or two)=Strategies_txt

DAPS15 - DA2

How would you describe your level of understanding of how university technology operates, where 1 equals 'it was pretty easy to understand' and 10 equals 'I thought I would never understand it'?
=LevelUnstng_txt

Can you say why you responded in the way you just did? (in a sentence or two)=YLevlUnstng_txt

In what way could the university improve your experience of technology? (in a sentence or two)
=UniImprove_txt

Thinking about your answers, is there anything else that you can think of that would help you to navigate the university's technology?=Helps_txt

Would you attend a couple of classes/workshops dedicated to basic computer/technology that is needed when you first start university?=Classes
Yes=1
No=2

When would be the best timing of these classes/workshops - 2 weeks after Orientation week, 4 weeks after or 6 weeks after?
2 weeks after Orientation=WhenClasses01
4 weeks after Orientation=WhenClasses02
6 weeks after Orientation=WhenClasses03
Other (please specify) =WhenClasses04,WhenClasses05_txt

DAPS15 - STS-Rev-A

Choices=Strongly disagree,Disagree,Neutral,Agree,Strongly agree
Values=1,2,3,4,5
Understand the level of effort involved for me to succeed in my studies.=**Rev-A01**
Understand that any worries or concerns I have about study are normal and does not mean I'm not coping or don't belong.=**Rev-A02**
Receive feedback early in a course to let me know how well I am progressing in my studies.=**Rev-A03**
Get off to a good start in my studies because I will know what is expected of me.=**Rev-A04**
Feel like I could take charge of my own development as a university student.=**Rev-A05**
Manage my own learning better because I will have opportunities to realistically assess my skills and capabilities.=**Rev-A06**
Develop as a person because the university will provide me with opportunities to do this.=**Rev-A07**

DAPS15 - STS-R-A2

Choices=Strongly disagree,Disagree,Neutral,Agree,Strongly agree
Values=1,2,3,4,5
Know who to ask for assistance with any concerns or issues I have about my studies.=**R-A01**
Find that study related assistance and advice is readily available and easy to access.=**R-A02**
Know how to organise and locate information I need.=**R-A03**
Know how to raise any concerns I may have about university systems (e.g., access to technology support).=**R-A04**
Have key university systems and procedures that can impact on my studies explained to me.=**R-A05**
Know how to connect with support services and/or support staff if help is needed.=**R-A06**
Have strategies for dealing with challenges I may face in my studies.=**R-A07**

DAPS15 - STS-R-A3

Choices=Strongly disagree,Disagree,Neutral,Agree,Strongly agree
Values=1,2,3,4,5
Make personal connections with other students by getting involved with social activities and introducing myself to people.=**R-A08**
Develop effective working relationships with fellow students in my courses.=**R-A09**
Feel a sense of fellowship with the students in my year level.=**R-A10**
Give and receive help and support from my fellow students (e.g. car-pooling, study groups).=**R-A11**
Feel like I belong in this university.=**R-A12**
Feel a part of the university because I will be known or be recognised by at least one staff member.=**R-A13**
Experience a positive relationships between staff in my program.=**R-A14**

DAPS15 - STS-R-A4

Choices=Strongly disagree,Disagree,Neutral,Agree,Strongly agree
Values=1,2,3,4,5
See the relevance of what I am studying to my career plan.=**R-A15**
Feel motivated to study because I can see how my chosen career relates to what I am studying.=**R-A16**
Understand why my course is structured and organised the way it is.=**R-A17**
See myself in my future professional role because I will have opportunities to discuss my motivations and goals for study.=**R-A18**
Have a sense of where my degree will take me because I will have opportunities to meet successful graduates and role models.=**R-A19**
Value being curious and open to new ideas.=**R-A20**
See critical thinking as important.=**R-A21**
Understand how to use information ethically by referencing correctly.=**R-A22**

Work towards being independent and managing my own studies.=**R-A23**

DAPS15 - PSI-12_1

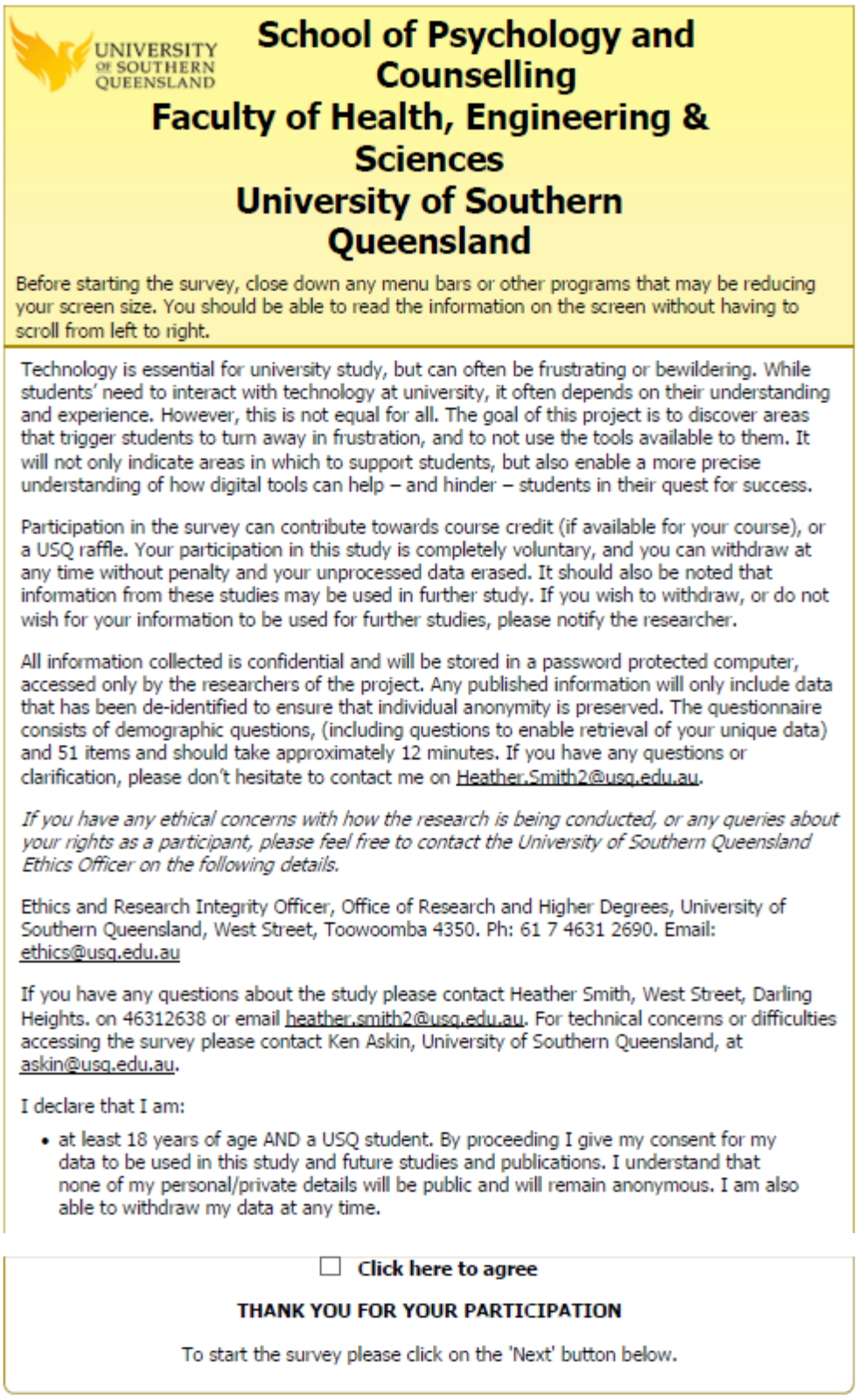
Choices=Strongly agree,Agree,Agree somewhat,Neutral,Disagree somewhat,Strongly disagree
Values=1,2,3,4,5,6
There are times when I become so emotionally charged that I can no longer see the alternatives for solving a particular problem.=**12_01**
Even though I work on a problem, sometimes I feel like I'm groping or wandering and not getting down to the real issue.=**12_02**
I generally act on the first idea that comes to mind in solving a problem.=**12_03**
When considering solutions to a problem, I do not take the time to assess the potential success of each alternative.=**12_04**
Sometimes I don't stop and take time to deal with my problems, but just kind of muddle ahead.=**12_05**
When I have a problem, I think of as many possible ways to handle it as I can until I can't come up with any more ideas.=**12_06**

DAPS15 - PSI-12_2

Choices=Strongly agree,Agree,Agree somewhat,Neutral,Disagree somewhat,Strongly disagree
Values=1,2,3,4,5,6
After following a course of action to solve a problem, I compare the actual outcome with the one I had anticipated.=**12_07**
When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation.=**12_08**
When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation.=**12_09**
Given enough time and effort, I believe I can solve most problems that confront me.=**12_10**
When faced with a novel situation, I have confidence that I can handle problems that may arise.=**12_11**
I trust my ability to solve new and difficult problems.=**12_12**

Appendix C - Final Phase

Online DAPSET Survey (copied from downloaded pdf)



UNIVERSITY OF SOUTHERN QUEENSLAND

School of Psychology and Counselling
Faculty of Health, Engineering & Sciences
University of Southern Queensland

Before starting the survey, close down any menu bars or other programs that may be reducing your screen size. You should be able to read the information on the screen without having to scroll from left to right.

Technology is essential for university study, but can often be frustrating or bewildering. While students' need to interact with technology at university, it often depends on their understanding and experience. However, this is not equal for all. The goal of this project is to discover areas that trigger students to turn away in frustration, and to not use the tools available to them. It will not only indicate areas in which to support students, but also enable a more precise understanding of how digital tools can help – and hinder – students in their quest for success.

Participation in the survey can contribute towards course credit (if available for your course), or a USQ raffle. Your participation in this study is completely voluntary, and you can withdraw at any time without penalty and your unprocessed data erased. It should also be noted that information from these studies may be used in further study. If you wish to withdraw, or do not wish for your information to be used for further studies, please notify the researcher.

All information collected is confidential and will be stored in a password protected computer, accessed only by the researchers of the project. Any published information will only include data that has been de-identified to ensure that individual anonymity is preserved. The questionnaire consists of demographic questions, (including questions to enable retrieval of your unique data) and 51 items and should take approximately 12 minutes. If you have any questions or clarification, please don't hesitate to contact me on Heather.Smith2@usq.edu.au.

If you have any ethical concerns with how the research is being conducted, or any queries about your rights as a participant, please feel free to contact the University of Southern Queensland Ethics Officer on the following details.

Ethics and Research Integrity Officer, Office of Research and Higher Degrees, University of Southern Queensland, West Street, Toowoomba 4350. Ph: 61 7 4631 2690. Email: ethics@usq.edu.au

If you have any questions about the study please contact Heather Smith, West Street, Darling Heights. on 46312638 or email heather.smith2@usq.edu.au. For technical concerns or difficulties accessing the survey please contact Ken Askin, University of Southern Queensland, at askin@usq.edu.au.

I declare that I am:

- at least 18 years of age AND a USQ student. By proceeding I give my consent for my data to be used in this study and future studies and publications. I understand that none of my personal/private details will be public and will remain anonymous. I am also able to withdraw my data at any time.

☐ **Click here to agree**

THANK YOU FOR YOUR PARTICIPATION

To start the survey please click on the 'Next' button below.

Demographic Details

Progress

These demographic questions are to help understand your particular situation, as well as enable the retrieval of your data with unique identifiers, such as student id, mother's maiden name, etc.

Please enter your surname/family name

Please enter your mothers maiden name.

Please enter your student number starting with a letter, e.g., w0012340.

What is your campus email address

Which USQ campus are you attending

- ○ Toowoomba
- ○ Springfield
- ○ Fraser Coast
- ○ Ipswich

Which school/faculty are you with?

- ○ Business
- ○ Education
- ○ Law
- ○ Arts
- ○ Health
- ○ Engineering
- ○ Science

What is your gender

- ○ Male
- ○ Female

What is your age in years

Is English your first language?

What is your main mode of study?

- ○ On-campus
- ○ Off-campus/Distance/Online

Are you a full-time or part-time student?

- ○ Full-time
- ○ Part-time

Do you live in Australia

- ○ Yes
- ○ No

Did you leave high school in the last 12 months?

- ○ Yes
- ○ No

Are you currently employed as well as studying?

- ○ Yes
- ○ No

If yes, how many hours do you work each week?

- ○ N/A
- ○ 1 - 5.9 hours
- ○ 6 - 15 hours
- ○ 15 - 30 hours
- ○ More than 30 hours

Are you an undergraduate or a postgraduate student?

- ○ Undergrad
- ○ Postgraduate
- ○ Other (specify)

At what stage are you at in your university course, for example Year 1 of 3

DAQ

Progress

(Smith, Quinn, & Kelly, 2015)

What one word would you use to describe the technology you are required to use at USQ?

Can you describe in a sentence or two why you chose that word?

What would you rate the level of difficulty you faced at the time, where 1 equals 'it was pretty easy' and 10 equals 'I thought it'd never get sorted out'?"

In a sentence or two describe what strategies you use, or know about, that might help you use technology.

What would you rate your level of understanding of how university technology operates where 1 equals 'it was pretty easy to understand' and 10 equals 'I thought I would never understand it'?

In what way could your experience of technology be improved?

Thinking about your answers, is there anything else that you can think of that would help you to navigate your university's technology?

Would you attend a couple of classes/workshops dedicated to computer/technology uses

- ◯ Yes
- ◯ No

When do you think is the best time to hold these workshops/classes?

- ◯ N/A
- ◯ Before Orientation week
- ◯ During Orientation week
- ◯ After Orientation week
- ◯ Other (please specify)

PSQ

Progress

Adapted from (PSI-12; Beccaria & Machin, 2011).

These questions are in relation to how you deal with problems	1 (strongly agree)	2 (agree)	3 (agree somewhat)	4 (do not care)	5 (DISagree somewhat)	6 (strongly DISagree)
Even though I work on a problem, sometimes I feel like I'm groping or wandering and not getting down to the real issue.	○	○	○	○	○	○
Given enough time and effort, I believe I can solve most problems that confront me.	○	○	○	○	○	○
When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation.	○	○	○	○	○	○
Sometimes I do not stop and take time to deal with my problems, I just kind of muddle ahead.	○	○	○	○	○	○
I generally act on the first idea that comes to my mind.	○	○	○	○	○	○
When considering solutions to a problem, I do not take the time to assess the potential success of each alternative.	○	○	○	○	○	○
When I have a problem I think of as many possible ways to handle it as I can, until I can't come up with any more ideas.	○	○	○	○	○	○
When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation.	○	○	○	○	○	○
After following a course of action to solve a problem, I compare the actual outcome with the one I had anticipated.	○	○	○	○	○	○
When faced with a novel situation, I have confidence that I can handle problems that may arise.	○	○	○	○	○	○
There are times when I become so emotionally charged that I can no longer see alternatives for solving a particular problem.	○	○	○	○	○	○
I trust my ability to solve new and difficult problems.	○	○	○	○	○	○

ETQ1

Progress

Please indicate your answer to the following questions with the answer that best describes how you agree or disagree with the following statements. These questions are about how you expect things to happen at university.

I expect to (or have already)....	Strongly DISagree	DISagree	Neutral	Agree	Strongly Agree
Understand the level of effort involved for me to succeed in my studies.	○	○	○	○	○
Receive feedback early in a course to let me know how well I am progressing in my studies.	○	○	○	○	○
Get off to a good start in my studies because I will know what is expected of me.	○	○	○	○	○
Feel like I could take charge of my own development as a university.	○	○	○	○	○
Manage my own learning better because I will have opportunities to realistically assess my skills and capabilities.	○	○	○	○	○
Develop as a person because the university will provide me with opportunities to do this.	○	○	○	○	○

ETQ2

Progress

Please indicate your answer to the following questions with the answer that best describes how you agree or disagree with the following statements.

I think I will (I have already)....	Strongly DISagree	DISagree	Neutral	Agree	Strongly Agree
Know who to ask for assistance with any concerns or issues I have about my studies.	○	○	○	○	○
Find that study related assistance and advice is readily available and easy to access.	○	○	○	○	○
Know how to organise and locate information I need.	○	○	○	○	○
Know how to raise any concerns I may have about university systems (e.g., access to technology support).	○	○	○	○	○
Have key university systems and procedures that can impact on my studies explained to me.	○	○	○	○	○
Know how to connect with support services and/or support staff if help is needed.	○	○	○	○	○

ETQ3

Progress

Please indicate your answer to the following questions with the answer that best describes how you agree or disagree with the following statements.

I expect to....	Strongly DISagree	DISagree	Neutral	Agree	Strongly Agree
Make personal connections with other students by getting involved with social activities and introducing myself to people.	○	○	○	○	○
Develop effective working relationships with fellow students in my courses.	○	○	○	○	○
Feel a sense of fellowship with the students in my year level.	○	○	○	○	○
Give and receive help and support from my fellow students (e.g. car-pooling, study groups).	○	○	○	○	○
Feel like I belong in this university.	○	○	○	○	○
Feel a part of the university because I will be known or be recognised by at least one staff member.	○	○	○	○	○
Experience positive relationships between staff in my program.	○	○	○	○	○

ETQ4

Progress

Please indicate your answer to the following questions with the answer that best describes how you agree or disagree with the following statements.

I hope to....	Strongly DISagree	DISagree	Neutral	Agree	Strongly Agree
See the relevance of what I am studying to my career plan.	○	○	○	○	○
Feel motivated to study because I can see how my chosen career relates to what I am studying.	○	○	○	○	○
Understand why my course is structured and organised the way it is.	○	○	○	○	○
See myself in my future professional role because I will have opportunities to discuss my motivations and goals for study.	○	○	○	○	○
Value being curious and open to new ideas.	○	○	○	○	○
See critical thinking as important.	○	○	○	○	○
Understand how to use information ethically by referencing correctly.	○	○	○	○	○
Work towards being independent and managing my own studies.	○	○	○	○	○