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## The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study

Benjamin Hay

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THE UNIVERSITY OF  
**NOTRE DAME**  
A U S T R A L I A

**The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study**

A thesis submitted in fulfilment of the requirements for the degree of

PhD in Nursing

School of Nursing and Midwifery

The University of Notre Dame Australia, Fremantle

2018

Benjamin Hay 208406

## Declaration

I certify that this thesis does not, to the best of my knowledge and belief:

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- iii. Contain any defamatory material.

Signature:

Benjamin Hay

Date: 5<sup>th</sup> February 2018

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-Benjamin Hay



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## Glossary

**Applications (Apps):** an application, typically a small, specialized self-contained software program downloaded onto mobile devices.

**Mobile technology:** Is a collective term used to describe the various types of cellular and Wi-Fi communication technology. They include a combination of hardware, operating systems, networking and software. Examples include portable smartphones and tablets.

**PDA (personal digital assistant):** a palmtop computer that functions as a personal organizer but also provides email and internet access.

**Smartphone:** a mobile phone that is able to perform many of the functions of a computer, typically having a relatively large screen and operating system capable of running general-purpose applications.

**Tablets:** a tablet or tablet PC (personal computer) is a portable computer that uses a touchscreen as its primary input device. Most tablets are slightly smaller and weigh less than the average laptop. eg. Apple iPad, Motorola Xoom.

**Wi-Fi:** a facility allowing computers, smartphones or other devices to connect to the internet or communicate with one another wirelessly within a particular area.

## **Abstract**

The ubiquitous use of mobile technology in today's society extends to the learning and teaching environment. Most academics in universities encourage its use, aided by libraries offering online resources. Whilst the literature highlights benefits of using mobile technology in learning, particularly for nurses to keep up-to-date, there is limited evidence on such use in clinical settings by graduate nurses in Western Australia (WA). Additionally, there is a lack of information and clarification on the use of such technology in WA hospitals. The purpose of this study was to identify and explore factors influencing the use of mobile technology by newly graduated registered nurses in the clinical area. The location of the study was in Perth, Western Australia. The study sought to answer the following questions: What factors influence nurse graduates use of mobile technology in the clinical setting? To what extent and in what ways do nurse graduates currently use mobile technology in the clinical setting? and What are the perceptions of nurse coordinators, educators and managers of graduate programs regarding mobile technology use in the clinical setting. In order to answer these questions, an explanatory, sequential, mixed method design was used.

Initially, a review was undertaken of existing policy and guidelines, regarding use of mobile technology, from both public and private hospitals. This phase of the study was followed by two major phases: (quantitative and qualitative). As a preparation to the quantitative phase, a survey was developed involving the modified use of the Technology Acceptance Model (TAM2). This model was used as the theoretical framework underpinning the study. The survey was administered online to registered nurse graduates using SurveyMonkey™. Both descriptive and inferential statistics were used to analyse the data. Findings from the data informed the next phase of the study.

Data collection for the qualitative phase of the study, involved synchronous Skype™ online text-based focus group interviews with the graduates. Additionally, nurse coordinators, educators and managers of graduate programs from both public and private hospitals, were invited to complete an online open-ended survey. Thematic analysis was used to analyse the data from this phase of the study. The

findings from both the quantitative and qualitative phases was synthesised to answer the research questions, forming a holistic picture to offer conclusions to the study.

This study is significant, as there appears to be a gap between learning with mobile technology in Universities, and its use in the clinical setting. This problem may be associated with the lack of standardised policies in the use of mobile technology, or from senior nurses' misperception of its benefits. The results of this study may lead to policies and guidelines being reviewed and implemented by local healthcare agencies, and could lead to review of current mobile technology integration into nursing undergraduate degrees.

# Chapter 1

## Introduction and Background

### Introduction

Chapter one provides an introduction and background to the study. It portrays the issues and problems underpinning the study and clarifies the purpose, research questions objectives and significance. Additionally, it discusses the role of researcher reflexivity, and details the researcher's previous experience that underpinned the study. This chapter will conclude with an overview of the thesis chapters.

### Issues and problems underpinning the study

Healthcare is increasingly technology-dependent with mobile technology devices connecting to national and international information. Many health professionals use mobile technology to guide clinical care and for continuing education. Health resources such as e-books, point of care guides, drug guidelines and search engines provide access to up-to-date research, guidelines and protocol's that support the use of evidence based practice. Additionally, these devices enable communication and networking with other health professionals. A benefit of mobile technology is that it can fit conveniently into a person's pocket.

The number of health professionals using smartphones and other mobile devices in the clinical setting is increasing (Mosa, Yoo & Sheets, 2012). A systematic review of healthcare applications for smartphones found that smartphones make useful tools for evidence-based practice at the point of care, for mobile clinical communication and for remote monitoring of patients. Importantly, smartphones can play a very important role in patient education and self-management of disease (Mosa, Yoo & Sheets, 2012).

University libraries encourage smartphone and tablet access to resources available online, through University student and staff portals. These resources are carefully selected, with access to hospital and health organisations to assist in the transition from theory to practice in clinical settings for students in health related



courses. The literature suggests students in the learning environment of a University and nurses in clinical settings are motivated to use mobile technology. Healthcare applications for mobile technology are known to enhance learning and productivity (Farrell & Rose, 2008; George, Davidson, Serapiglia & Barla, 2010; Koeniger-Donohue, 2008; Hudson & Buell, 2011; Patillo, Brewer & Smith, 2007; Wu & Lai, 2009; & Secco, Jamieson, Profit, Bailey, Brennick, Whitty-Rodgers, 2010).

A number of health institutions worldwide have embraced mobile technology. One Canadian hospital, for example, supplied approximately 2,000 iPad2 units to health professionals, following a successful pilot study into the use of mobile technology. The hospital also developed an in-house app called the 'Clinical Mobile Application' to provide physicians with access to information resources as well as the ability to view diagnostic results. The hospital enhanced the app with a picture archiving and communication system (PACS) viewer, and voice recognition system for recording electronic physician orders and notes (Mobile Healthcare Today, 2011).

Anecdotally, in WA hospitals, there is a lack of information and clarification on the use of mobile technology in the clinical settings. In some clinical settings, nurses are instructed in memos to switch off their mobile technology, despite there not being any policy or guideline supporting this action. Other clinical settings appear to have a more liberal policy, allowing nursing staff to utilise mobile technology with specific guidelines for its use. Initial enquiries into hospital guidelines/regulations and policy regarding mobile technology revealed inconsistencies across health services and lack of information regarding staff and students using their own devices in the clinical settings.

There are also inconsistencies within the hospital systems regarding access to resources offered by the library services. For example, at the Child and Adolescent Health Service in Perth WA, mobile technology has been embraced through online subscriptions to resources. Recommendations on applications (apps) and websites have also been communicated to staff and students. Unfortunately, however, nursing staff are prohibited to use smartphones in clinical settings with regular memos reminding staff of this directive (personal communication, The Head of Department for the Library and Information Service 13<sup>th</sup> May 2013).

Similarly, at one major public hospital in Perth there are a large number of resources available for staff and students using mobile technology. The library staff make these resources available by promoting and supporting their use (Head of Department, Library and Information Services, personal communication, 14<sup>th</sup> May 2013). Currently, evidence suggests that medical staff are allowed and encouraged to use this technology in clinical settings. In an Intensive Care Unit (ICU) for example, medical staff were permitted to use mobile technology, but they must be a minimum of 1 metre from medical equipment. Nurses in the same unit, however, were instructed to turn off mobile phones (Clinical Nurse Manager of an Intensive Care Unit memorandum, 16<sup>th</sup> November 2005).

Nurses, midwives and student nurses are bound by a standard of practice, which guide the provision of care dictated by Nursing and Midwifery Board Australia, (2008). Currently, there is a policy outlining issues regarding social media. These do not, however, detail the use of mobile technology. In a hospital environment, nurses, midwives and nursing students are obligated to practice under the guidance of hospital policies, guidelines and standards with direction from nurse managers, nurse educators and nurse executives. The hospitals and other healthcare agencies, expect the same professional standards from students as their staff. These include professional presentation, punctuality, work ethics and standards of practice (Levett-Jones & Bourgeois, 2007).

Within the WA public healthcare hospital system, the Department of Health (DOH) provides operational directives and information circulars to inform staff and others of state-wide policies, guidelines and frameworks applicable to people who work in the public healthcare system. These modes of communication operate through:

**Operational Directives:** Operational directives are policy statements that are approved by the Director-General of Health and are mandatory for all WA Health staff to comply with.

**Information Circulars:** Information Circulars (IC's) are documents that provide advice or guidance within WA's public health system. IC's are not policy statements, although they may be used to advise the existence or change in status of a policy statement (Government of Western Australia, Department of Health, 2015, p.1.).

The Department of Health (2015) lists two policies and guidelines for mobile technology use in clinical settings. Mobile telephone policy and guideline (OD 0337/11) only applies, however, to mobile devices supplied by the Department of Health. An acceptable use policy-information and communications technology (OD 0468/13) discusses computing using WA health resources. Neither of these policies, however, address the use of personal, mobile devices.

Within the Universities in WA that offer an undergraduate nursing degree, it is an expectation that students use their mobile technology on their clinical practice rotations. This directive is provided in an online format in the Nursing Competency Assessment Schedule (NCAS). This documentation provides formal evidence that a student has attended their clinical rotation, and has met the Nursing and Midwifery Board of Australia (NMBA) registered nurse standards for practice (2016). In addition, the NCAS document is a standardised assessment tool used by students and facilitators in many Universities across Australia.

University libraries encourage smartphone and tablet access to resources available online, through University student and staff portals. These resources are often recommended by academics and industry professionals and are utilised for teaching and learning purposes within specific healthcare courses. Additionally, many universities have designed software for mobile technology, together with best practice guidelines for educators and students. This has facilitated the role of the educator to change, as students engage in more informal learning outside the classroom (Johnson, Adams Becker, Cumins, Estrada, Freeman and Ludgate, 2013). It is suggested that the future for tertiary education will be defined by students being able to work, learn and study whenever and wherever they want, using their own mobile technology (Johnson, Adams and Cumins, 2012). For nursing academics, the challenges to the use of mobile technology for learning, lies in balancing learning resources with policies, guidelines and standards in clinical settings.

Technology has a direct influence on knowledge, skills, practice, values, ethics, and politics within nursing (Barnard, 2015). With a rapidly changing society, the meaning and implications of technology for nursing practice alters. This brings ongoing challenges for the new graduate and experienced nurses (Barnard, 2015).

The problem arises when students want to use their mobile technology in hospitals that do not have a policy or guideline on its appropriate use.

Thus, there is a need to investigate what factors may influence mobile technology use for nurse graduates; to what extent they may currently use the technology for the betterment of patient care; and to investigate the role of their supervisors when directing the graduate to use or not to use within the clinical setting.

### **Study purpose**

The purpose of this study was to identify and explore factors influencing nurse graduates use of mobile technology in clinical settings in Perth, Western Australia.

### **Research questions**

1. What factors influence nurse graduates use of mobile technology in the clinical setting?
2. To what extent and in what ways do nurse graduates currently use mobile technology in the clinical setting?
3. What are the perceptions of nurse coordinators, educators and managers of graduate programs, regarding mobile technology use in the clinical setting?

### **Objectives**

- Review existing policies and guidelines for mobile technology use in the clinical settings;
- Develop a survey based on the proposed theoretical TAM2 framework and undertake construct validity testing;
- Describe findings from the survey;
- Synthesize the findings from the survey to frame questions for the online text-based focus group interviews with nurse graduates;
- Investigate the role of nurse coordinators, educators and managers of graduate programs, regarding mobile technology;

- Synthesise the findings from both the quantitative and qualitative phases of the study;
- Provide recommendations from findings.

### **Study significance**

This study is significant in that currently there are few standardised policies issued by healthcare institutions to guide the use of mobile technology in the clinical setting. This issue has created a potential gap between learning as a student nurse in the University setting and the application as a graduate in clinical setting. The results of this study may lead to policies and guidelines being reviewed by local healthcare agencies and may lead to review of current mobile technology integration into an undergraduate degree. Importantly, mobile technology may help to bridge knowledge gaps graduates may have, and increase their confidence at the point of care, which can lead to better patient care. There is a need to delve more deeply into the complexities of technology in nursing, as it is a major influence in healthcare outcomes and experiences (Barnard, 2016). Further evidence is required that addresses the relationship between nursing and technology by examining: its effects in the clinical setting; efficiencies; its relationships between nursing and caring; and the range of philosophical questions that may arise from the empowering of people in their healthcare choices (Barnard, 2016). Some scholars suggest, that it is our duty as nurses within a patient advocate role, to occupy ourselves with the errors, advantages, difficulties, and temptations of technology for the benefit of those who most need our assistance and advocacy (Barnard, 2016).

### **Study context and setting**

There are approximately 1045 student registered nurses graduating annually from four universities in Western Australia (Parliament of Western Australia, 2013; Nursing and Midwifery Office, 2014). These include the University of Notre Dame Australia (UNDA), Edith Cowan University (ECU), Curtin, and Murdoch Universities. Students from these universities will have spent a considerable amount of time in clinical settings across both the public and private healthcare sectors in WA. Graduates having completed their undergraduate nursing degree, are registered

as a health practitioner with the Australian Health Practitioner Regulation Agency (AHPRA). Registration is mandatory for all nurses and midwives in Australia in order to meet the regulatory standards for practice.

The majority of new nurse graduates apply to the Health Department's GradConnect system. This online system lists graduate nurse programs available across a number of metropolitan and country locations and includes both public and private hospitals (Parliament of Western Australia, 2013; Nursing and Midwifery Office, 2014). The majority of graduate programs are located at Fiona Stanley Hospital (FSH); Royal Perth Hospital (RPH); Sir Charles Gairdner Hospital (SCGH); and St. John of God Hospitals (SJOGH)-Murdoch and Subiaco.

### **Researchers background**

When investigating what factors may influence mobile technology use for nurse graduates, a mix of research methods and methodologies was required. As both quantitative (objective) and qualitative (subjective) methods were utilized within the study, it was important to acknowledge the role of reflexivity and how the researchers underlying values, assumptions, and beliefs may have affected the research process (Lockyer, Gondocz, & Thivierge, 2004). This transparency was important from a qualitative perspective, as reflexivity has also been identified as a resource rather than a cause of bias (Liamputtong, 2009). Furthermore, when reflexivity was transferred from knowledge to recommendations (actions) in the later stages of the study, the researcher was able to recognise possible biases and perceptions from within the field of practice (Alley, Jackson & Shakya, 2016). Thus, the following description provides details of the researcher's previous experience and background that underpins the study and is written in the first person.

As a senior registered nurse (RN), I have worked mainly in critical care areas in both a clinical and education role. Within these roles, I have observed new staff and students to the Intensive Care Unit (ICU) facing significant stressors, such as the high acuity of the patients. In my experience, an additional challenge was that most of the resources such as hospital policies, drug guides and guidelines, which were previously available in the nurse's station, moved to the hospital intranet that could only be accessed with a secure password by regular staff.

As a nurse clinician and educator I noted a culture of sharing many new and exciting innovations in mobile technology that could assist nurses to provide patient care. For example, mobile technology apps provided basic translation for patients, whilst waiting for formal interpreter services. Additionally, when learning about a new piece of equipment such as a ventilator for example, a mobile ventilation app simulator, enabled flexible learning in a less scary situation than if the ventilator was connected to a patient. Another use of mobile technology was being able to search for an unfamiliar medication or disease at the bedside. Subsequently, increased confidence was noted in being more prepared, when speaking with family members about their significant other's illness and medications.

When there was a transition to a ward PC (Personal Computer) for every ICU bedspace, nursing management debated, whether to allow each ward PC to be connected to the Internet. At the time, they felt that nurses could have become distracted from patient care. Such attitudes led me to believe, that there was an element of mistrust and paternalism from nursing management. Although most bedside ward PC's were eventually connected to the internet, access was still a challenge for graduates and students due to difficulties with accessing the system; their unfamiliarity in navigating the hospital software and the available resources to find information required.

A further challenge to graduates was the potential to be viewed by others as behaving unprofessionally when using mobile technology for learning or at the point of care. I noticed graduates continually trying to justify their appropriate use of mobile technology. In contrast, however, many awake or longer term ICU patients would use their mobile technology, to stay in contact with family members; for entertainment; or to communicate with staff if they were unable to speak due to an artificial airway device.

A fear of interaction with ICU equipment was a concern for nursing management, with most visitors being asked to turn off their devices. The same instruction, however, was not enforced for medical staff, who often received calls and frequently used their devices at the bedside to communicate, and find information and resources at the point of care. Underpinning these discrepancies was

the lack of hospital policies or guidelines directing the use of mobile technology. Such direction came from nursing management, who varied in their support.

Since transitioning to academia, I noted nursing students were encouraged to access most of their University resources on their mobile phones, iPad's, and laptops for their learning, assessment, and communication. Students accessed eBooks; apps for medication calculations; course outlines; University policies; University maps; and enrol into courses.

Based on my experience, it was pertinent to investigate: the factors that may have influenced graduates use of mobile technology; to what extent they currently use the technology; and to investigate the role of that their supervisors play when directing the graduate in the use of mobile technology in the clinical setting. The assumption was, that discrepancies and inconsistencies related to mobile technology, has created a potential gap in the transition of theory to practice for newly graduated nurses in clinical settings.

## **Conclusion**

In conclusion, chapter one has highlighted the discrepancies and inconsistencies related to mobile technology use in the clinical setting. Such factors may have created a potential gap in the transition of theory to practice for nursing students and newly graduated nurses. An assumption is that these factors may be associated with a lack of standardised policies across clinical settings. In order to investigate what national and international studies have found in relation to graduate's use of mobile technology in the clinical area, chapter two will provide an overview of the literature.

The literature review, will briefly discuss key concepts associated with mobile technology use by nurse graduates. These concepts will set the background for the proposed study and will include: nursing students and graduates use of mobile technology; mobile technology in learning and teaching; mobile technology use by health professionals; policies and guidelines associated with mobile technology in the clinical setting; and factors influencing the use of mobile technology in healthcare.



Chapter three details the methodology, including the mixed method explanatory sequential design used in the study. It will also provide a brief discussion on the philosophy underpinning mixed method approach to research. The remainder of the chapter concerns the development and testing of the draft survey.

Chapter four describes the quantitative phase of the study. It will detail the process involved in the promotion and administration of the online survey, the data collection methods, and the subsequent analysis and presentation of the results. It will provide an overview of the findings that required more explanation and exploration, that were subsequently used to develop the open-ended questions for the online text-based focus group interviews.

Chapter five described the qualitative phase of the study. It will detail the sequence of methods, analysis of data and the finding. It will conclude with a brief synopsis of the chapter prior to the final discussion chapter.

Chapter six provides a synthesis of the findings from both the quantitative and qualitative phases of the study, juxtaposing them with the research questions. The chapter concludes by discussing the limitations of the study, together with recommendations.

## **Chapter 2**

### **Review of the Literature**

#### **Introduction**

This literature review identifies and briefly discusses key concepts associated with mobile technology use by nursing graduates. These concepts will set the background for the proposed study. It will include nursing students and graduates use of mobile technology; mobile technology in learning and teaching; mobile technology use by health professionals; policies and guidelines associated with mobile technology in the clinical setting; and factors influencing the use of mobile technology in healthcare.

A systematic search of the research literature was performed using the universities electronic online databases based on the key concepts highlighted above. The online databases included for example: CINAHL, MEDLINE, PubMed, Cochrane Library, JAMA Network, New England Journal of Medicine, and Science Direct. A broad list of keywords were included in the search which included: mobile technology, personal digital assistants (PDA's), hand held computers, laptops, notebooks, smartphones, nursing education, information communication technology (ICT), Information technology (IT), nurse education, and elearning. Keywords were then searched in the results which included: barriers, enablers, attitudes and perceptions. Inclusion and exclusion criteria was based on recency of peer-reviewed papers that linked to the key concepts. Information sourced was appraised using the 'RADAR-test' framework (Mandalios, 2013).

#### **Nursing students and graduates use of mobile technology**

Undergraduate nursing students have found that mobile devices can increase their self-confidence (Goldsworthy, Lawrence & Goodman, 2006; Johansson, Peterson & Nilsson, 2013; & Wu and Lai, 2009) enhance their learning (Farrell & Rose, 2008; George, Davidson, Serapiglia & Barla, 2010; Koeniger-Donohue, 2008; Patillo, Brewer & Smith, 2007; Wu & Lai, 2009; Secco, Jamieson, Profit, Bailey, Brennick,

Whitty-Rodgers, 2010; & Hudson & Buell, 2011) and assist in integrating theory to practice (Wu and Lai, 2009). Recent trials of mobile technology use by student nurses in their clinical practice, have demonstrated successful integration into clinical practice. These trials revealed benefits for clinical practice including access to point of care resources such as: drug references; enhanced learning in the clinical setting; maintenance of patient safety; efficiency of care; and staff satisfaction (Farrell & Rose, 2008; George, Davidson, Serapiglia, Barla, & Thotakura, 2010; Hudson & Buell, 2011; Koeniger-Donohue, 2008; Patillo, Brewer & Smith, 2007; Secco, Jamieson, Profit, Bailey, Brennick, Whitty-Rodgers, 2010; Wu & Lai, 2009).

A United States (US) study of 89 undergraduate nursing students and graduates use of mobile technology, found that 96% of students used their personal digital assistants (PDAs) in the clinical setting, 67% in the classroom and 56% for personal use. Eighty percent of participants used their mobile device as a reference in education, with medication/drug guides being the highest references utilised (97.9%), second to medical dictionaries (83.3%). Seventy one per cent of students indicated that their PDA improved their efficiency, with 100% indicating that it was an effective educational tool (George, Davidson, Serapiglia, Barla & Thotakura, 2010). Likewise, in a similar US survey of 3900 registered nurses and students, it was found that 85% had an application version of a drug guide, with 71% using a smartphone at work. Sixty six per cent of nursing students used their smartphone in nursing school with 85% of them suggesting they would like the drug application guide (Dolan, 2012).

As medicines are the most common treatment in healthcare, they are also associated with higher incidences of errors and adverse events which can lead to injury and death (Australian Commission on Safety and Quality in Health Care [ACSQHC], 2008). In Australian hospitals, problems associated with medication is one of the highest reported adverse events incidents in which harm to a patient may occur (Australian Institute of Health and Welfare [AIHW], 2017). A recent literature review reviewing the extent of medication errors and adverse drug reactions in Australian hospitals, revealed medication safety continues to be a significant problem. In hospitals in Australia, there are an estimated 230,000 medication related admissions each year with an associated annual cost of \$1.2 billion (Roughhead, Semple & Rosenfeld, 2017).

Many solutions have been discussed to assist in preventing medication errors which includes the use of technology at the point of care. The National Safety and Quality Health Service (NSQHS) ten standards were created to assist all health service organisations in Australia to deliver safe and high quality care. From the ten standards, standard four relates to medication safety. Within standard four, recognised solutions for reducing common causes of medication errors can include: improving clinical workforce and clinician-patient communication; using technology to support information recording and transfer; and providing better access to patient information and clinical decision support at the point of care (ACSQHC, 2012).

Responsibility for meeting Standard Four is shared from a range of professionals that includes nurses at varying levels in healthcare settings. The ACSQHC states that systems should be developed considering local circumstances, with consideration of individual roles and resources using information technology, equipment, staff, education and training (ACSQHC, 2012). Personal use of mobile technology at the point of care may assist in meeting standard four for healthcare settings and may assist in reducing medication errors for nurse graduates and students. Further research is required, therefore, to investigate the role of mobile technology at the point of care for improving safety with medication administration, for nurse graduates transitioning from University to clinical settings.

A recent study within the U.S. with first year nursing students, revealed that 90% of students planned to continue using healthcare smartphone apps as a clinical resource, having used them in the University settings and in clinical rotations (George, DeCristofaro, Murphy, & Sims, 2017). The authors suggest, it is important to encourage students to use these resources early within the curriculum (George, DeCristofaro, Murphy, & Sims, 2017). This research implies that mobile technology for learning and as an ongoing clinical resource, is encouraged at an early stage within undergraduate nursing programs.

Previous research with student nurses using mobile technology, supports the notion that students access resources they are familiar with from their University setting (Kuiper, 2008; Williams and Dittmer, 2009). In two studies which involved student nurses using their mobile technology clinically, students found online mobile technology more useful than text-based resources, and were more likely to access

evidence based resources with this method (Kuiper, 2008; Williams and Dittmer, 2009). In another study, confidence was increased for nursing students when they were able to view video files of clinical skills on mobile technology such as an iPod. The clinical skill was performed based on the modelling demoed in the video file through this format (Clay, 2011). Further research is required to investigate if nurse graduates access similar resources from their University training on their mobile devices, as a bridge from University to the clinical setting.

Similarly, research into mobile technology use with third year nursing students from two nursing schools in South Korea, found that 46.2% used them during clinical practice, and the majority of those surveyed (83.7%) had observed nurses using them clinically (Cho & Lee, 2016). The authors argued that educators and faculty of nursing schools should develop policies that encourage intelligent and safe use of mobile technology during clinical rotations (Cho & Lee, 2016).

An important and recent study with nursing students, found that educators can enhance the benefits of mobile technology use in academic and clinical settings (Williamson & Muckle, 2017). Benefits were noted through improved delivery methods, practice methods, and strategies to keep students engaged and prepared (Williamson & Muckle, 2017). It is argued that these initiatives would ensure that nursing students are even more prepared for the transition into the clinical workforce (Williamson & Muckle, 2017). Another study in the U.S. with nursing students using personal digital assistant (PDA's) in both clinical and classroom settings, identified similar strategies to enhance use of mobile technology clinically. These included having preceptors and nursing staff who were competent in using the resource (Hudson & Buell, 2011).

A critical review of the literature regarding mobile technology use in clinical nursing education, found a lack in the current body of evidence for a clear definition of what mobile technology is, and where its boundaries lie in clinical nursing education (O'Connor & Andrews, 2015). In addition, the authors identified conflicting reports of patient and staff attitudes towards mobile technology use in clinical areas. They suggest further research is required to explore these issues in more detail so nursing education and practice can move into the future (O'Connor & Andrews, 2015). Addressing the many sociotechnical barriers is required when

implementing mobile technology within the clinical areas (O'Connor & Andrews, 2015).

### **Mobile technology in learning and teaching**

Smartphone use and mobile technology has carved a niche in the area of tertiary education. This is associated with: portability of Wi-Fi; cellular networks; apps; and high-resolution screens. These communication technologies have provided learning in and out of the classroom (George, Davidson, Serapiglia & Barla, 2010; Johansson, Petersson, & Nilsson, 2013; & Johnson, Adams & Cumins, 2012). Currently, students use mobile technology to assist their learning needs both on and off campus (Smith, Raine, & Zickuhr, 2011; Tindell & Bohlander, 2012). An Australian project investigating the use of iPods by student nurses studying off campus, found that there were significant benefits. These included an enhanced learning experience for the students and a positive teaching experience for educators. Although challenges arose from: connectivity difficulties; small screen sizes; compatibility of learning resources; and technology literacy levels, both students and educators were innovative and resourceful in managing these problems (Martyn, Larkin, Sander, Yuginovich, & Jamieson-Proctor, 2013).

In contrast however, researchers in the U.S. who studied undergraduate students enrolled in four different degrees, found that increased use of cell phones was associated with decreased academic performance. It was suggested that based on these findings, a review of policies affecting the use of mobile phones should be conducted in academic environments (Lepp, Barkley & Karpinski, 2015). Correspondingly, another U.S. study demonstrated that whilst 95% of students brought their mobile phones to their undergraduate class, 92% used their device to send text messages unrelated to their learning (Tindell & Bohlander, 2012).

It has been recently argued by some authors, that there is no such thing as a digital native who is able to engage and utilise technology information systems due to being simply being born into it (Kirshner & De Bruyckere, 2017). Instead however, it is argued that educators should review the learners: cognitive knowledge and skills, their attitudes and dispositions, and their meta-cognitive knowledge and skills rather than assuming their digital native status (Kirschner, 2015). Within

beginning stages in school settings when learner's own mobile devices are encouraged, it is suggested that educators know when to use and when not to use these tools to teach by example (Kirshner & De Bruyckere, 2017).

A Canadian literature review found 52 studies relating to integrating mobile devices into nursing curricula. These consisted of randomised controlled, quasi experiments, qualitative and mixed methods studies. Findings from these studies suggested that there were benefits for nursing students in using mobile devices. Implementing such devices, however, posed challenges such as a lack of administrative support, and time/funding for education of faculty and students (Doyle, Garrett & Currie, 2013).

Correspondingly, the Canadian Association of Schools of Nursing (CASN) has embraced the integration of nursing informatics in curricula and professional practice by developing competencies expected on graduation. The competencies consisted of three domains: information and knowledge management; professional and regulatory accountability; and use of information communication technology (ICT). An overarching competency stated that the RN, as part of their undergraduate education and for entry-to-practice: 'uses information and communication technologies to support information synthesis in accordance with professional and regulatory standards in the delivery of patient/client care' (CASN, 2012, p.5). The CASN promoted the development of a culture within nursing education that embraced the integration of nursing informatics in curricula and professional practice. It suggested this be achieved by: dialogue amongst key players for integration of nursing informatics into nursing; increasing the capacity of nurse educators to teach nursing informatics; and to develop nursing informatics outcome based objectives for undergraduate curricula (CASN, 2012).

An U.S. study assessing undergraduate and graduate nurse programs for nursing informatics competencies, found that they were competent in: basic computer knowledge; attitude to clinical informatics; and wireless device skills. In contrast, however, the students perceived themselves as not competent in applied computer skills and in the clinical informatics role (Choi & De Martinis, 2013). These later findings point to the skills needed for future nurses in informatics and the establishment of a baseline of informatics competencies in nursing curricula.

Recommendation from nurse leaders and healthcare stakeholders in the U.S., argue that competencies in informatics are needed to adequately prepare students for evidenced-based practice and safe nursing care, on graduating into professional practice (Hebda & Calderone, 2010).

Findings from an Australian literature review on eLearning and ICT in nursing education, found students needed ongoing support and education with nursing informatics. It was argued that this initiative would enable lifelong learning skills for evidence-based care. To enable this process to take place, it has been suggested that increased time and adaption of education methods would be required by educators to incorporate eLearning into their teaching practice (Button, Harrington & Belan, 2013).

Many nursing programs in the U.S. have integrated informatics into the clinical, classroom and laboratory settings. It has been suggested, however, that more work needs to address constraints on mobile technology in the clinical settings. Concerns have also been raised in relation to cost factors such as; lack of IT support; lack of faculty acceptance; role modelling; and activities encouraging mobile technology (Raman, 2015).

Previous literature suggested nursing students used mobile technology devices in the form of tablet computers, to mentor and educate other nursing students (Bogossian, Kellett, & Mason, 2009). In relation to the influence of others, and role modelling, nursing staff gave positive feedback to students using mobile technology for education and learning, as they viewed its integration in education as progression of the nursing profession (Bogossian et al., 2009). In the same study however, some nursing students were reluctant to use their mobile technology resource due to the potential unprofessional image implications in front of patients (Bogossian et al., 2009).

Research conducted in New Zealand with nurse managers and nursing students in regards to mobile technology use in clinical settings, revealed students preferred its use as an educational referencing tool for clinical decision making (McNally, Frey, & Crossan, 2016). Managers in the same study however, perceived its use as unprofessional, and did not trust younger cohorts of student nurses to act ethically when using this technology. The authors recommend that without a change



in the perceptions held by nurse managers, with resolution of the valid safety concerns, the use of mobile technology in clinical areas may remain covert and unregulated (McNally, Frey, & Crossan, 2016).

### **Mobile technology use by healthcare professionals**

Information and computer technology are changing the way that health professionals deliver patient care (Smedley, 2005). This change is associated with the advances in healthcare technologies. Nurses face the challenge of managing quality, safe patient care with an increase in clinical information and technological advances (Doran, Haynes, Kushniruk, Straus, Grimshaw, Hall, Dubrowski, Di Pietro, Newman, Almost, Nguyen, Carryer, & Jedras, 2010). A pilot study aimed at assessing nursing students' technology skill level and perceived barriers to technology, found that learning new technologies was seen as important for advancement within nursing. Students perceived that although technology skills were not critical to entering the nursing field, they felt these skills were critical to their current position and essential for their promotion. The participants felt that although they valued technology, training and exposure were major barriers to learning new technologies in the workplace (Virgona, 2013).

An Australian survey of 43 health professionals, found that 91% owned a mobile phone, and 87% used their personal mobiles to support their clinical practice. Despite these findings, however, the participants had reservations in using their mobiles in the clinical setting. Concerns related to patient confidentiality; cross-infection; whether apps were permitted at their workplace; and whether patients and colleagues might perceive that the mobile was being used for non-work purposes (Koehler, Vujovic & McMenamin, 2013). Despite these reservations, there continues to be an increase in the number of health professionals using smartphones and other mobile devices in the clinical setting (Mosa, Yoo & Sheets, 2012).

In a survey of 821 nurses, 75% owned a smartphone and 66% had an iPhone or iPad device (Springer Publishing, 2011). According to a survey of 130 hospitals in the US by networking vendor Aruba Networks, about 85% of hospitals allowed employees to bring and use their own mobile devices, including cell phones, smartphones, laptop computers and tablets. Within these hospitals, more than 50%

allowed employees to access the hospital Internet, about a quarter allowed them some access to hospital applications, whilst only 8% allowed full access to the hospital network (Aruba Networks, 2012).

Recent research into personal smartphone use by nurses in acute care settings in the US across six hospitals, revealed whilst most participants (98%) used a smartphone in the acute care setting, participants older than 50 years were less likely to use a smartphone in acute care settings and to agree with the benefits of smartphones (Flynn, Polivka, & Behr, 2017). Based on the results of the study, the authors concluded a critical need exists for acknowledgment that smartphones are used by point-of-care nurses in many ways, and that a need for realistic policies for its use is required. Patient care would then be enhanced and potential distractions for nurses would be minimized (Flynn, Polivka, & Behr, 2017).

A cultural change in regards to the clinical use of mobile technology has been identified in recent literature (Farrell, 2016). Qualitative findings of a recent mixed method study with the use of iPhones by nurses, reported that using mobile technology was integral to the modernization of the workplace (Farrell, 2016). Furthermore, the study reported a degree of evolution and change was occurring in ward culture for mobile technology use (Farrell, 2016). In moving into the future, however, it was suggested in the study that a larger screened device such as an iPad would have benefits in patient education. The iPad might not be as useful for communication, however, as it cannot be put into your pocket like a smartphone (Farrell, 2016).

A systematic review of healthcare apps for smartphones found that they made useful tools in the clinical setting. They were used in providing evidence-based practice at the point of care, for mobile clinical communication, and for remote monitoring of patients. Importantly, smartphones could play a role in patient education and self-management of health (Mosa, Yoo & Sheets, 2012).

An Australian study of nurses' use of an online website evidence resource at the point-of-care, revealed 58% of nurses had heard of the site, with 70% of the sample using the websites. Senior nurses more than other nurses most frequently used the resource and had a greater awareness of the site. Whilst the resource was used to fill knowledge gaps and for personal education, findings indicated that

managerial and supervisor support was significant in legitimising information seeking (Gosling, Westbrook & Spencer, 2004).

A UK-based, multicentre, cross-sectional survey study, explored the ownership rates and use of smartphones among doctors and nurses in the clinical setting. Across five hospital sites, 98% of doctors and 95% of nurses owned a smartphone, with 92% of doctors and 53% of nurses finding them 'very useful' or 'useful' in performing their clinical duties. Medical apps were used as part of their clinical practice with 89% of doctors and 67% of nurses accessing these from their smartphones. Staff sent patient related clinical information on these devices, which raised concerns for healthcare organisations to develop policy to support the safe and secure use of these technologies (Mobasheri, King, Johnston, Gautama, Purkayastha & Darzi, 2015).

### **Policy and guidelines associated with mobile technology use in the clinical setting**

In the clinical setting, nurses, midwives and nursing students are obligated to practice under the guidance of hospital policies, guidelines and standards with direction from nurse managers, nurse educators and nurse executives. For new nurses in the clinical setting, the challenge in using mobile technology for learning, means balancing learning resources with these regulations. There could be a potential gap in the transition of theory to practice when there are discrepancies and inconsistencies with policies and guidelines addressing the use of mobile technology. In a UK study, challenges affecting compliance when distinguishing between essential and irrelevant policies and guidelines within hospitals, was found to affect staff morale. Issues such as: policy and guideline length; complexity; accessibility; volume; and failures to consult with other health professionals; were seen to be part of the challenge. The study recommended rationalisation and the standardisation of policies and guidelines at national and local levels (Carthey, Walker, Deelchand, Vincent & Harrop Griffiths, 2011).

The National Institute for Health and Care Excellence (NICE) launched two apps concerning evidenced-based clinical guidelines. These were freely available for National Health Service (NHS) staff on their mobile devices. This initiative suggested that the message to clinical staff is that it is acceptable to access these

guidelines on mobile devices in clinical settings (Moore, Anderson, & Cox, 2012). Locally in WA, Sir Charles Gairdner Hospital (SCGH) nursing staff are encouraged to access professional development and educational opportunities using a scanned quick response (QR) code on posters located around the hospital. This code is a two dimensional (2-D) matrix that is often referred to as a barcode (Denso, 2011). It can be scanned by mobile device apps that enables an Internet link to access the information contained in the poster. Staff are encouraged to scan the QR code for a 'registration form', or for a 'smartphone form'. It is assumed that staff can use their mobile devices, but there are no accompanying guidelines for their use in clinical settings.

Within the clinical setting, many hospitals originally banned phones due to anecdotal evidence and fear that they might interfere with clinical monitoring of patients and pacemakers. The Australian Mobile Telecommunications Association (AMTA) reported however, that neither the American Medical Association (AMA) nor the UK Medicines and Healthcare products Regulatory Agency (MHRA) condone blanket bans on using mobile phones in hospitals. Alternatively, both these organisations encourage hospitals to develop local guidelines to minimise the risk of interference, by taking into account local circumstances, including the location of sensitive medical equipment (Australian Mobile Telecommunications Association [AMTA], 2015). The risk from interference, however, appears to be low. The Mayo Clinic in the U.S. conducted 510 tests of 16 different medical devices with 6 cellular phones. Only 1% of the tests performed, demonstrated clinically important interference. The researchers suggested that if no clinically important adverse effects occur as a result of using cellular telephones in the hospital, then it seems that the advantages that this technology brings to the institution and patients would be well received (Tri, Severson, Firl, Hayes & Abenstein, 2005). Although there remains a low risk for interference, most organisations and critical care areas are advised to keep mobile phones one metre away from the bedspace (Lieshout, Veer, Hensbroek, Korevaar, Vroom & Schultz, 2007). This is consistent with evidence of discrepancies within the clinical settings, where (as previously highlighted) a memo to clinical ICU staff indicated medical staff can use mobile devices at least 1 meter from equipment, but nurses are instructed to turn off these devices.

A study reporting the perceptions of administrators, staff and project leaders about factors influencing implementation of nursing best practice guidelines, found that individual, organisational and environmental issues influenced guideline implementation. The study recommended that best practice guidelines could be better implemented, by tailoring them to specific groups of stakeholders and to the individual practitioner (Ploeg, Davies, Edwards, Gifford & Miller, 2007). Role modelling evidence-based practice, was found to be an important factor in the transition from novice to expert practitioner with nurse leaders providing pivotal support (Buonocore, 2004; Byram, 2000).

Correspondingly, the authors of a recent important discussion paper regarding benefits and barriers of mobile technology use at the point of care for nursing in Australia, highlight the need for appropriate governance in healthcare environments. The authors argue, due to the rapid uptake of mobile technology use, a paradox exists in clinical settings. Although mobile technology use is recognised to enhance nursing practice, and for ongoing learning and development, nurses are limited by unclear guidance. Within Australia, the Australian Nursing and Midwifery Accreditation Council (ANMAC) states that nursing programs require the inclusion of nursing informatics and technology (Australian Nursing and Midwifery Accreditation Council [ANMAC], (2012); & Australian Nursing and Midwifery Accreditation Council [ANMAC], (2014)). Reform is required in clinical settings however, to enable implementation at the point of care (Mather, Gale, & Cummings, 2017). In Australia, the rapid uptake and use of mobile technology has outpaced its governance within healthcare settings (Mather, Gale, & Cummings 2017). The authors argue that although mobile technology use is recognised to enhance nursing practice, and for ongoing learning and development, nurses are limited by unclear guidance from governing bodies (Mather, Gale, & Cummings, 2017).

Furthermore, an Australian study revealed that for undergraduate nurses, personal and professional use of information technology has outpaced the development of policy, or codes of practice for guiding its use in the workplace (Mather, Cummings & Allen, 2014). The study revealed that undergraduate nurses limit their access to non-work or non-patient centred information when undertaking work integrated learning, but expect easy mobile access to ensure safe and competent care (Mather, Cummings & Allen, 2014).

An integrative review of nurse's attitudes toward meaningful use technologies like mobile technology, revealed that nurses' perceptions of meaningful use technologies are most influenced by peer support and the overall effect of the technology on existing processes and workflow (Scott, 2017). These meaningful use technologies intend to improve healthcare quality, safety, and care coordination (Scott, 2017). The author suggested that proactively engaging nurses as full stakeholders in implementing and improving these technologies can increase acceptance and positive perceptions of its use, to ensure improvements in patient care (Scott, 2017).

A recent study focused on the perceptions and experiences of nurse managers in British Columbia in the Bring Your Own Device (BYOD) phenomenon within nursing practice. The study suggested specific policy was required about how personal mobile technology should be used in clinical settings, and this included boundaries and expectations of use (Martinez, Borycki, & Courtney, 2017). A recent study of nurse leaders in the U.S. into the clinical use of personal mobile technology with staff, suggested more concerns than benefits. The study, however, suggested caution for the implications of the findings, suggesting clinical nurses at the point of care who were not included in the study may find significant benefits (Brandt, Katsma, Crayton, & Pingnot, 2016). More research is required, therefore, to investigate both nurses and nurse leader's perspectives into the factors that may influence clinical mobile technology use.

A recent Australian mixed method study reported qualitative findings on the use of iPhones by nurses in an acute setting revealed benefits at the point of care with patients including enhanced communication. Negatives included small screen sizes when educating patients, and the perception of unprofessional use with patients and family (Farrell, 2016). An important conclusion to the study, recommended that nursing leaders and managers in education and clinical settings to develop policy to ensure the potential benefits can be woven into the everyday practice of nursing (Farrell, 2016). The author states that more research is needed to realize the potential of these technologies and the impact on patient outcomes (Farrell, 2016). The study suggests a significant theme emerged that mobile technology was so well embraced, that it would become such a necessary clinical tool such as the stethoscope for clinical areas (Farrell, 2016).

A qualitative, descriptive study of student's experiences in clinical settings when using mobile technology, identified that students felt 'stuck in the middle' due to a lack of clarity around mobile technology use. In some cases it was supportive, and in others, it was non-supportive (Beauregard, Arnaert, & Ponzoni, 2017). Due to challenges associated with contextual clarity, inconsistent expectations from preceptors, and the concern of professional image when using mobile technology clinically, students formed adaptations to its use. Adaptations included strategies demonstrating they could be trusted in use of the device, such as continuous disclosure explaining what the device is being used for. As identified by the author, having to constantly adapt, ultimately, may discourage students using mobile technology as a valuable point of care resource (Beauregard, Arnaert, & Ponzoni, 2017).

Another study reviewing nursing students perceptions of using mobile technology at the point of care, found more time was actually spent with patients, by looking up information to improve quality of care with enhanced safety (Grabowsky, 2015). Opportunities for patient education may be missed if there are no clear guidelines or policies informing professional, clinical use of mobile technology.

Furthermore, a U.S. study reviewing what information patients and family was provided for an Intensive Care Unit (ICU) admission, was examined across four different hospitals (Schnock, Ravindran, Fladger, Leone, Williams, Dwyer, Vu, Thornton & Gazarian, 2017). Results revealed that despite a need for clear information, patients and family had no central or easily accessible standard source of educational content (Schnock et al, 2017). Furthermore, it was recommended that a web based digital learning centre be built around different stages of the ICU admission, as this would leverage easily accessible technology to access the content on demand (Schnock et al, 2017).

Canada and the U.S. seem to be leading innovations, however, in guiding professional mobile technology use in clinical settings. One of these innovations involves eLearning courses promoting mobile technology in healthcare settings and in health education. These are available free online for nurses to undertake (Registered Nurses Association of Ontario [RNAO], 2017) Detailed hospital information sheets and posters from nurses to patients, advise of mobile technology

use by staff and for patient education is another initiative that guides professional use (Registered Nurses Association of Ontario [RNAO], 2017).

When there are inconsistencies and discrepancies with clear guidelines or policies available across clinical settings, students and graduate nurses may use their personal mobile technology in a covert manner. Previous research with nursing students, identified that were covert and discreet with their clinical mobile use, as the culture of the unit or ward, impacted their use of mobile technology clinically (Doyle et al. 2014; Strandell-Laine, Stolt, Leino-Kilpi, Saarikoski, 2015; Pimmer, Brysiewicz, Linxen, Walters, Chipps, & Gröhbiel, 2014).

Additionally, previous research with nurses in acute settings found that even when policy that restricted clinical use of mobile technology, nurses perceived the benefits outweighed the risks of being caught out by nurse leaders (Bautista & Lin, 2016). The study conducted from in-depth interviews with nurses across thirteen hospitals in the Philippines, reviewed sociotechnical components on nurses' use of mobile technology at work (Bautista & Lin, 2016). The study found that mobile technology use was instrumental for the nurse's role. Although its use was prohibited by most hospitals, however, nurses justified their covert use for clinical purposes and for the benefit of their patients (Bautista & Lin, 2016). Other findings within the same study included that nurses used their own devices as there were no hospital provided devices for use, and that senior nurses and managers also influenced their use (Bautista & Lin, 2016). The research suggested that hospitals should consider revisiting their policies regarding nurses' use of personal mobile phones at work as the devices can improve work productivity. Clear and constructive guidelines were recommended for its use considering the work related benefits (Bautista & Lin, 2016).

When nurses felt their organisation had high levels of facilitating conditions of both physical and technical infrastructures supporting the use of the technology, high levels of technology acceptance was noted (Aggelidis & Chatzoglou, 2009; Asua, Orruno, Reviriego, & Gagnon, 2012). The authors of a study involving both nurses and medical staff, noted these facilitating conditions included: support and technical help when the technology was implemented, available equipment, and importantly end-user involvement in the decision making process (Asua, Orruno,



Reviriego, & Gagnon, 2012). Further research is required, therefore, to investigate the levels of support available in hospital settings in the clinical use of mobile technology for graduate nurses.

### **Factors influencing the use of mobile technology in healthcare**

An Australian study of nurses found a number of principle barriers to the use of information and computer technology (ICT) in the clinical setting. These included: current work demands; access to computers; and a lack of support. The study identified that these barriers, must be addressed by local administrators and managers at a state and national level (Eley, Fallon, Soar, Buikstra & Hegney, 2008). The study focused on ICT as a ward based computer system or application for patient data entry, with no specific mention of mobile technologies. Also considerable developments in mobile technology and learning for healthcare applications have occurred since the study was published. A need therefore, is to investigate the factors that may influence a new nurse graduate's use of technologies such as mobile devices.

Technology acceptance models for individuals and organisations have analysed the impact of social influences and cognitive instrumental processes on the acceptance of mobile technology (Venkatesh & Davis, 2000). Cognitive instrumental processes included whether the technology was seen as having job relevance; having a high output quality; and a demonstrable result within the clinical setting (Venkatesh & Davis, 2000).

From the social influence perspective, a meta-analysis of technology acceptance found the influence of others, was related to the perceived usefulness of the technology and the intention to use it in the workplace. These people of influence were those perceived as important in the organisation, and may or may not have given directions for its use. The matter of compliance could be associated with the intention to use the technology. The other social influence was the internalisation effect of interpreting information from important others, as evidence of reality leading to perceived usefulness (Schepers & Wetzels, 2006).

A study within a tertiary education setting, found that peers strongly influenced undergraduate students. It was noted that students were more technology

ready and sensitive to trends. They were also influenced by technology characteristics than non-students or older users (Schepers & Wetzels, 2006). The findings from the study have implications for nursing, nurse managers and nurse educators when considering mobile technology for the clinical settings. It also points to the need to conduct a further study to identify and explore potential factors to the use of mobile technology from the graduate's perspective.

Mobile technology is changing the way in which nurses intervene, access health information, and communicate. This enhances health promotion, and the prevention, diagnosis, and treatment of illness (Doswell, Braxter, DeVito Dabbs, Nilsen, & Klem, 2013). The rapid introduction of mobile technologies and mHealth into nursing practice, dictates that educators must train our current and future nurses to be prepared to deliver these new strategies of care (Doswell, Braxter, DeVito Dabbs, Nilsen, & Klem, 2013).

In summary, evidence suggests that nursing students and nurses are keen to continue to learn with resources they utilise on their mobile devices, but evidence on potential factors to using these when transitioning to clinical settings is limited. The research proposed will seek to identify these potential factors.

### **The Technology Acceptance Model (TAM) theoretical framework**

The Technology Acceptance Model (TAM) first originated in the 1980's to investigate individual users acceptance and behaviour to technology and systems (Davis, 1989). The TAM model suggests that users evaluate a technology and/or system based on its Perceived Ease Of Use and Perceived Usefulness (PU). If the technology and/or system is perceived as easy to use and useful, then the user has a positive attitude to the system, leading to the decision and Intention To Use (ITU) the system leading to its actual use (Davis, Bagozzi & Warshaw, 1989; Holden & Karsh, 2010). The TAM has had strong empirical findings and has been replicated in many information technology studies (Chen, Yang, tang, Huang & Yu, 2008; Putzer & Park, 2010; Shoham & Gonen, 2008; Zhang, Cocosila & Archer, 2010). For example, a study in the US using the TAM found that community hospital nurses, were influenced by several factors in their use of smartphones. These factors included: observing others using a smartphone; the perceived compatibility of the

smartphone to other technology in the work setting; and the internal environment of the work setting. The environment included such factors as the size of resources and support from management (Putzer & Park, 2010).

Similarly, recent mixed methods research used the TAM model to evaluate student nurses perceptions of usefulness and ease of use of technology within an undergraduate nursing program. Both quantitative and qualitative results and findings suggested that overall, students perceive technology as useful and easy to use (Williamson & Muckle, 2017). The term ‘technology’, however, was broadly defined as: e-books; clinical reference software on handheld devices; polling software; interactive whiteboard systems; learning management systems; and medium/high-fidelity simulation devices (Williamson & Muckle, 2017).

The TAM model consistently explained a substantial proportion of the variance in usage intentions and behaviour of technology acceptance. It compared and was adapted from well-known alternative models, such as the Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB) (Venkatesh & Davis, 2000). The TPB postulates that a person’s intentions/behaviour was based on three main determinants including: a personal component which reflects the individual’s attitude to the behaviour; a social influence or social pressure to perform or not perform the behaviour also titled subjective norm; and finally, a sense of efficacy or ability to perform the behaviour, termed perceived behavioural control (Ajzen, 2005). The TPB was an extension of TRA, which included the additional determinant of perceived control over the performance of the behaviour (Montano & Kasprzyk, 2015).

Findings from a literature review of the TAM in healthcare settings, demonstrated that TAM can predict a substantial portion of the use or acceptance of health information technology (Holden & Karsh, 2010). Following the study it was found that for important future directions, the TAM could benefit from several additions and modifications specifically to the health care context (Holden & Karsh, 2010). The TAM, and variations of the model such as TAM2, however, have been criticised by some scholars due to its self-reporting structure, versus an objectively measured approach (Legris, Ingham and Collerette, 2003; Yousafzai, Foxall and Pallister, 2007; Venkatesh & Davis, 2000).

A key weakness and limitation of TAM, was that the causes and explanations of the variables such as usefulness and ease of use were not identified. Some scholars within the literature, however, have criticized TAM research for adding variables unsystematically, raising the risk of a less coherent TAM theory (Benbasat & Barki, 2007).

Despite the criticisms, the TAM it was extended to the TAM2. This extension included key social influences and cognitive variables that were considered as assisting in determining the barriers and facilitators in the acceptance of technology (Holden & Karsh, 2010; Legris, Ingham, & Colletette, 2003; Venkatesh & Davis, 2000). An integrative literature review demonstrated that the TAM2 could provide a better explanation of nurses' acceptance of healthcare technology (Strudwick, 2015).

The TAM2, whilst appearing to fit this study, is not without potential limitations and weaknesses. The original authors noted in their important study, that their sample sizes were less than 50 for each of their four longitudinal samples (Venkatesh & Davis, 2000). The smaller sample sizes, risked reducing the power of the significance of the tests. Most of the findings across all four studies, however, were significant and the small sample sizes provided assurance that levels of significance observed, indicated meaningful effect sizes (Venkatesh & Davis, 2000).

Another problem identified with TAM2, was that four of the variables were measured with only two questions or items. The original authors noted within their study, however, reliability or validity concerns were not warranted, as adequate reliability was measured with high Cronbach alpha scores along with strong factorial validity (Venkatesh & Davis, 2000).

As this study will use nurse graduates voluntary use of mobile technology, a foreseeable weakness in using the TAM 2 for this study was its focus on mandatory usage of technology in industry with only two sites classified as voluntary (Venkatesh & Davis, 2000). Furthermore, the study found that social influences for voluntary usage of technology, was non-significant (Venkatesh & Davis, 2000). Despite this finding, however, it is argued that the TAM2 model may demonstrate a significance of these variables, since complex social relationships and cognitive forces may influence graduates in the clinical setting. Additionally, incorporating the

TAM2 framework will assist in answering the research questions. It includes the following variables (see Figure 1):

- Subjective Norm (SN) (expressing the influence of colleagues, supervisors, and patients);
- Image (expressing the status of the individual in the organization);
- Job Relevance (JR) (showing the importance of the technology for the job);
- Output Quality (OQ) (reflecting the perceived system's output); and
- Results Demonstrability (RD) (expressing the ability of the individual to share with others the results of using the technology (Venkatesh & Davis, 2000))

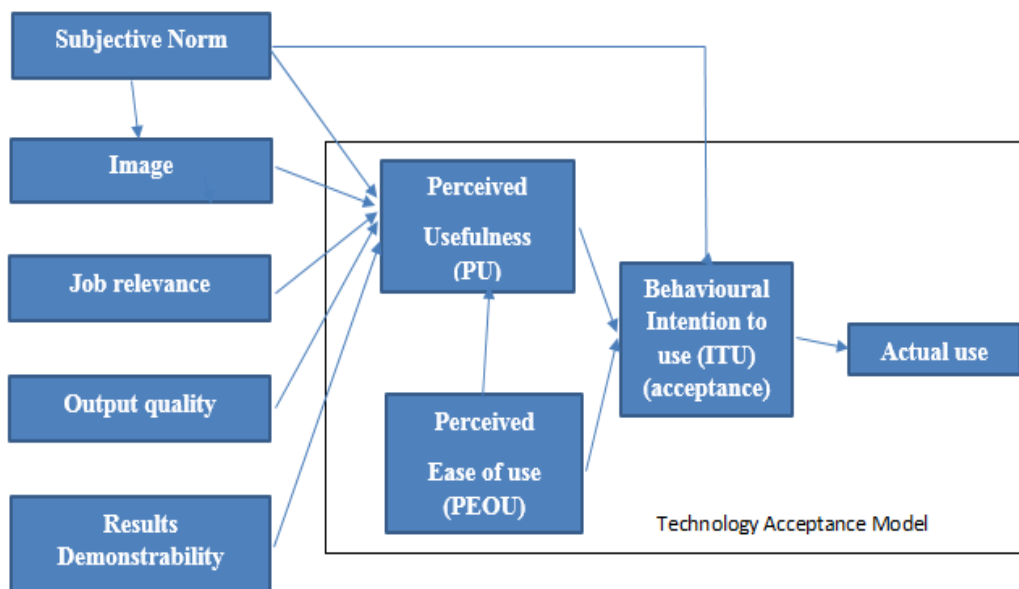


Figure 1. The Technological Acceptance Model 2 (TAM2) (Adapted from Venkatesh & Davis, 2000)

### TAM2 Variables

The TAM2 model incorporates the variables of social influence processes of Subjective Norm (SN), and Image. Social influences impacting behavioural intention to use technology in the clinical setting was found to be significant (Holden, Brown, Scanlon, & Karsh, 2012). In one study evaluating bar coded medication administration technology within the clinical area, found that social influence

predicted behavioural intention as nurses were influenced by peers, patients, medical staff and administrators (Holden, Brown, Scanlon, & Karsh, 2012). A similar finding demonstrated that when nurses used technology such as hospital information systems, the social influence of others predicted their behavioural intentions (Aggelidis & Chatzoglou, 2009). There are minimal studies, however, that have investigated the impact of the TAM2 variables of social influence on graduate nurses use of mobile technology in clinical settings.

An extensive literature review across a number of domains including health, revealed gender played a significant role in determining the intention to accept technology (Goswami & Dutta, 2016). Previous research, by one of the original TAM2 authors, revealed that women used technology or systems when there was less effort required, with a lower Perceived Ease Of Use (PEOU) due to higher levels of technology anxiety (Venkatesh & Morris, 2000). Such a finding was unsurprising when conducted on mandatory usage in industry, and could be different now that most people in the community commonly use technology.

In addition, previous research linked a stronger social influence effect, when females were seen to be more sensitive to the suggestions of their peers. This influence was stronger when they formed an Intention To Use (ITU) the technology (Venkatesh, Morris, Davis, & Davis, 2003). The same study also revealed that females were more anxious than men in using technology. This resulted in a reduction in their self-effectiveness, leading to increased perceptions of the effort required to use the technology (Venkatesh et al, 2003). It is argued that given these findings from TAM2 studies, both the social and cognitive influences of graduate's intentions to use or not to use mobile technology in clinical settings needs to be explored.

Cognitive instrumental processes related to how the individual formed a perceived usefulness (PU) judgement, by comparing the technologies capabilities with what needed to be done in their job or role. Perceived Usefulness (PU) suggests that if the nurse believes the technology is useful they are more likely to accept it in the clinical setting. Other studies have suggested that was considered useful as it enhanced patient safety; improved care quality; and/or increased efficiencies (Strudwick, 2015). The cognitive variables include: Job Relevance (JR); Output

Quality (OQ); Result Demonstrability (RD); and Perceived Ease Of Use (PEOU) (Venkatesh & Davis, 2000).

Previous research with nurses and hospital staff for computer based technology within a hospital setting, revealed Job Relevance (JR) as a significant independent predictor of technology acceptance (Ketikidis, et al, 2012). In a different setting, home care nurses found that the use of PDA's was not of Job Relevance (JR) and was not a significant predictor of technology acceptance (Zhang, Cocosila & Archer, 2010). It could be suggested from these findings that the significance of the TAM2 variable of Job Relevance (JR), may be mainly associated within hospital settings. Further research could expand on potential differences between specialities and clinical settings.

An integrative literature review, concerning nurses' use of healthcare technology using the TAM model and TAM2 found that TAM has been applied to nursing populations since the year 2000 but only twenty included nurses. Sixteen were noted that used extended versions of TAM such as TAM2 (Strudwick, 2015). This shortage of evidence suggests that although research is continuing, it is still in its infancy and needs more to explore factors that may affect nurse's use of technology in healthcare.

## **Conclusion**

This brief literature review uncovered limited studies on nurse graduates clinical use of mobile technology. It did, however, suggest that student nurses are familiar with its use and are taught and encouraged to use it in the University setting. This finding was deemed important, as the perspectives of student nurses may have an influence on their use of mobile technology when practicing in the clinical area on graduation. This study investigates these factors in seeking answers to the research questions.

## **Chapter Three**

### **Methodology**

#### **Introduction**

This chapter details the methodology, including the mixed method explanatory sequential design used in the study. It will also provide a brief discussion on the philosophy underpinning mixed method approach to research. The remainder of the chapter concerns the development and testing of the draft survey.

#### **Mixed methods research**

The focus of the design for this study was to combine statistical trends from quantitative data, with participant's personal experiences from the qualitative data, to better understand the research problem and to answer the research questions (Creswell & Plano Clark, 2011; Creswell, 2015). It has been suggested that using this approach provides a balance between the limitations and strengths of one approach with the other (Creswell & Plano Clark, 2011).

Mixed method research is typically associated with a pragmatist worldview from a philosophical perspective. The core of the philosophy is that truth is 'verified and confirmed by testing ideas and theories in practice' (Patton, 2015, p.151). Pragmatists emphasise the nature of experiences and focus on the outcomes of action. It is argued that pragmatic decisions can be made based on constraints and limitations that emerge, rather than adherence to a pure paradigm. It also fosters the mixing of methods and adapting data collection as the study unfolds (Patton, 2015). Nursing is a practice-based discipline thus, the use of mixed method was deemed appropriate to answer the research questions.

#### **Study design**

The explanatory sequential approach to the research design involved the collection and analysis of both quantitative and qualitative data. The analysis of the first phase



(quantitative) connected and informed the second phase (qualitative). Using this design, each data set was dependent on the results of the previous phase and built on what was learnt (Creswell & Plano Clark, 2011). The study was composed of six stages (see Figure 2). The framework for the study provided an overview of the links between the quantitative and qualitative phases of the study. Stages one, two and three formed the quantitative phase of the study whilst stages four, five and six formed the qualitative phase.

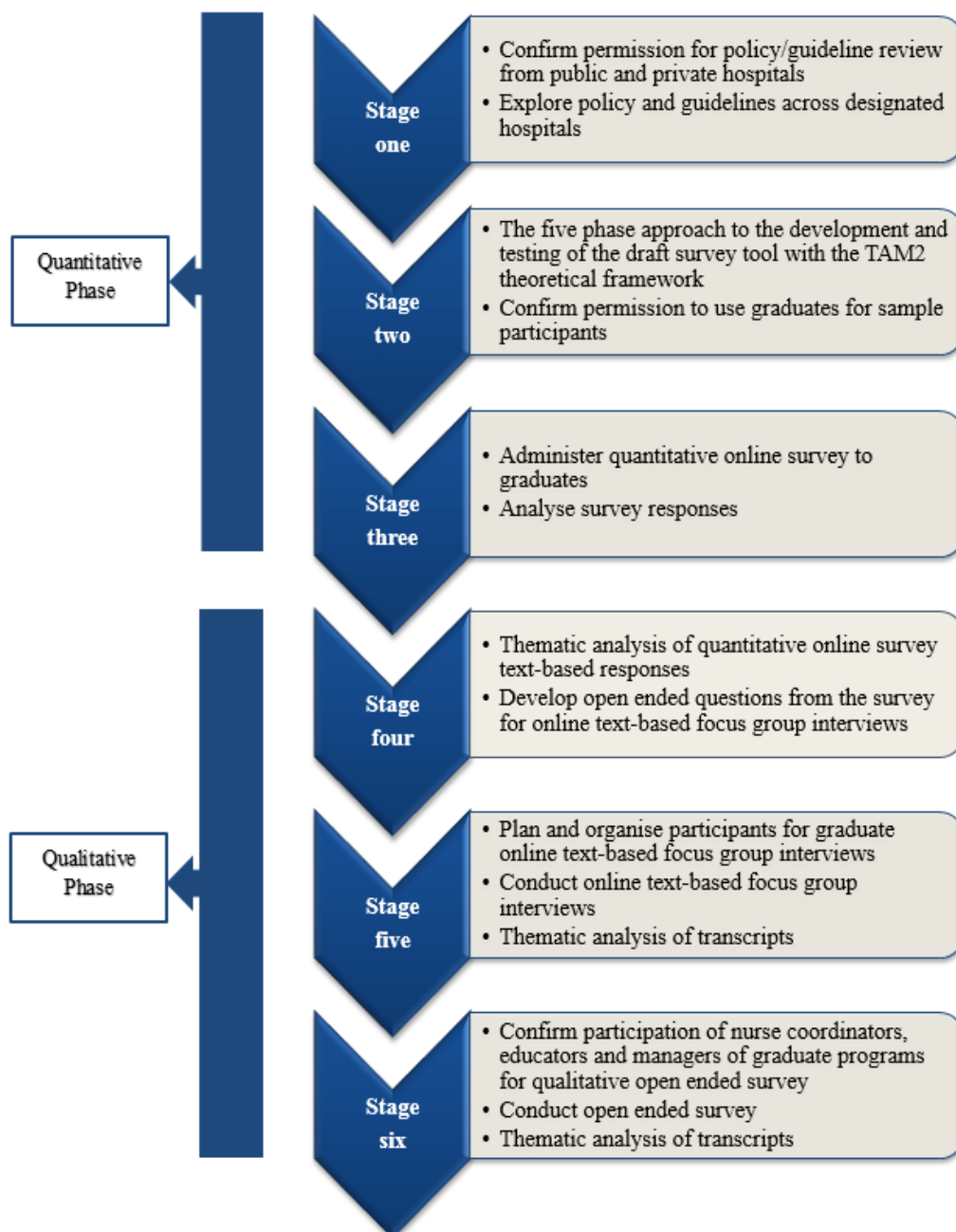


Figure 2. A diagrammatic representation of the study design

As can be seen in the design of the study it consisted of six sequential stages. Each stage was predicated on the previous stage since the findings from each influenced the transmission of the next. The following research questions were addressed within stages three to six.

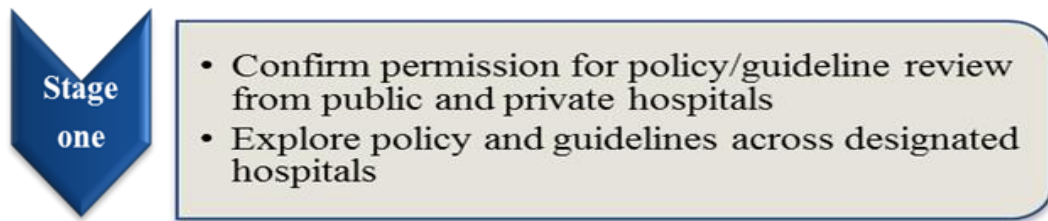
### **Research questions**

1. What factors influence nurse graduates use of mobile technology in the clinical setting?
2. To what extent and in what ways do nurse graduates currently use mobile technology in the clinical setting?
3. What are the perceptions of nurse coordinators, educators and managers of graduate programs, regarding mobile technology use in the clinical setting?

Stage three describes the quantitative phase of the study. It details the process involved in the promotion and administration of the online survey, the data collection methods, and the subsequent analysis and presentation of the results. It provides an overview of the findings that require more explanation and exploration. The findings were subsequently used to develop the open-ended questions for the online text-based focus group interviews. Research questions one and two were addressed from a quantitative perspective.

Stages four to six describes the qualitative phase of the study. It details the sequence of methods, analysis of data and the findings. Research questions one and two were addressed from a qualitative perspective from text-based focus group interviews with graduates who undertook the quantitative survey in stage three. Research question three was addressed in stage six, which referred specifically to the perceptions of nurse coordinators, educators and managers of graduate programs, regarding mobile technology use in the clinical settings.

The final chapter of the thesis provides an important synthesis of the findings from both the quantitative and qualitative phases of the study, juxtaposing them with the research questions.



*Figure 3.* Stage one of the quantitative phase

**Stage one: Confirm permission for policy/guideline review**

The aim of stage one was to explore in greater detail, policy and guidelines concerning mobile technology available across Fiona Stanley Hospital (FSH); Royal Perth Hospital (RPH); Sir Charles Gairdner Hospital (SCGH); and St. John of God Hospitals (SJOGH)-Murdoch and Subiaco. An email request with a formal letter to gain access these hospitals for information on policy/guidelines was forwarded to the Directors of Nursing of the designated hospitals that offered graduate programs (see Appendix 1). Most people indicated there were no policy or guidelines. At the FSH however, there was a Bring Your Own Device (BYOD) policy. The graduate program coordinator advised that anecdotally this was not well known by the graduates or other staff in the hospital.

**Ethical considerations**

Stage one also involved seeking the final ethical and governance approval through the sites within the study. The study utilised low risk ethical principles and followed the guidelines outlined by the National Statement on Ethical Conduct in Human Research (NHMRC, 2007). The Human Research Ethics Committee reference number from University of Notre Dame Australia included 015163F. The study adhered to the ethical principles of beneficence, non-maleficence, justice, and confidentiality. The study was considered low risk in affecting aspects of non-maleficence, and the researcher acknowledged the ethical rights of the participants during the conduct of this study.

The Human Research Ethics Committee (HREC) and Research Governance Office provided the HREC number as 2016-037 for the public hospital sites of SCGH, FSH, and RPH. For the site at FSH, a further reference number was 2016-159, and for RPH, 16-159. For the sites at SJOGH, the HREC reference numbers included 1024.

Informed consent was gained from each participant in the study. It adhered to the issues relating to the principle of respect of the individual right to full disclosure and encompassed the right to self-determination. The participant information sheet specific to each site outlined the rights and responsibilities of the participants and the researcher. Participants were informed that they were under no obligation to participate in the study, and that they could withdraw from the study at any time.

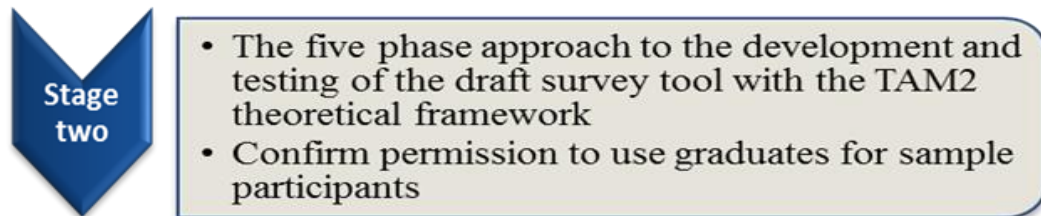
It is acknowledged that there may have been a power differential between the researcher and nursing students used in the test-retest, since the researcher is a Senior Lecturer in the School of Nursing and Midwifery at UNDA, Fremantle Campus and also works within the healthcare workforce. It was essential to assure the participants were comfortable in their participation and that the study took place outside the researcher's academic position.

Participants were assured that taking part in the study and that information gathered, did not prejudice employment prospects. This process assisted in achieving a balanced relationship with the participants and increased the trustworthiness of the study. Gaining consent from participants and using clear communication skills helped to build trust. Developing a partnership with the participants, asking permission, and using clear communication skills to build trust, resolved possible bias. Consent to participate in the study demonstrated a lack of coercion.

The principle of justice and right to fair treatment was considered in the design of the survey and during the collection of other data. Questions for the focus groups and interviews were aimed at developing rapport and encouraging participants to share their thoughts. The interviews took place at times mutually convenient to both researcher and participant with the participant playing the lead role in determining these arrangements. All participants were provided with the opportunity to review their transcripts, to add comments, make corrections or withdraw from any statement.

Confidentiality and privacy are important aspects of ethical research. Some of the data and themes may be sensitive to individual clinical sites and to participants thus, removal of any identifying information will be maintained during the study. A numeric code was entered and kept in the researchers journal and cross-coded with the participant with contact details. Data collected electronically, including transcript

recordings, were stored securely in accordance with the University's policy in a password-protected file and loose printed data was stored separately in a locked filing cabinet in the School for a period of five years. To ensure confidentiality, the researcher and his supervisor were the only people permitted access to the data.



*Figure 4.* Stage two of the quantitative phase

### **Stage two: Development and design of the survey**

In order to answer the research questions it was decided that a survey would be appropriate. Since the potential participants would be employed as graduate registered nurses working across shifts both day and night, it was more flexible to design the survey for online use. Typically, the online survey obtained quantitative information about the prevalence, distribution and interrelations of variables within the sample (Polit & Beck, 2014). It was developed using the key concepts identified in the literature review including TAM2 theoretical framework. The next step was to test the draft survey for validity and reliability. This step is outlined in Figure 5.

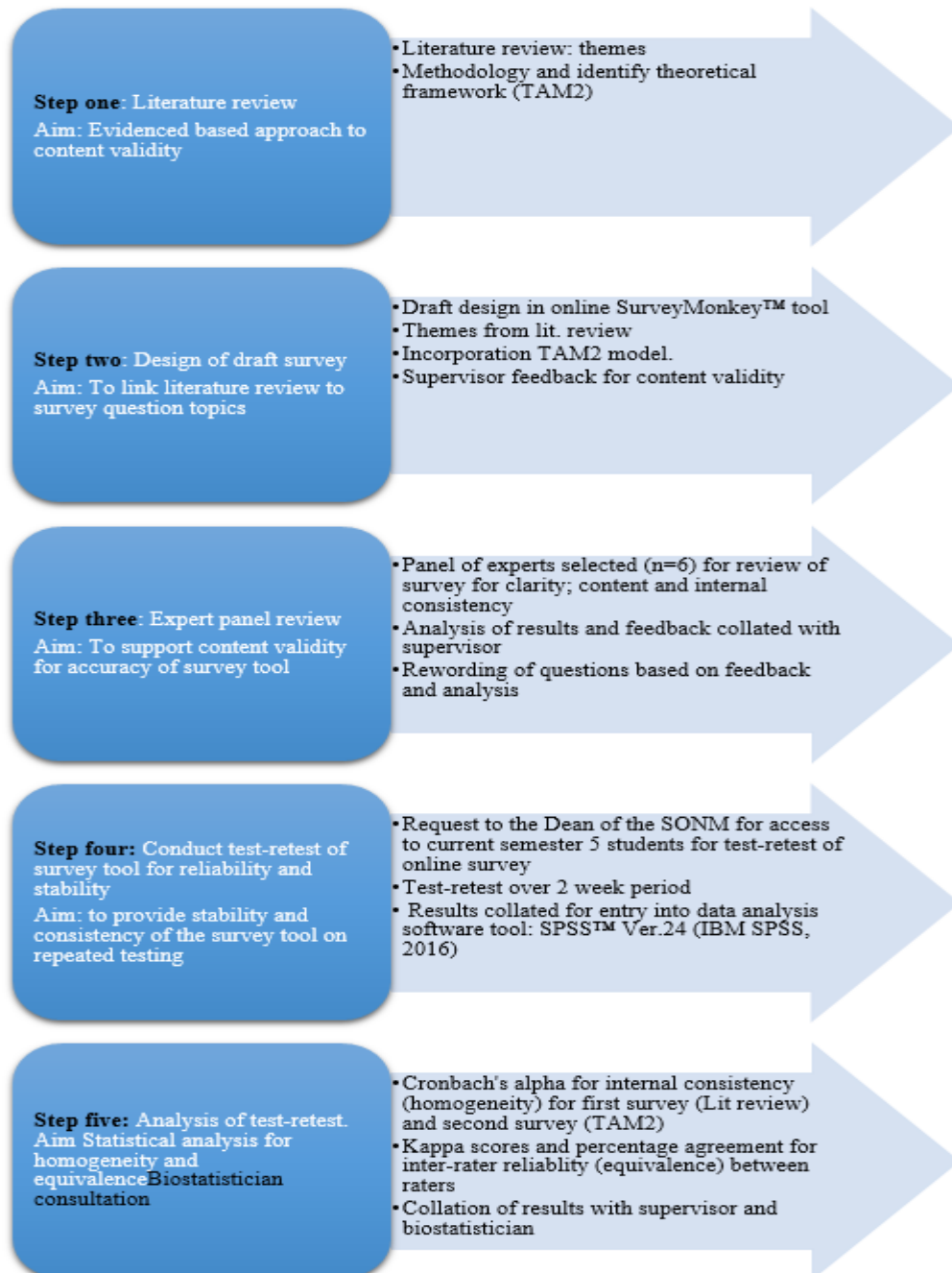
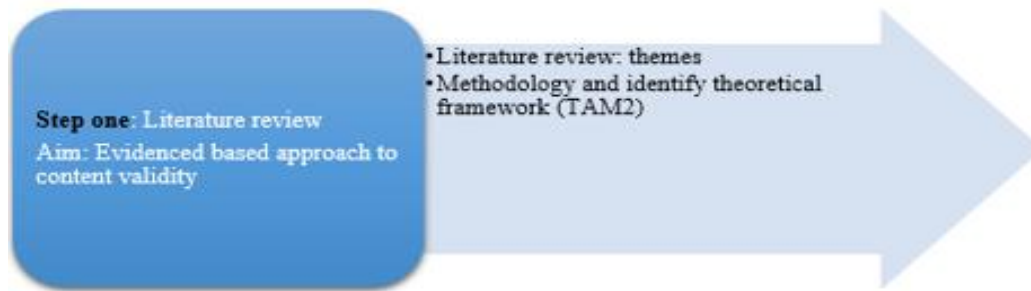


Figure 5. Online survey development process



*Figure 6.* Step one: Literature review

### **Step one: Literature review**

The first step in the process of developing the draft survey was to examine the literature to identify themes that could provide an evidence-based approach to the design. These themes constituted the first section of the survey.

As previously identified, the TAM2 model had been used across a number of areas in assessing technology use. The questions used in the model have been previously well validated (Venkatesh & Davis, 2000). In order to apply the TAM2 to this study, it was necessary that TAM2 underwent very slight modifications to apply to the research setting. Such changes included the term ‘mobile technology’ in place of the term ‘system’ by the original authors. Additionally, the term ‘supervisors/managers’ was added to two of the TAM2 questions when referring to ‘people of importance’. The remaining questions were not changed so that it maintained consistency with the original questionnaire (Venkatesh & Davis, 2000).

The original TAM2 included moderating variables such as experience and voluntariness (Venkatesh & Davis, 2000). Voluntariness was defined as the extent to which potential adopters of the technology or system perceived the adoption decision to be non-mandatory (Hartwick and Barki 1994). As the use of mobile technology by graduates in the clinical setting was deemed to be a voluntary choice the terms ‘Voluntariness’ and ‘Experience’ were not included in the draft survey.

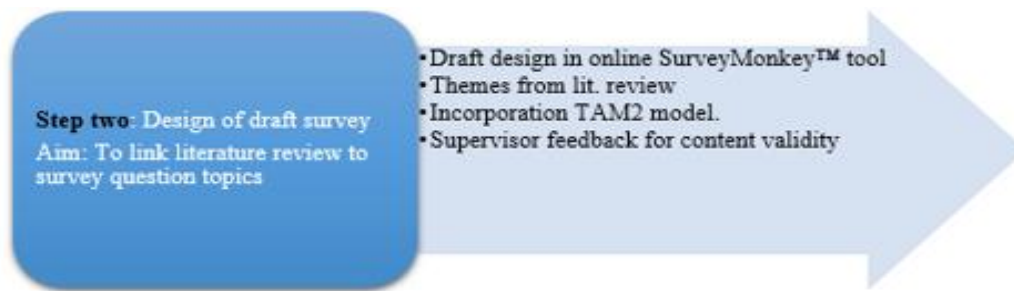


Figure 7. Step two: Design of survey

## Step 2: Design of the survey

Whilst online surveys are economical, flexible and provide a broad scope, they can tend to yield low response rates, and can be relatively superficial rarely probing deep into human behaviour (Polit & Beck, 2014). For this study, the draft survey consisted of a self-report questionnaire using closed-ended questions for most items. Participants also had the opportunity in selected sections, however, to include written comments.

In the development the survey, careful consideration was given to the order of the questions; the clarity of the information sought; the grammar; and that each item was value free (Schneider, Whitehead, Elliott, LoBiondo-Wood & Haber, 2012). It was important to maintain consistency among the items, including the testing and scoring systems (Schneider, Whitehead, Elliot, LoBiondo-Wood & Haber, 2012). To confirm these issues, the questionnaire underwent validity and reliability testing.

It was deemed important for consistency and clarity of the responses to include a working definition of the term mobile technology. This was highlighted at the top of each new page of questions. The survey included instructions for completion and an invitation to participate in the text-based focus group following completion of the survey.

The survey was structured into two main sections with a five item Likert scale for each question. Participants indicated for each question whether they: strongly agreed, agreed, unsure, disagreed, or strongly disagreed. An 'unsure' option was included since it was deemed important the context of participants being unsure if a policy or guideline was present in the hospital. Although inclusion of the unsure



choice in a Likert scale can be considered controversial, as it allows the participant to avoid making a clear choice or a positive or negative statement (Burns & Grove, 2001). Nevertheless, it was important in the descriptive analysis of the data to explore and explain the findings.

Section one referred to the literature review key topics, and section two referred to the modified TAM2. The themes included in the sections are outlined below.

### Section One

- Nursing graduates use of mobile technology in the clinical setting
- Mobile technology in learning and teaching relating to the clinical setting
- Mobile technology in learning and teaching relating to the University setting.
- Mobile technology use by nurses and other health professionals
- Policies and guidelines associated with mobile technology in the clinical setting

### Section Two

- Factors influencing the use of mobile technology in healthcare (TAM 2 Model)

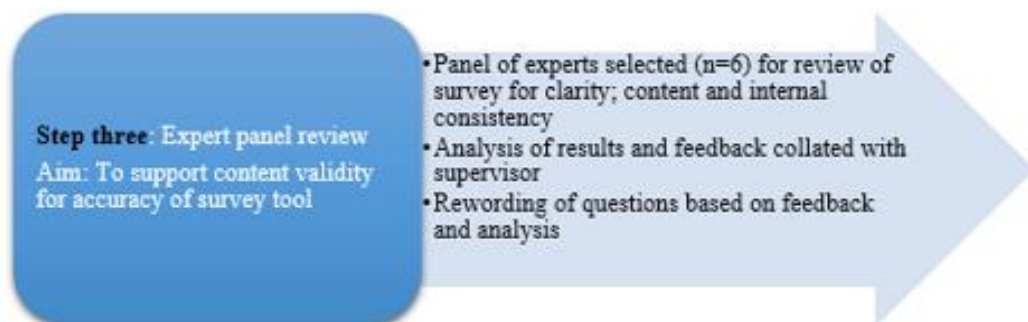


Figure 8. Step three: Expert panel review

### Step three: Expert panel

Methods for measuring validity, is based on judgement particularly from an expert panel of experienced people. Three aspects of validity have been identified: content validity; criterion-related validity; and construct validity. It was argued about the

usefulness of using the three terms, since they are all related with an overlap of approaches (American Education Research Association, American Psychological Association & National Council on Measurement in Education, 1999). Construct validity was seen as a unifying umbrella term under which all types of validity were situated (Beckstead, 2009; Schneider, Whitehead, Elliott, LoBiondo-Wood and Haber, 2012). The content expert approach, however, is useful in the early phase of the instrument development for clarity of content (Schneider, Whitehead, Elliot, Lobiondo-Wood, & Haber, 2012).

Six academics and experienced researchers within the School of Nursing and Midwifery were recruited for this purpose. All survey reviewers were selected based on their experience with constructing online surveys and their extensive research backgrounds. Two expert reviewers were topic experts on mobile technology and elearning, and had conducted research on mobile technology in teaching and learning. This number of people was deemed acceptable (Lynn, 1986; Streiner & Norman, 2005). The panel members were invited via email and personal communication to evaluate the draft survey (see Appendix 2). An email with instructions within the survey (see Appendix 3) was provided to the reviewers, along with a rating scale and a response section.

The clarity of each item was determined by a rating scale of “clear”, or “unclear” (Mastaglia, Toye & Kristjanson, 2003). Content validity clarified the adequacy of items for participants to understand the meaning of the conceptual domains and to evaluate redundancy among the items (Imle & Atwood, 1988). Reviewers were asked to indicate a closed ended response in assessing content validity to specific items, and then as part of a set of questions. The panel were provided with specific guidelines for judging the content of the questions (relationship to the construct); the order they were presented; one question for each item; be grammatically correct, free of jargon; and not open to alternative interpretations (Polit & Beck, 2014). These measures were to determine the clarity, content validity and apparent internal consistency of the draft survey (Lynn, 1986). Reviewers were able to provide feedback comments in a textbox under each subsection.

Internal consistency is applied where there were a number of items that purported to measure the same multidimensional construct (Nagy, Mills, Waters & Birks, 2010). In addition, it refers to whether these items are grouped or linked together appropriately as a particular subset of the conceptual domain (Mastaglia, Toye & Kristjanson, 2003). This process was important to apply the TAM2 framework to the survey.

### **Expert panel review results**

Five out of the six (83%) panel members agreed that the item was consistent (Lynn, 1986). The researcher and supervisor revised items that did not achieve a minimum agreement (DeVon, et al., 2007). A textbox at the end of each section provided comments to further refine and provide clarity for the questions. Suggestions for rewording particular questions were useful and provided the researcher and supervisor with creative alternatives prior to the test-retest of the draft survey. Face validity was strong for most questions with only slight rewording required for a small number of questions. All results from the expert panel are provided in Appendix 4.

It was considered whether rewording section two would be viable, since changing the original TAM2 structure may alter its validity and thus affect the results. A decision was made to keep the questions in their current form and review the test/retest results in regards to its reliability.

As part of the survey design, a comment check box was included as 1 of 3 options to select. These options included: 'Yes, No, and Comments'. Four reviewers indicated 'Yes', with one indicating 'No, and one checking the comments box. In a redesign of the survey draft to the expert panel, the option to choose "comments" would be removed as it seemed to confuse the panel members.

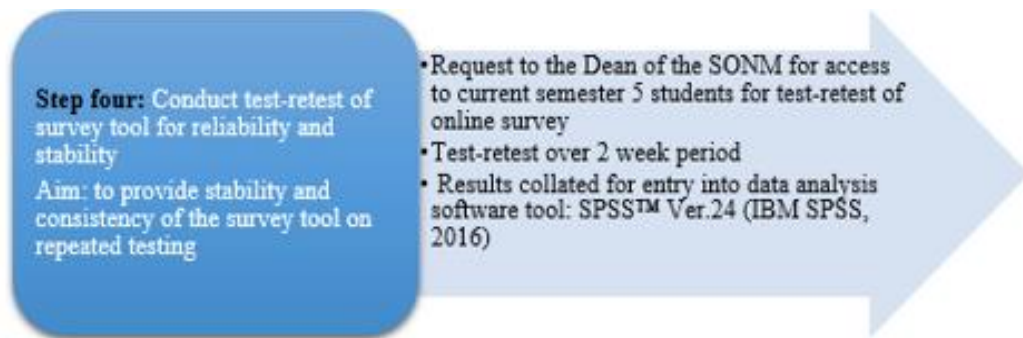


Figure 9. Step four: Conduct test-retest of survey tool for reliability and stability

#### **Step four: test-retest**

Reliability refers to consistency of a test calculating what it is supposed to measure and focuses on three elements (Fain, 2015). These three elements include test-retest reliability (stability), internal consistency (homogeneity), and interrater reliability (equivalence) (Fain, 2015). Test-retesting was required to compare data from both test one (T1) and test two (T2) for reliability of the draft survey (Creswell & Plano Clark, 2011). The draft survey needed to consistently measure the same results over time. Achieving stability of an instrument is when similar results are obtained on separate occasions (Nagy, Mills, Waters & Birks, 2010; Polit & Beck, 2014; Schneider, Whitehead, Elliot, Lobiondo-Wood & Haber, 2012).

In order to undertake the test-retest, permission was granted from the Dean of the School of Nursing and Midwifery at the University of Notre Dame to invite third year, semester five students to test the draft survey. Third year students would have spent nearly 1120 hours in clinical settings in healthcare agencies across WA and were best placed to evaluate the draft survey for reliability. An email invitation with a hyperlink and information sheet (see Appendix 5) was forwarded to the potential participants. The researcher and semester five lecturers promoted the study on PowerPoint slides (see Appendix 6).

Accordingly, the draft survey was administered twice to a convenience sample of students. A two-week interval between the T1 and T2 was applied. Timing of the tests was important, as the participants may have remembered their scores from T1 when completing T2, which could have affected the co-efficient (Nagy, Mills, Waters & Birks, 2010). Participants were encouraged to complete T1 within a one-week timeframe, before attempting T2. Students were then encouraged to

complete T2 due by the end of the second week. Test 1 was completed by 36 students (31.2%) of the cohort.

To avoid the possibility of response set bias, the researcher aimed to balance positively and negatively worded items to reduce the tendency for participants to agree or disagree in a uniform way (Fain, 2015). In order to prevent participants identifying potential themes in the TAM2 section the software SurveyMonkey™ was programmed to randomise each of the questions in the second section of the draft survey. This also meant that no TAM2 subheadings were used in any of the surveys.

The measurement of the extent that the raters assign the same score to the same variable/s is termed interrater reliability (McHugh, 2012). Measurement of interrater reliability can be applied through percentage agreement calculated as the number of agreement scores divided by the number of scores (McHugh, 2012). Cohens Kappa is a statistical measure that quantifies the degree of consistency among raters (Fain, 2015). It is a measure of agreement that adjusts for chance agreement (Cohen, 1960).

Kappa was designed for nominal random variables. Surveys with Likert scales are considered to be ordinal data measurement. This discrepancy creates concerns where in ordinal data, the seriousness of a disagreement is dependent on the differences between the ratings (Wilcox, 2012). Influences to the Kappa score, include prevalence, bias and non-independence of ratings (Sim & Wright, 2005). Kappa can also fail to capture all the information in ordinal data, as it does not allow partial credit for ratings that are similar but not exactly the same. Collapsing similar categories together can often improve the kappa score (Newman & Kohn, 2009). In order to avoid some of these influences in this study, the Likert scales were collapsed from five to three categories for analysis using Kappa and percentage agreement. The survey was reviewed and critiqued by the University's Biostatistician and the researcher's supervisor during this phase.

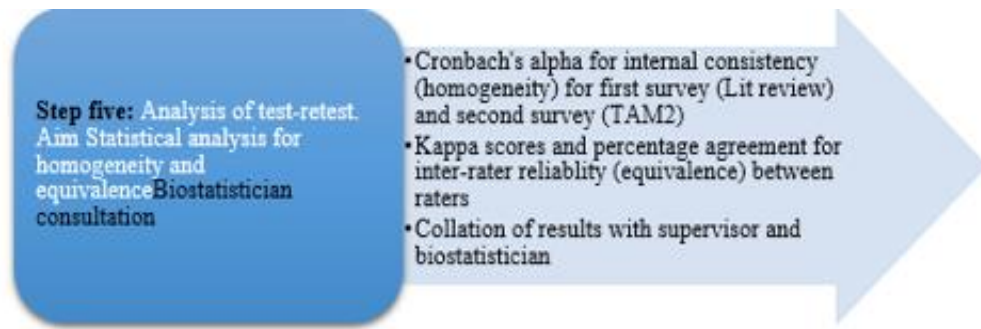


Figure 10. Step five: Analysis of test-retest for homogeneity and equivalence

### Analysis and results

The results from the test-retest were transferred from the SurveyMonkey™ software into SPSS™ Ver.24 (IBM SPSS, 2016). It was noted some participants had not completed both T1 and T2 the subsequent incomplete tests were, therefore, deleted from the final set of data. Removing these participants' responses resulted in 23/113 (20.3%) cohort. The data were manually compared then adjusted within SPSS™ Ver.24 (IBM SPSS, 2016).

### Section one of the draft survey

In order to measure the internal consistency of both sections of the draft survey, Cronbach's alpha was calculated. This statistical procedure measures the extent to which all items in the survey measure the same concept. It has been suggested that the test-retest of 0.80 would be considered a good reflection of reliability for a survey (Polit & Beck, 2012). For newly developed instruments, however, a reliability coefficient of 0.70 was considered acceptable (Burns & Grove, 2001). Cronbach's alpha scores demonstrated in section one of the survey were considered reliable and consistent (see Table 1).

Table 1

*Cronbach Alpha Scores for Test-Retest: Section One*

<b>Section One Subheading Questions</b>	<b>Cronbach Alpha Scores for Test1 and Test2</b>
Q8 Nursing graduates use of mobile technology in the clinical setting: Questions 1-10	Ranged from .789 (T1) - .724 (T2)
Q9 Mobile technology in learning and teaching relating to the clinical setting: Questions 1-5	Ranged from .641 (T1) - .585 (T2)
Q10 Mobile technology in learning and teaching relating to the University setting and clinical practice rotations: Questions 1-5	Ranged from .700 (T1) - .747 (T2)
Q11 Mobile technology use by nurses, other health professionals and patients: Questions 1-9	Ranged from .357 (T1) - .719 (T2)
Q12 Policies and guidelines associated with mobile technology in the clinical setting: Questions 1-7	Ranged from .834 (T1) - .787 (T2)

Both Kappa scores and percentage agreements were calculated for each question in both sections of the draft survey. A percentage agreement of 80% was considered as acceptable in the early testing (McHugh, 2012) (see Appendix 7).

Kappa scores for section one of the draft survey mostly ranged from fair to excellent based on Fleiss’s evaluation criteria which suggested: poor < 0.40, fair = 0.40–0.599, Good = 0.60–0.749, excellent 0.75 (Fleiss, 1981). Results were colour coded for improved visual representation (see Appendix 7). Nine questions which scored poorly still indicated reasonable to high percentage agreements. The poor range questions were reviewed along with the qualitative responses, to gain greater understanding of why the consistency among raters may have been low. The results were then reviewed and a decision was made to keep the questions, as the vast majority of scores were positive with high percentage agreements.

## Section two of the draft survey

This section of the draft survey concerned the TAM2. It contained subheadings that reflected the original study (Venkatesh & Davis, 2000). Cronbach's alpha was calculated according to each coded subheading including: Intention To Use (ITU); Perceived Usefulness (PU); Perceived Ease Of Use (PEAU); subjective norm (SN); Image; Job Relevance (JR); Output Quality (OQ); and, Results Demonstrability (RD).

Table 2

*Cronbach Alpha scores for Test-Retest: Section Two (TAM2)*

Section Two Subheading Questions	Cronbach Alpha Scores for Test1 and Test2
Intention To Use (ITU)	Ranged from $\alpha = .724$ (T1) - $.713$ (T2)
Perceived Usefulness (PU)	Ranged from $\alpha = .896$ (T1) - $.864$ (T2)
Perceived Ease Of Use (PEOU)	Ranged from $\alpha = .827$ (T1) - $.800$ (T2)
Subjective Norm (SN)	Ranged from $\alpha = .862$ (T1) - $.770$ (T2)
Image	Ranged from $\alpha = .799$ (T1) - $.864$ (T2)
Job Relevance (JR)	Ranged from $\alpha = .841$ (T1) - $.888$ (T2)
Output Quality (OQ)	Ranged from $\alpha = .679$ (T1) - $.896$ (T2)
Result Demonstrability (RD)	*Ranged from $\alpha = -.600$ (T1) - $.443$ (T2)

\*For the Result Demonstrability (RD) subsection (4 questions), the last question was reverse scored to fit the calculation of the statistic.

Although the original instrument had been considered reliable, it was pertinent to use Kappa since the draft survey had modified a few items. The Kappa scores for this section were similar to those in section one. Thus it was decided not to change or remove any questions from the original TAM2 model.

In reviewing the text-based comments on the draft survey it was noticed that students indicated they were not permitted to use mobile technology as directed in their clinical practice handbook. This finding may have influenced the students' unwillingness to answers questions positively. Additionally, students may have been



unaware of hospital based library resources. These findings from the test-retest may have influenced the statistics.

### **Conclusion**

This chapter outlined stage one and two within the study. The aim of stage one was to explore in greater detail, policy and guidelines available across the sites within the study. Potential inconsistencies and discrepancies between the sites was noted, where most did not have a specific policy or guideline directing acceptable use of mobile technology for staff. Stage two involved a systematic process of testing the online survey for reliability and validity, prior to administering to the graduates. Chapter four discusses the data collection, analysis and results of the online survey.

## Chapter Four

### Quantitative survey data collection, analysis and results

#### Introduction

This chapter describes the process involved in stage three of the study. It will discuss data collection methods the subsequent analysis and present a summary of the results. These will identify and explore the factors influencing nurse graduates use of mobile technology in clinical settings. The main aim was to administer the online survey to a purposeful sample of participants and to analyse the responses in order to seek answers to the following research questions:

1. What factors influence nurse graduates use of mobile technology in the clinical setting?
2. To what extent and in what ways do nurse graduates currently use mobile technology in the clinical setting?
3. What are the perceptions of nurse managers, nurse educators, coordinators of graduate programs of mobile technology in the clinical setting?

The results of the analyses are presented in sections to assist in answering the first and second research questions. The third question will be analysed in the qualitative phase. The results of the survey are presented using a structured approach and to maintain the sequential nature of the research. The data analysis stage involved reviewing the quantitative results that needed further explanation for use in the qualitative phase of the study. This process links the quantitative and qualitative phases in order to minimise threats to validity (Creswell & Plano Clark, 2011).

The first section of this chapter presents descriptive statistics based on demographic variables that provides context to the study. This is followed by frequencies and percentages of responses to questions regarding mobile technology use for learning, and for clinical applications.

The second section of the chapter utilised Fisher's exact tests to reveal statistically significant differences between demographic variables and specific

questions in section one and two of the survey. Application of Fisher's exact testing identified trends in the data to assist in answering the research questions, and as part of the sequential research design. These trends were explored in the qualitative phase of the research.

The third and fourth sections of the chapter analysed data from section two of the online survey. This section of the survey concerned the application of the TAM2. Pearson's  $r$  correlation coefficients were calculated to describe the relationship between these TAM2 variables to assist in answering the research questions. Basic hypothesis testing was incorporated based on previous research, to compare the statistical significance and strength of relationships between the TAM2 variables.

The final section applied regression analysis with the TAM2 model to further explain the main independent variables contributing to Perceived Usefulness (PU) and the Intention To Use (ITU) the technology for graduate nurses. Three types of regression analysis further extended the trends in the data to assist in answering the research questions.

Once the online survey was completed, the data was saved on a secure networked personal PC, and then imported into SPSS™ Ver.24 (IBM SPSS, 2016) formats for further data analysis. The data was cleaned, checked and screened for normality prior to conducting the statistical analysis. The University biostatistician was consulted during this phase of the research.

### **Setting and sample participants**

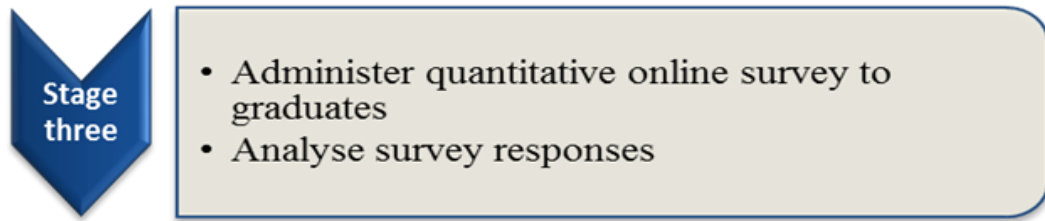
As identified in Chapter one, most registered nursing graduates are from the main four universities of the University of Notre Dame Australia (UNDA), Edith Cowan University (ECU), Curtin, and Murdoch University. On their graduation, the majority are employed within the Perth metropolitan area. This includes the North Metropolitan Health Service (NMHS) in 2013, with RN graduates employed at Sir Charles Gairdner Hospital (SCGH) (162). From the South Metro Health Service (SMHS) in 2013, the majority of graduates were employed at (RPH) (160) and Fremantle Hospital Health Service (FHHS) (80). It is noted that a large number of

staff moved from FHHS and RPH to the new Fiona Stanley Hospital under the South Metropolitan Health Service (SMHS) after 2013.

The majority of new nurse graduates apply to the Health Department's GradConnect system when seeking a graduate nurse program in Western Australia (Parliament of Western Australia, 2013; Nursing and Midwifery Office, 2014). GradConnect lists graduate positions available across a number of metropolitan and country locations and includes both public and private hospital options. As previously indicated, in 2016, the majority of RN graduate positions were located within SCGH with 126 RN graduates, followed by FSH with 86, RPH with 35, and SJOGH with 24 RN's (Subiaco 18 and Murdoch 6). A total of 271 RN's formed the sample cohort at these sites within the study in 2016.

### **Sampling of participants**

The survey was distributed to graduates at the selected hospitals utilising a non-probability convenience sample. All respondents were in their first year of nursing practice, which was the only criterion for participating in the proposed study. Graduates had completed their undergraduate degree and were registered as a health practitioner with the Australian Health Practitioner Regulation Agency (AHPRA). It is mandatory in Australia that all nurses and midwives must be registered with AHPRA and meet their standards for practice. Following permission from the University of Notre Dame Australia (UNDA) Human Research Ethics Committee (HREC), permission was sought to access the registered nurse graduates within the identified hospitals. During this process, the researcher met with the graduate program coordinators and research coordinators for guidance in optimising the data collection process. The graduate coordinators recommended promotion of the study should take place at the graduate study days and uploading the hyperlink to the survey on the hospital's online Learning Management System (LMS) (see Appendix 8-11). Also to reach a maximum of graduates, permission was granted to email the survey hyperlink and information sheet via the graduates email account. Guidance was provided to the researcher to capture graduates at varied stages of their program.



*Figure 11.* Stage three of the quantitative phase

### **Stage three data collection**

Stage three involved the launch of the online survey to potential participants utilising SurveyMonkey™. This software is accessed through an online cloud based company (www.surveymonkey.com). Although electronic surveys can be associated with lower response rates than postal methods in healthcare research, advantages can include reduced costs and ease of analysis (McPeake, Bateson & O’Neill, 2014). Strategies to improve responses in the study included forwarding email reminders to the graduate coordinators (McPeake, Bateson & O’Neill, 2014).

The researcher presented a brief background to the research and provided an invitation to participate during planned graduate study sessions. Graduate program coordinators at some sites allowed time for graduates to access and complete the survey at the time of the presentations. Some participants, however, ran out of time during the session to complete the second section of the survey that dealt with the TAM2. Completion of the survey was considered participant consent. At the end of the survey participants were asked tick a check box to indicate if they consented to being contacted for stage four (qualitative) phase of the study (see Appendix 12).

This was noted in the data analysis phase, where n=66 graduates completed the majority of the survey, however, this number was reduced to n=57 completing Section Two (TAM2) of the survey. In order to prevent participants identifying potential themes in the TAM2 section and thus affecting the results, the software SurveyMonkey™ was programmed by the researcher to randomise each of these questions in the survey to graduates. This meant that no subheadings were used in the surveys, with only the researcher knowing which questions matched the subheadings.

## **Data analysis and results**

Analysing data for trends and characteristics was an essential part of this study. The survey contained quantitative information about the prevalence, distribution and interrelations of variables. Data from the survey was first analysed using descriptive statistics. These statistics describe and synthesize data and assist in describing the characteristics of the sample (Polit, Beck & Hungler, 2001; Richardson-Tench, Taylor, Kermode & Roberts, 2014).

For consistency of the survey items, Cronbach's alpha was calculated in the data analysis for both section one and two following completion of the survey. As previously mentioned in phase 4 in Chapter 3, a reliability coefficient of 0.70 was considered an acceptable finding (Burns & Grove, 2001). Once the online survey was completed, the data was saved on a secure networked personal PC. To ensure consistency in this study's results, a biostatistician was consulted to assist in preparing the data for analysis and transferring it to software applications such as SPSS™ (IBM SPSS, 2016). The data was cleaned, checked and screened for normality prior to conducting the statistical analysis.

## **Descriptive statistics results**

As described previously in the Methods chapter, the online survey included instructions, a demographic section, section one, section two, and an invite to participate in a text-based focus group after the survey completion. The demographics section included the following parameters:

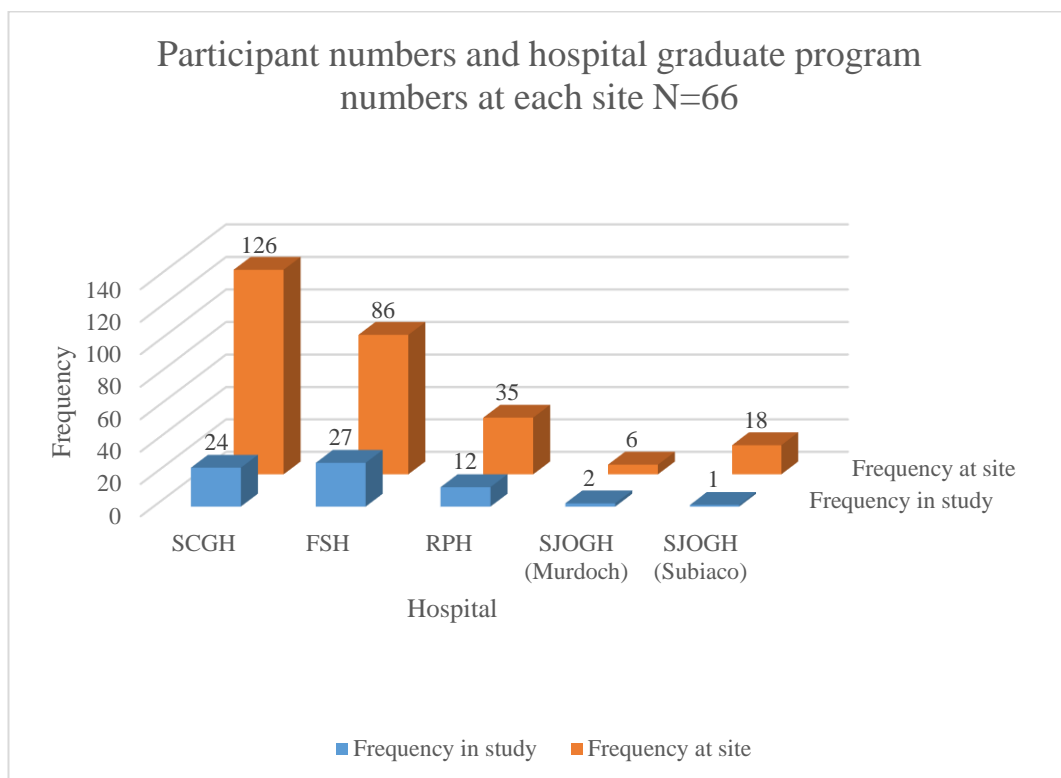
- Contact details for participants name and email
- Age group
- Gender
- Confirmation that the participant was in-fact a registered nurse employed in a graduate nurse program and not an enrolled nurse. (At this question, if the participant indicated they were an enrolled nurse, the survey was preprogramed to end for the participant and thanked them for their time).
- Which University the participant completed their nursing degree
- Hospital where currently employed
- Experience- in months at current Hospital

- Ownership of a mobile technology device
- Mobile technology devices and types owned

A five item Likert scale was utilised for each question in both section one and section two. Participants indicated for each question whether they: strongly agree (value 1), agree (value 2), unsure (value 3), disagree (value 4), or strongly disagree (value 5).

**Participant numbers.**

The number of graduates from each hospital is depicted in figure 12. For each of the sites, RPH had 34% of the cohort that participated in the study, followed closely by FSH with 31%, SCGH with 19%, SJOGH Murdoch with 33% and SJOGH Subiaco with 5%. This provided a sample size of 66/271 (24%) from the cohort of graduates at the sites within the study.



*Figure 12.* Participant numbers in study compared to Hospital Graduate program numbers at each site.

The ages of the graduates who participated in the study is portrayed in figure 13. The majority of participants were within the 20-25 years age range, followed by the 26-30 year age range.

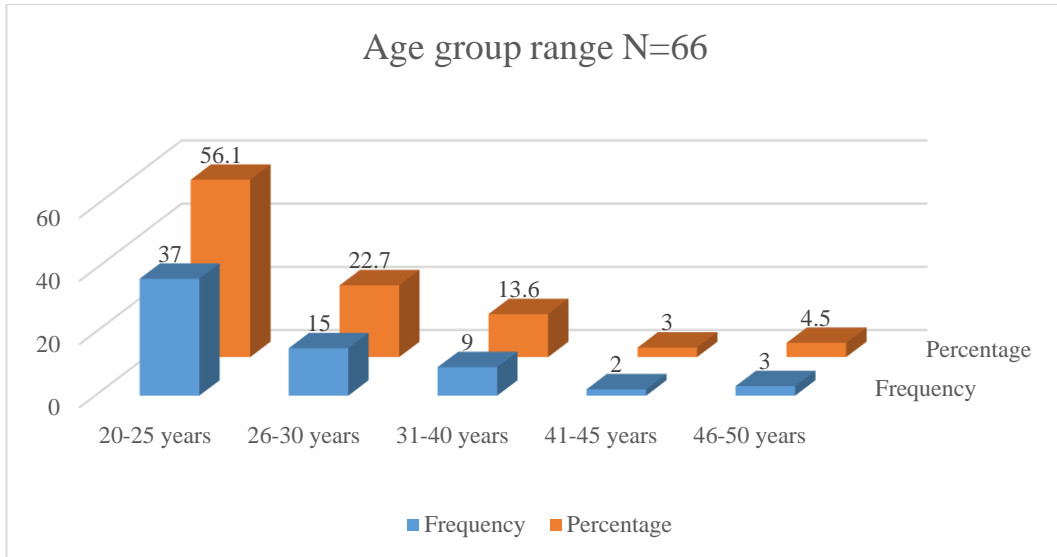


Figure 13. Age group range.

As indicated in figure 14, the majority of participants (N=66) were female with 60 (90%) completing the survey, with 6 (9%) males. This was an expected finding within this cohort, as a reflection of the current workforce gender difference. As a comparison in industry, between 2015/2016 in WA, there were 31,436 (90%) female nurses, and 3,228 males (9%) from a total of 34,664 (AHPRA report, 2016).

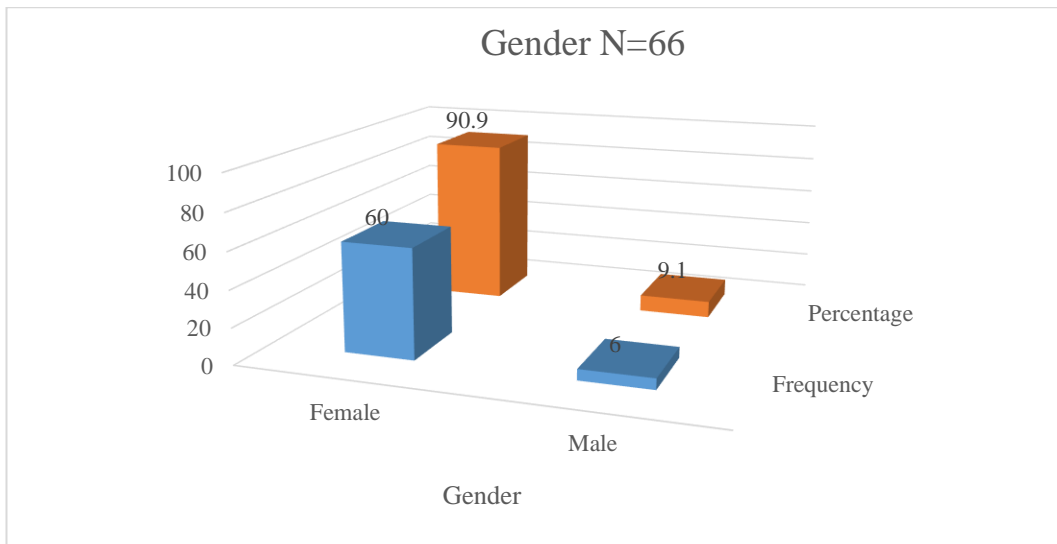
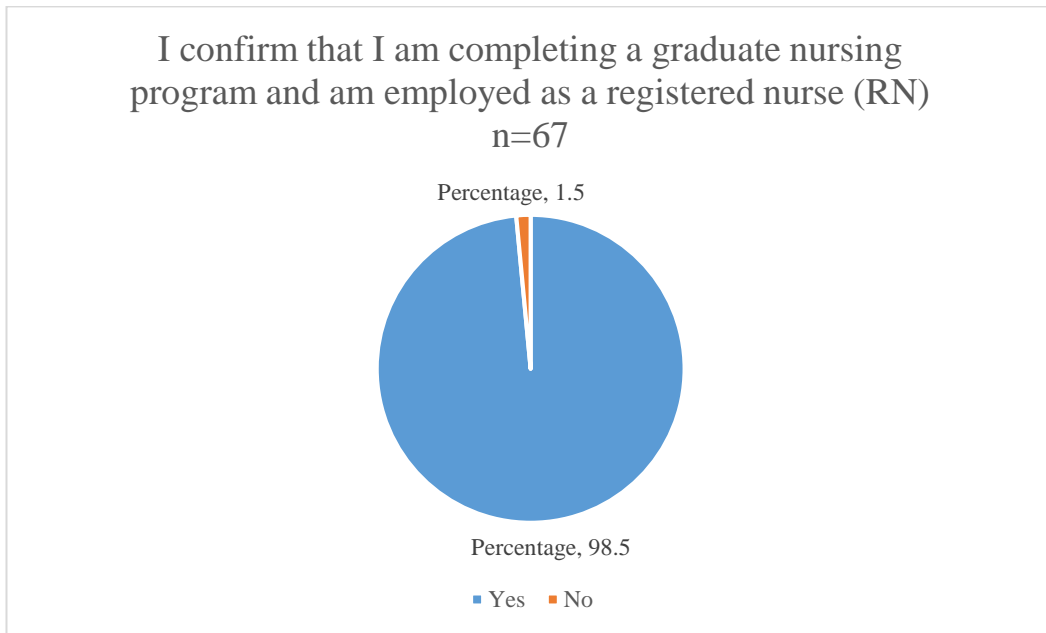


Figure 14. Gender

Participants were asked to confirm that they were registered nurses within a graduate program as some were enrolled nurses. This question was important to



ensure consistency of the results, as only registered nurses were included in the study. As indicated only 1 (1%, N=67) person indicated they were not a registered nurse (see Figure 15). At this point, the enrolled nurse was thanked for their time. Originally 67 participants commenced the survey but with the removal of the enrolled nurses the number was reduced to 66 participants.



*Figure 15.* Confirmation of RN and graduate program

Approximately a third of participants attended UNDA and Curtin University. The remaining participants attended Edith Cowan University and Murdoch University, with none indicating they attended ‘Other’ universities. These results are represented in Figure 16.

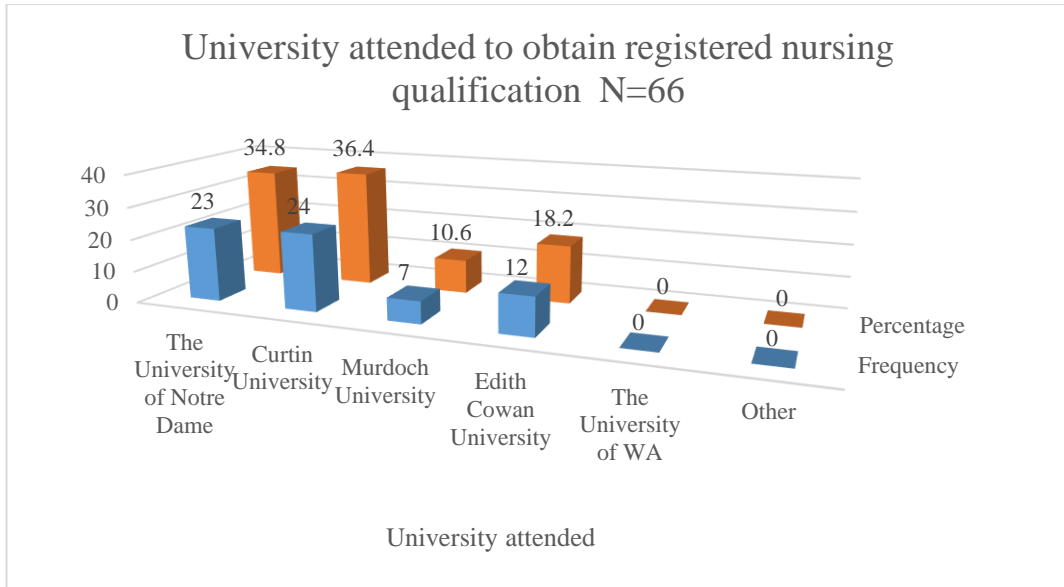


Figure 16. University attended to obtain registered nursing qualification

Participants indicated which hospital they were currently undertaking their graduate program (see Figure 17).

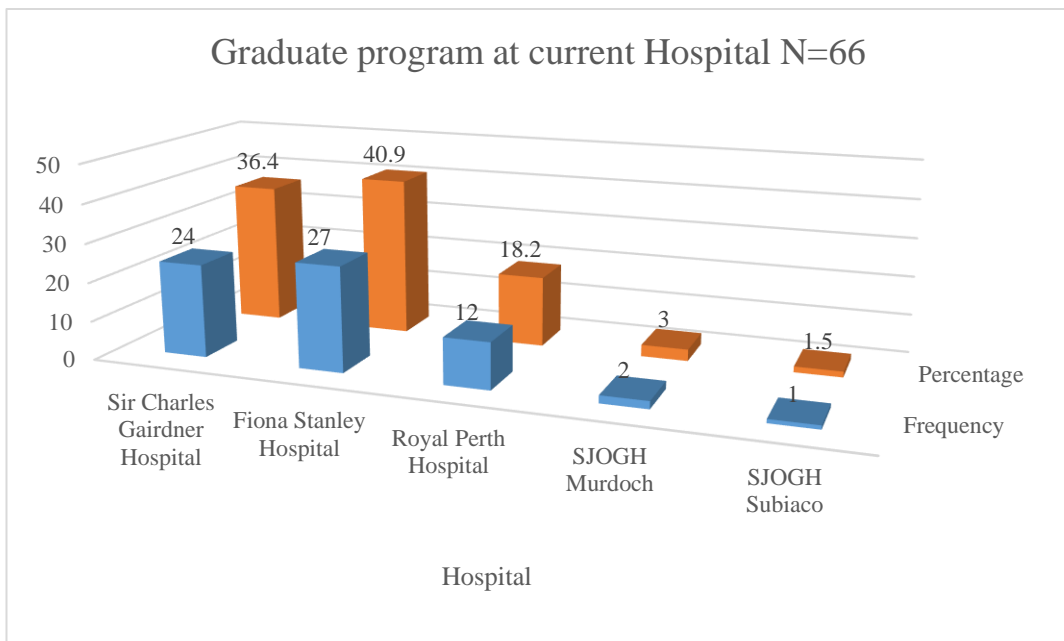


Figure 17. Graduate program at current Hospital

The majority of participants were from the public sector such as FSH, followed by SCGH and RPH. Only 3 (3%) participants worked at St. John of God

Hospital Murdoch campus, and 1 (1%) from St. John of God Hospital Subiaco campus. Both of these were the private hospitals.

Participants were asked about the time they had spent employed within their graduate program at their particular hospital. Participants selected a specific time frame that included 1-3 months; 4-6 months, 7-10 months; or 11 months or longer with results presented in Figure 18.

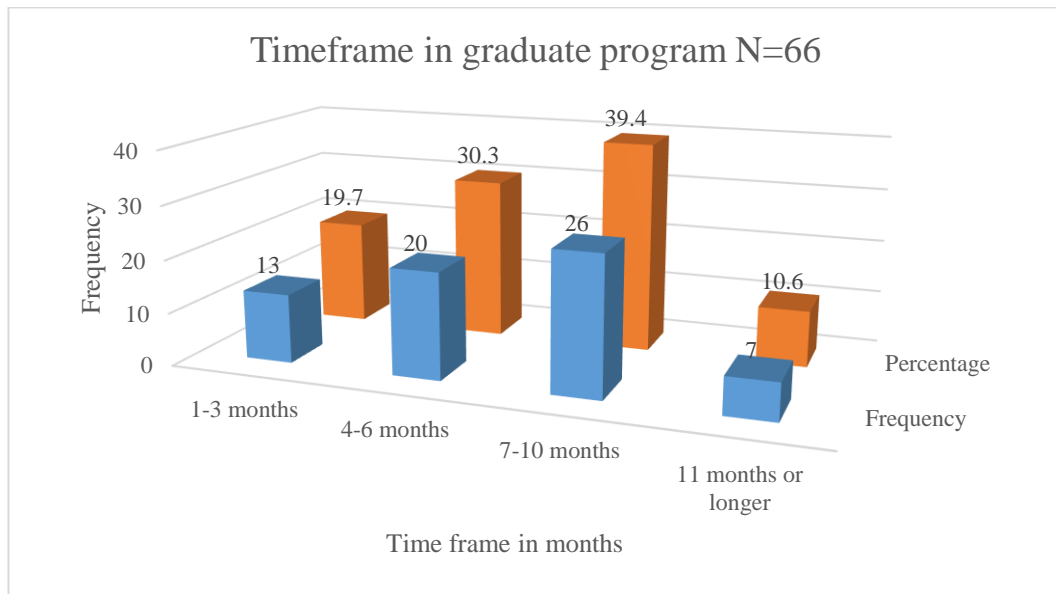


Figure 18. Timeframe in graduate program

The majority of participants were in the 7-10 month time frame, followed by the 4-6 month time frame. Only 10% indicated they had 11 months or longer of experience in their graduate program.

Participants were asked whether they owned a mobile technology device such as a smartphone; iPad; tablet or laptop. All 66 (100%) participants indicated they owned one of these devices. To further define what types of mobile devices graduates owned, participants selected from a list of possible devices. All participants in the survey 66 (100%) indicated they owned a smartphone or mobile device. The second highest owned device was a laptop, followed by a tablet such as an iPad or similar. Only a handful of participants 4 (6%) owned a smartwatch (see Figure 19).

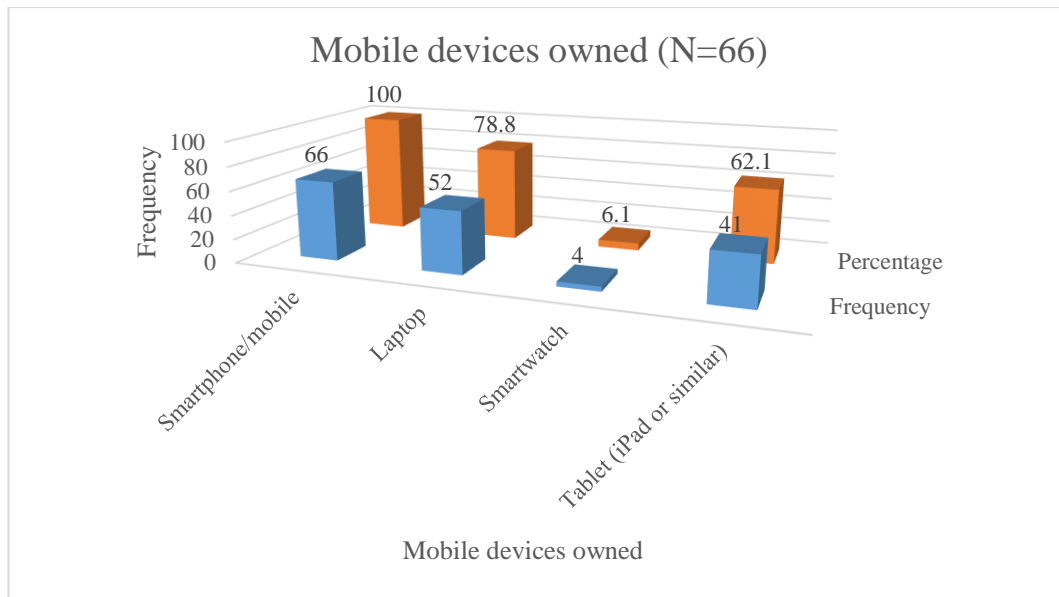


Figure 19. Mobile devices owned

### Descriptive statistics for section one and two of the online survey

To ensure consistency of answers for each following section, participants were instructed to select responses to questions based on how they felt mobile technology related to nursing. In addition, the term mobile technology was defined for each question subheading (see Appendix 12).

Descriptive statistics with frequencies and percentage of responses were used to assist in answering the first two of the research questions. Subheadings in section one of the survey linked the key concepts identified in the literature review. Section two used the pre-validated TAM2 tool but did not include sub-headings.

### Nursing graduates use of mobile technology in the clinical setting.

A visual representation of the questions relating to the first subheading of ‘nursing graduates use of mobile technology in the clinical setting’ is provided in Figure 20. Cronbach’s alpha for the questions within the subheading was high at  $\alpha=0.921$ .

Participants were asked about their use of mobile technology in the clinical setting within their graduate programs (see Figure 20). A Likert scale was used to effect agreement with statements relating to subheadings. Most graduates indicated they ‘valued accessing relevant clinical information on mobile technology (n=63). Eighty eight percent of participants either strongly agreed or agreed with the statement. Three quarters of the participants (n=63) indicated they ‘used mobile

technology to find information for clinical application/s'. The vast majority of the participants (74%) indicated they used mobile technology for their clinical application within their graduate programs.

Participants were asked if using mobile technology clinically had an effect on their self-confidence levels clinically. In response to the question (n=63): 'when using mobile technology clinically, my self-confidence clinically is improved', most (71%) of participants either strongly agreed or agreed.

Participants were asked about their use of applications (apps) within the clinical setting 'In the clinical setting, I use a number of applications (apps) on mobile technology'. Approximately half the participants agreed to the question and with the other half disagreeing. To the question 'I use eBooks on my mobile technology device to access clinical information' 63% of the participants either strongly disagreed or disagreed.

The majority of graduates indicated they 'use search engines like Google on my mobile technology device to access clinical information'. Nearly eighty five percent of participants either strongly agreed or agreed with the statement.

Over 70% of participants either strongly agreed or agreed with the statement (n=62) 'Using mobile technology clinically enables me to save time'. Similar to the previous question relating to saving time, over 70% of participants felt 'using mobile technology clinically enables me to be more efficient'.

Most participants (64%) either strongly agreed or agreed with the statement 'Using mobile technology clinically improves the safety and quality of my care'. For the last question in the subheading, participants were asked: 'Using mobile technology clinically improves my organisational skills'. Most participants n=63 (over 60%) indicated they either strongly agreed or agreed that their organisation skills were improved with mobile technology in the clinical setting.

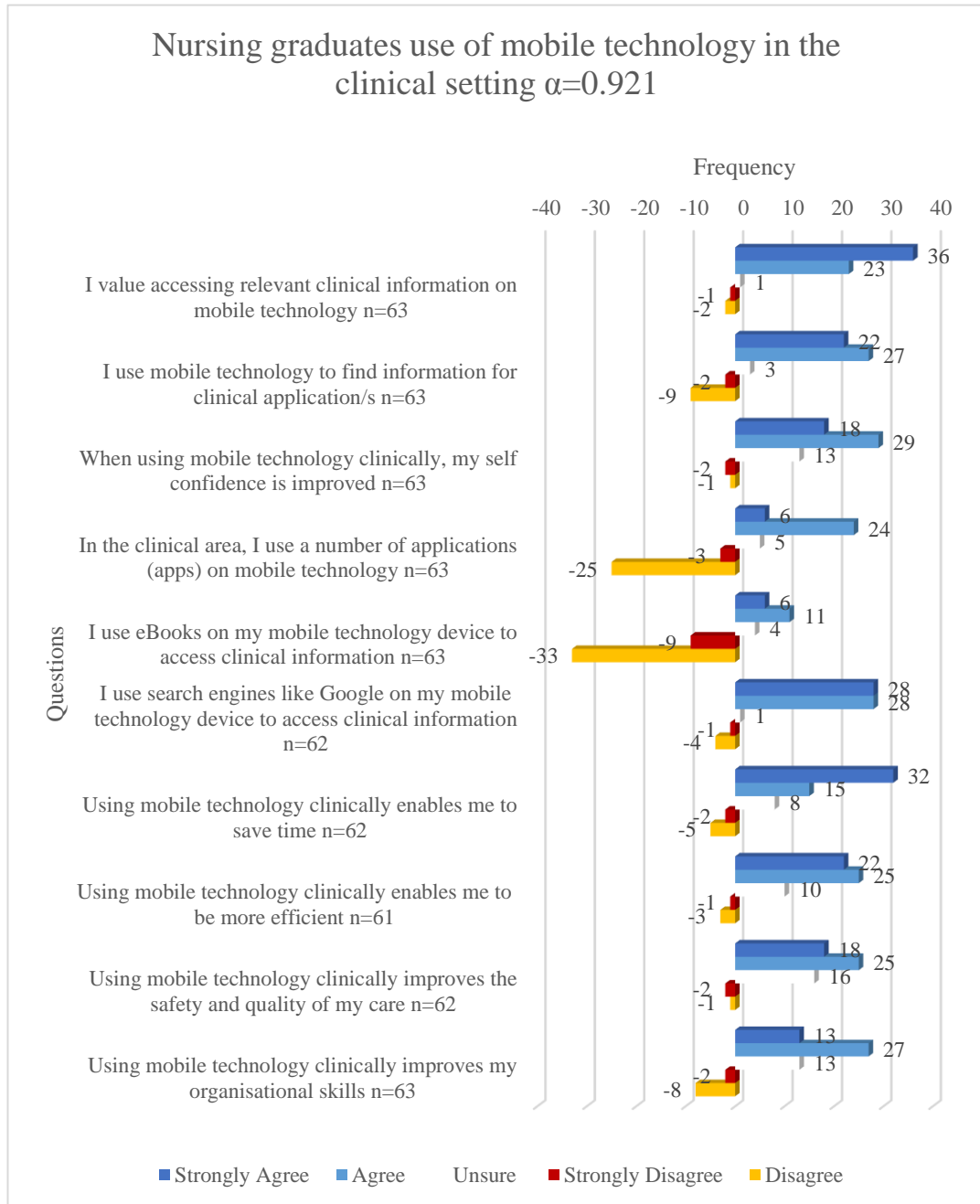


Figure 20. Nursing graduates use of mobile technology in the clinical setting

#### Mobile technology in learning and teaching relating to the clinical setting.

A representation of the questions relating to the subheading of ‘mobile technology in learning and teaching relating to the clinical setting’ can be seen in Figure 21.

Cronbach’s alpha for the questions within the subheading was high at  $\alpha=0.744$ .

The majority (over 77%) of participants indicated that ‘using mobile technology clinically improves my learning’. Over 63% of participants felt that ‘using mobile

technology improves the transition from theory to practice’. Only a small amount of participants (7%) indicated they disagreed with the statement.

When asked if: ‘The education and learning department of the hospital supports staff using mobile technology’ at their site, most participants indicated they were unsure 25 (37%). Only 6% strongly agreed, with 19% agreeing with the statement. Although participants felt mobile technology clinically improved their learning, when asked if: ‘I am encouraged to use mobile technology for educational opportunities’, almost half either disagreed or strongly disagreed. For the last question in the subheading, most (83%) of participants felt ‘I would use mobile technology for ongoing learning in the clinical setting if permitted’.

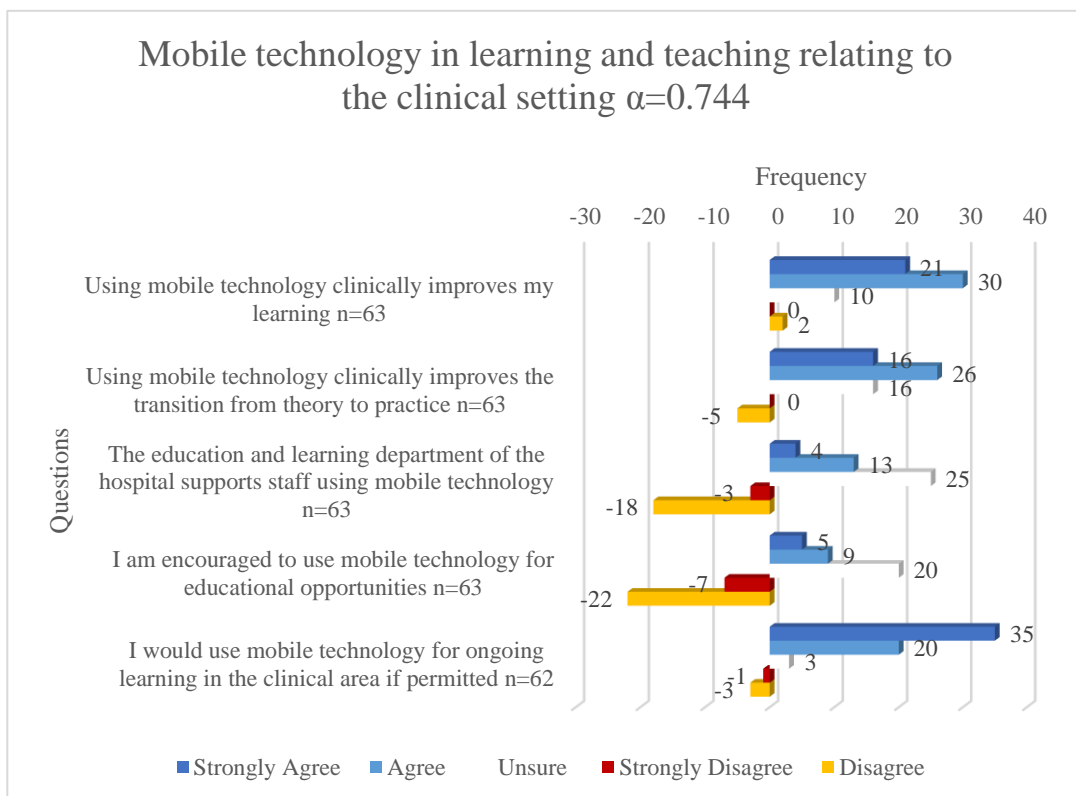


Figure 21. Mobile technology in learning and teaching relating to the clinical setting

### Mobile technology in learning and teaching relating to the University setting and clinical practice rotations.

A visual representation of the questions relating to the subheading of ‘mobile technology in learning and teaching relating to the University setting and clinical practice rotations’ can be seen in Figure 22. Cronbach’s alpha for the questions within the subheading was high at  $\alpha=0.750$ .

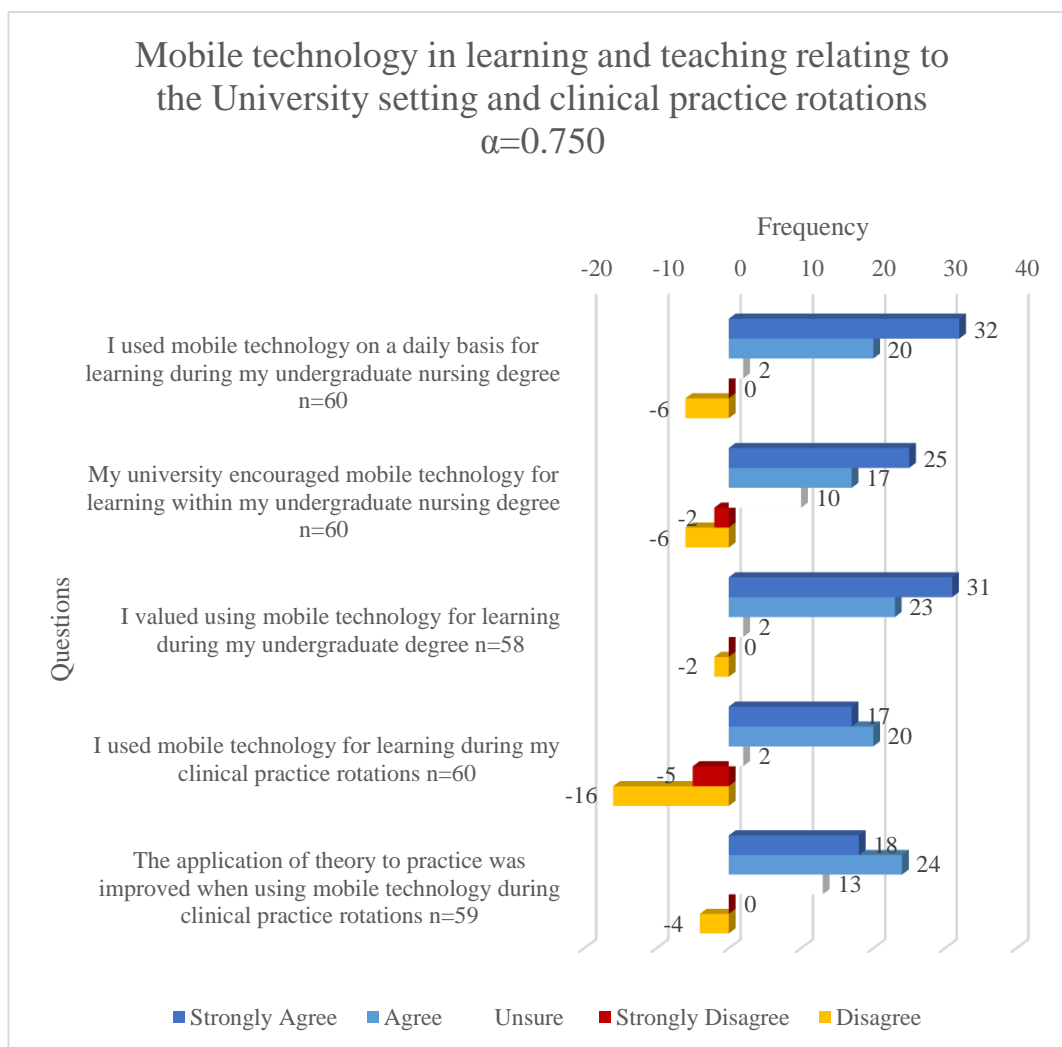
To determine if participants used mobile technology for learning within their University degree, (n=60) participants responded to the question: 'I used mobile technology on a daily basis for learning during my undergraduate degree'. Close to 80% of participants either strongly agreed or agreed with the statement that indicated high use of mobile technology for learning within the University setting.

Sixty two percent of participants indicated they either strongly agreed or agreed with the statement 'My University encouraged mobile technology for learning within my undergraduate nursing degree'. Interestingly, whether their University encouraged learning with mobile technology or not, over 81% of participants indicated they '...valued using mobile technology for learning during my undergraduate nursing degree'.

Over half of the participants either strongly agreed or agreed with the statement 'I used mobile technology for learning during my clinical practice rotations'. This was an interesting finding, considering that most Universities advised students to turn off their mobile devices whilst on clinical rotations. The use of mobile technology as a bridge from University was explored further in the qualitative phase.

For the final question in the subheading, over 63% of participants felt 'The application of theory to practice was improved when using mobile technology during clinical practice rotations'. As nearly 20% felt unsure, this response may have reflected whether graduates were permitted or not to use mobile technology on clinical practice their undergraduate program. Those who used mobile technology despite potential restrictions, however, felt their application of theory to practice was improved.





*Figure 22. Mobile technology in learning and teaching relating to the University setting and clinical practice rotations*

**Mobile technology use by nurses, other health professionals and patients.**

A visual representation of the questions relating to the subheading of ‘mobile technology use by nurses, other health professionals and patients’ can be seen in Figure 23. Cronbach’s alpha for the questions within this subheading was lower at  $\alpha=0.517$ . It was noted the removal of some questions did not improve the overall Cronbach’s alpha score. Although some subheadings in section one demonstrated high internal consistency with strong alpha scores, this particular subheading demonstrated a lower value. The implications of this result could be considered a limitation of the study and is discussed later in the following qualitative phase.

Over 65% of the participants noted they ‘...regularly observe health professionals using mobile technology in the clinical setting’. This result suggested

that high numbers of the multidisciplinary team use mobile technology clinically, this could influence graduates use from a role modelling point of view.

In regards to the use of mobile technology compared to current technology in the clinical settings, participants were asked: 'In my experience, it is difficult to access PC/computers in my department/ward'. Participants were mainly split between agreeing 44% and disagreeing 41%. Compared to the availability of technology on the wards and mobile technology, over 60% of participants indicated they '...would prefer to access information on mobile technology rather than the ward PC/computer'.

The influence of others in the clinical setting when using technology, was explored with the following questions. The vast majority of the graduate nurses felt 'Patients may think I am using mobile technology for unprofessional reasons' with over 81% either strongly agreeing or agreeing with this statement.

The influence of colleagues in the clinical setting was explored with the question: 'Other staff may think I am using my mobile technology for unprofessional reasons'. Over 83% of participants were concerned about what other staff thought about their use of mobile technology in the clinical setting. When asked: 'I regularly observe patients using their own mobile technology in their bed-spaces', 88% either strongly agreed or agreed with the statement. Participants observed a high level of mobile technology use by patients with only 1 (1%) feeling unsure and 1 (1%) disagreeing with the statement.

Just under half of the participants either disagreed or strongly disagreed with the statement 'Patients and significant others in my care ask me how to access relevant resources relating to their health by using their mobile technology'. Many (60%) participants either disagreed or strongly disagreed with the statement 'I currently use mobile technology as an aid in educating the patient and significant others'.

In the final question of the subheading, graduates were asked: 'If permitted, I would use mobile technology as an aid in educating the patient and significant others'. Interestingly, over 74% of graduates either strongly agreed or agreed with the statement. This suggests the influence of others or the organisation to grant permission to use mobile technology for educating the patient and family members.

Graduates indicated they were keen to use the resource for educating, but felt they may need permission to do so within their role.

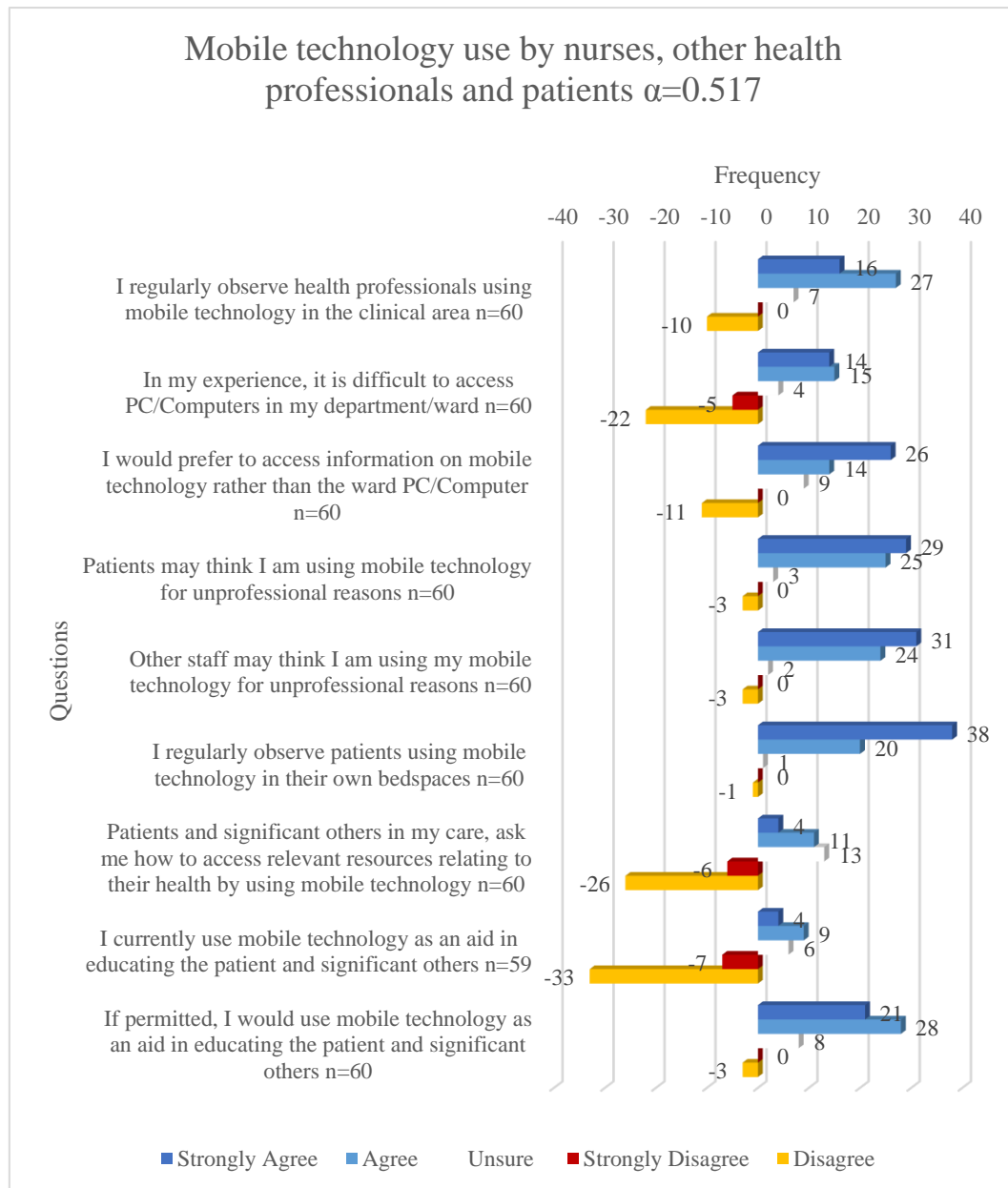


Figure 23. Mobile technology use by nurses, other health professionals and patients

**Policies and guidelines associated with mobile technology in the clinical setting.**

Cronbach’s alpha for the questions within the subheading concerning policies and guidelines was lower at  $\alpha=0.570$ . Removing three questions from this section increased Cronbach’s alpha score to  $\alpha=0.766$ . The questions that were removed

included: 'I am aware of a hospital guideline or policy that guides the use of mobile technology'; 'I would value being able to use mobile technology to access hospital policies and area specific guidelines for nursing care'; and 'I would value a hospital policy or guideline that would guide health professionals in the use of mobile technology in the clinical setting'. A lack of consistency in the responses may have reflected a potential inconsistency between hospitals. Nevertheless, all questions were kept within the subheading in order to detect specific patterns that related to these questions in the qualitative phase of the study.

Regarding the influence of supervisors and nurse leaders such as ward nurse managers, participants were asked: 'Nurse managers/supervisors of my department/ward support nurses using mobile technology'. Most participants indicated they felt unsure (40%), with 39% either disagreeing or strongly disagreeing with the statement. Only 10% of the participants agreed with the statement. This result suggested a large degree of uncertainty and an associated low level of support of mobile technology use in the clinical setting by direct nurse managers/supervisors.

Participants were asked if higher nursing management of the hospital supported nurses using mobile technology through the question: 'Senior nurse managers/supervisors of the hospital support nurses using mobile technology'. A similar response was noted to the previous question 48% were unsure, 31% either disagreeing or strongly disagreeing with the statement. Similarly to the previous question, only 10% agreed with the statement.

As indicated in the literature review and background to the study, hospital libraries subscribe to many online and mobile resources that match with University resources. When participants were asked 'Departments such as the hospital library, support all staff using mobile technology', most 65% felt unsure. As most staff are orientated to the hospital library resources on commencement of employment, it was interesting that most of the participants felt unsure that this department supported their clinical use of mobile technology.

To clarify if there was a difference between participants perception of hospital library support for all staff use of mobile technology and nursing staff use, the question was worded with the addition of: 'Departments such as the hospital library, support nursing staff using mobile technology'. Almost the same results

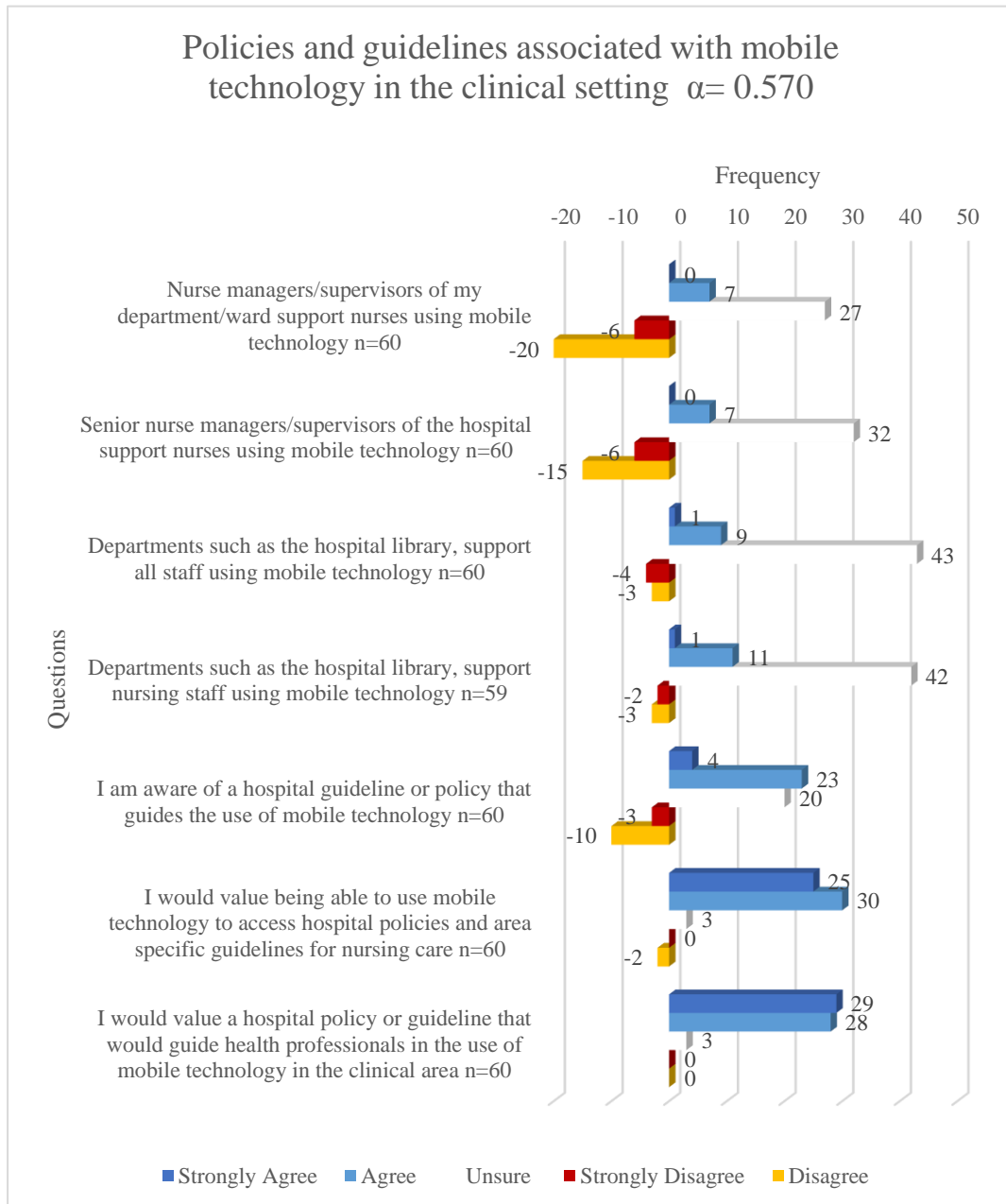
were noted to the previous question, with most participants indicating they felt unsure (63%).

To aid in identifying if a factor of mobile technology use was related to policy or guidelines (if available), the following question was posed: ‘I am aware of a hospital guideline or policy that guides the use of mobile technology’. Well under half (41%) of the participants strongly agreed or agreed with the statement, with 30% feeling unsure about a policy or guideline existing at their hospital site. This was an interesting finding, considering only one site (FSH) had a staff personal mobile technology use policy/guideline available.

The majority of 83% of participants indicated ‘I would value being able to use mobile technology to access hospital policies and area specific guidelines for nursing care’. This result suggested a preference for access to hospital policies and guidelines on a mobile device at the point of care.

As indicated in previous questions, participants felt unsure if local supervisors, hospital supervisors and areas such as the hospital library support their clinical use of mobile technology. Graduates also indicated they were unsure if a guideline or policy exists for its use. For the question: ‘I would value a hospital policy or guideline that would guide health professionals in the use of mobile technology in the clinical setting, over 86% of graduates either strongly agreed or agreed with the statement. Interestingly, no participants disagreed with the statement.

A visual representation of the questions relating to the subheading of ‘Policies and guidelines associated with mobile technology in the clinical setting’ can be seen in Figure 24.



*Figure 24. Policies and guidelines associated with mobile technology in the clinical setting*

**Descriptive statistics for Section Two: TAM2 variables affecting the use of mobile technology in health care.**

For section two of the survey the question structure and wording was adapted from the original TAM2 framework (Venkatesh & Davis, 2000). The researcher undertook a coding process that matched the original TAM2 framework. As previously mentioned, no subheadings were used in the surveys, as each question in section two was programmed to appear in random order for each participant. The researcher then

collated the results of section two by recoding the TAM2 questions in order to the subheadings in the framework. This framework incorporated the social influence processes of Subjective Norm (SN), and Image, along with the cognitive variables of Job Relevance (JR), Output Quality (OQ), Result Demonstrability (RD), and Perceived Ease Of Use (PEOU) (Venkatesh & Davis, 2000). The TAM, as a precursor to the TAM2, suggests if a system or technology has Perceived Usefulness (PU), this leads to the decision and consequent Intention To Use (ITU) the system, which leads to its Actual use (Davis, Bagozzi & Warshaw, 1989). The number of participants for this section decreased from n=66 to n=57, due to the time constraints experienced by the participants at one hospital.

**Intention To use (ITU).**

Intention To use (ITU) was defined by the following two questions (see Figure 25): ‘Assuming I have access to mobile technology, I intend to use it’, and ‘Given that I have access to mobile technology, I predict that I would use it’. Cronbach’s alpha for the two questions for ITU was high at  $\alpha=0.875$ . For the question ‘Assuming I have access to mobile technology, I intend to use it’, Most participants (74%) strongly agreed or agreed with the statement. For the second question ‘Given that I have access to mobile technology, I predict that I would use it’, over 78% of participants strongly agreed or agreed (see Figure 25).

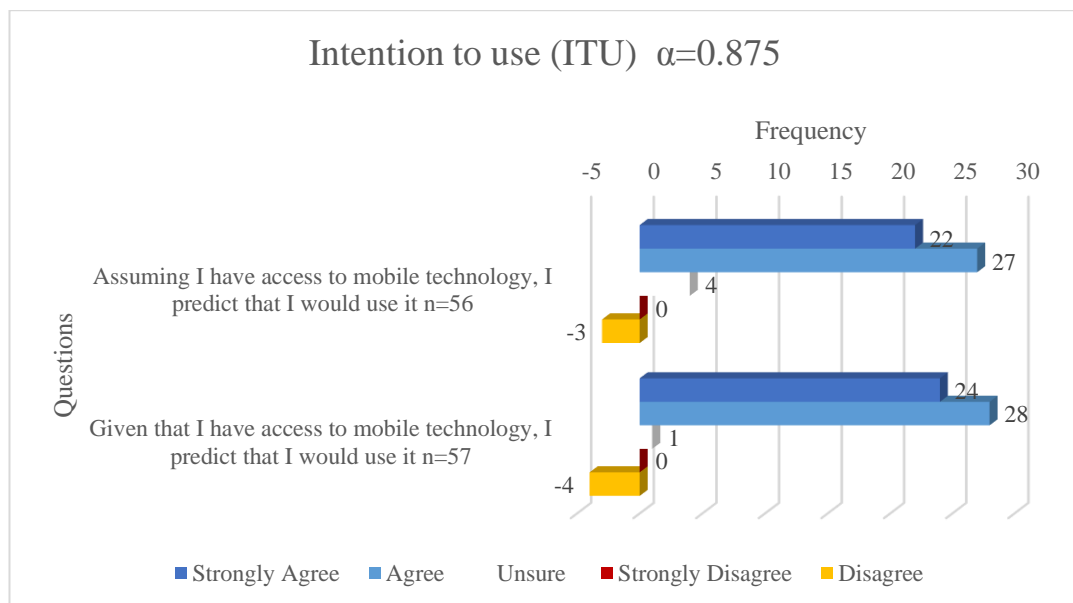


Figure 25. Intention To Use (ITU)

### Perceived Usefulness (PU).

Perceived Usefulness (PU) was defined by the following four questions that included ‘Using mobile technology improves my performance in my job’; ‘Using mobile technology in my job increases my productivity’; ‘using mobile technology enhances my effectiveness in my job’; and ‘I find mobile technology to be useful in my job’. Cronbach’s alpha was high for the four questions explaining PU at  $\alpha= 0.902$ .

For ‘Using mobile technology improves my performance in my job’, over half of the participants (58%) indicated they strongly agreed or agreed with the statement. For: ‘using mobile technology in my job increases my productivity’, over 57% of participants strongly agreed or agreed. For the question “using mobile technology enhances my effectiveness in my job’, similar results to the previous question was noted. Participants either strongly agreed, or agreed (61%) with the statement. The final question of ‘I find mobile technology to be useful in my job’ revealed over 75% either strongly agreeing or agreeing with the statement (see Figure 26).

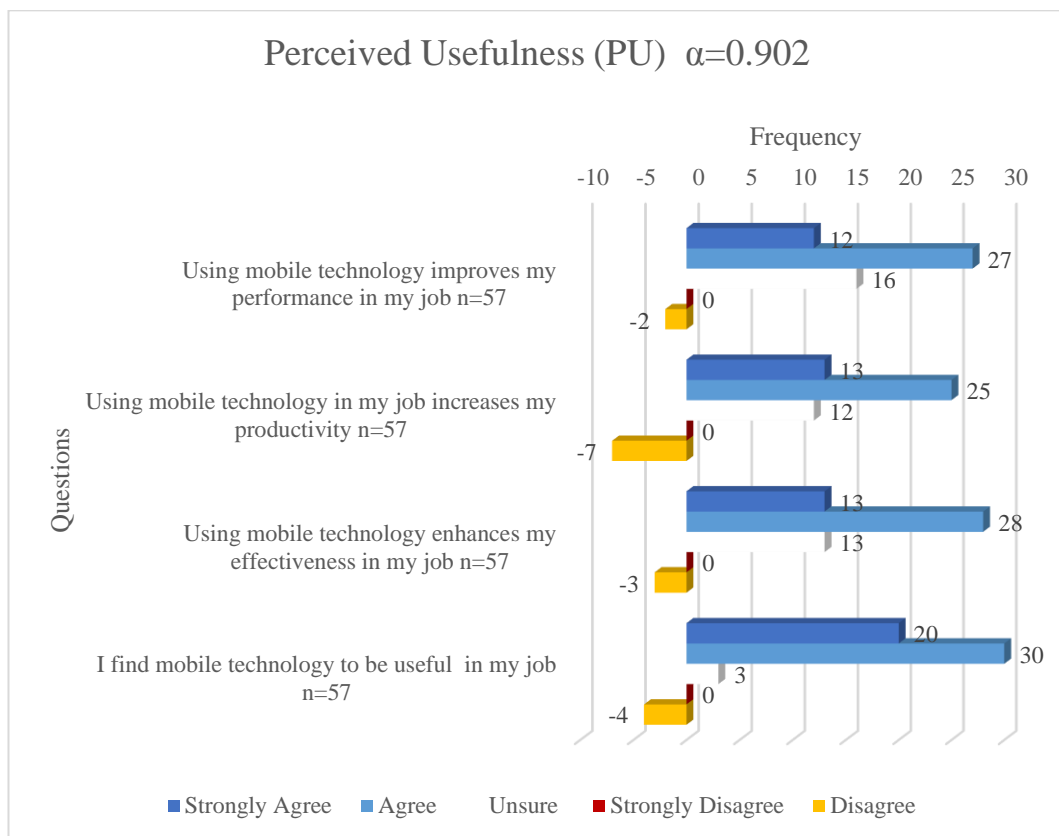


Figure 26. Perceived Usefulness (PU)



### Perceived Ease of Use (PEOU).

Perceived Ease of Use (PEOU) was defined by four questions that includes: ‘My interaction with mobile technology is clear and understandable’; ‘Interacting with mobile technology does not require a lot of my mental effort’; I find mobile technology to be easy to use’; and ‘I find it easy to get mobile technology to do what I want it to do’. Cronbach’s alpha was high for the four questions that make up PEOU at  $\alpha=0.778$ .

For the first question ‘My interaction with mobile technology is clear and understandable’, more than 66% of participants indicated they strongly agreed or agreed with the statement. For the question: ‘Interacting with mobile technology does not require a lot of my mental effort’, over 71% strongly agreed or agreed with the statement. In regards to the question ‘I find mobile technology to be easy to use’, over 80% strongly agreed or agreed. For the final question in PEOU: ‘I find it easy to get mobile technology to do what I want it to do’, over 69% of participants either strongly agreed or agreed with the statement (see Figure 27).

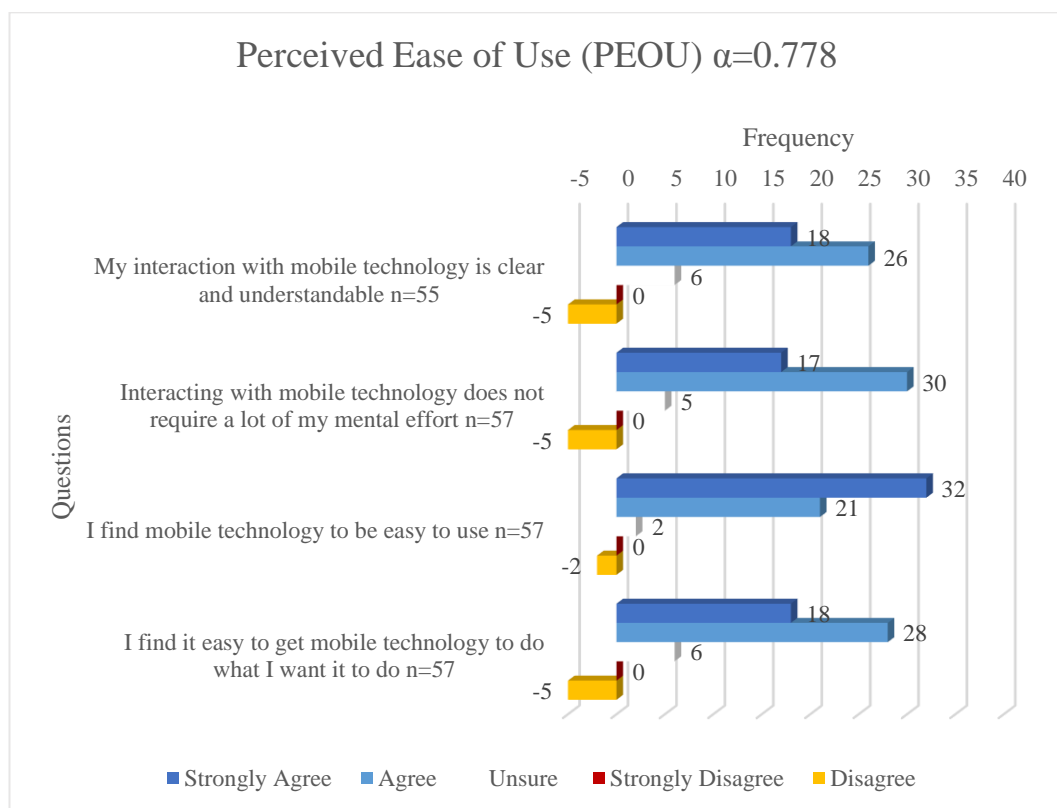


Figure 27. Perceived Ease of Use (PEOU)

### Subjective Norm (SN).

Subjective Norm (SN) was defined by two questions that included ‘People (nurse managers/supervisors) who influence my behaviour think that I should use mobile technology’; and ‘People (nurse managers/supervisors) who are important to me think that I should use mobile technology’. Cronbach’s alpha was high for these two questions at  $\alpha=0.837$ .

The majority of participants felt unsure (42%) that ‘People (nurse managers/supervisors) who influence my behaviour think that I should use mobile technology’. This was consistent with questions in section one of the survey where graduates were unsure if they had nurse manager support in the use of mobile technology. A similar response was noted in ‘People (nurse managers/supervisors) who are important to me think that I should use mobile technology’. Just under half of the participants (47%) felt unsure, with the statement (see Figure 28).

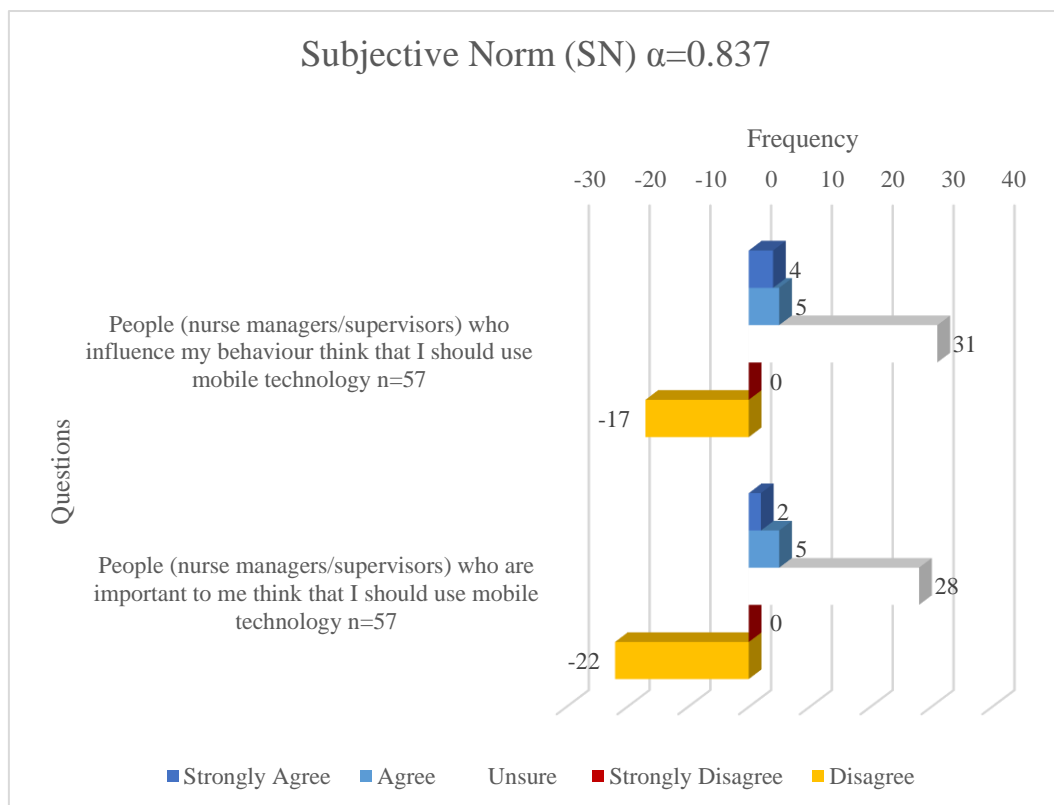


Figure 28. Subjective Norm (SN)

### Image.

Image was a factor of the TAM2 model that was represented by three of the following questions (see Figure 29): ‘People in my organisation who use mobile technology have more prestige than those who do not’; ‘People in my organization who use mobile technology have a high profile’; and ‘Having mobile technology is a status symbol in my organization’. Cronbach’s alpha was high for these questions in the subheading at  $\alpha=0.780$ .

For the question ‘People in my organisation who use mobile technology have more prestige than those who do not’, participants either disagreed or strongly disagreed (37%). Participants indicated they felt unsure (37%) with the statement ‘People in my organization who use mobile technology have a high profile’.

For the final question of ‘Having mobile technology is a status symbol in my organization’, nearly half (46%) of the participants either strongly disagreed or disagreed with the statement (see Figure 29).

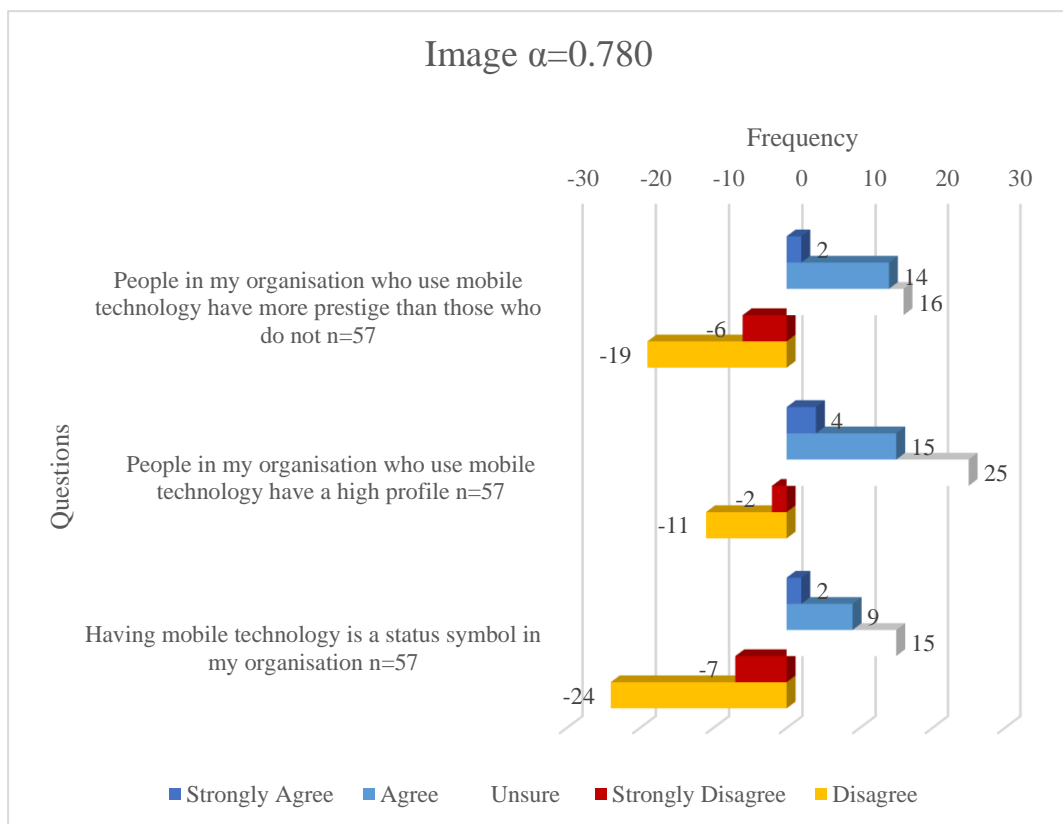


Figure 29. Image

### Job Relevance (JR)

Whether the participants felt mobile technology was relevant to their job, was part of the TAM2 framework and the coded subheading of Job Relevance (JR). Only two questions related to JR and these included: ‘In my job, usage of mobile technology is important’, and ‘In my job, usage of mobile technology is relevant’. Half of the participants felt that ‘In my job, usage of mobile technology is important’ with strongly agreeing and (49%) agreeing with the statement. For the other question, over 65% of participants indicated they strongly agreed or agreed that: ‘In my job, usage of mobile technology is relevant’ (see Figure 30).

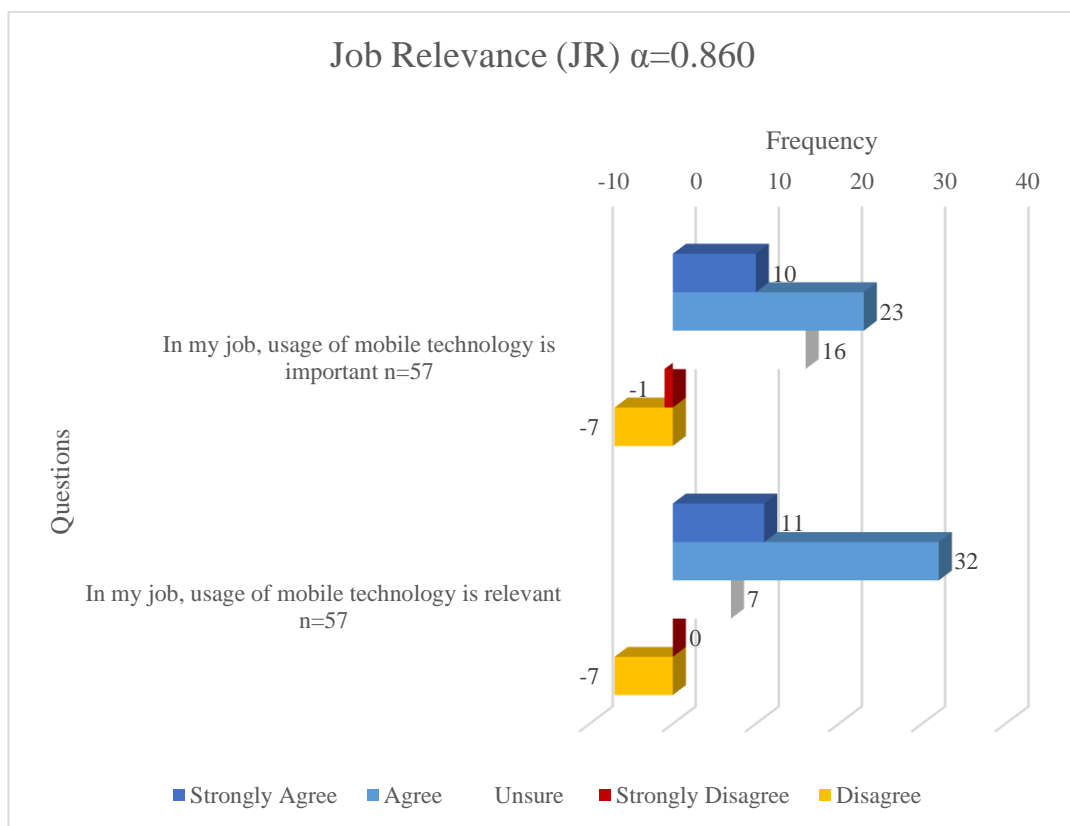


Figure 30. Job Relevance (JR)

### Output Quality (OQ).

Participants were asked if the use of mobile technology has a high quality in the clinical setting. This was measured using Output Quality (OQ) from TAM2. The following two questions reflected this variable: ‘The quality of the output I get from my mobile technology is high in the clinical setting’; and ‘I have no problem with

the quality of my mobile technology’s output in the clinical setting’. Cronbach’s alpha for the two questions was high at  $\alpha=0.828$ .

Half of the participants indicated they either strongly agreed or agreed (49%) with the statement ‘The quality of the output I get from my mobile technology is high in the clinical setting’. For the second and final question in the subheading, over 56% of participant’s either strongly agreed or agreed when asked: “I have no problem with the quality of my mobile technology’s output in the clinical setting” (see Figure 31).

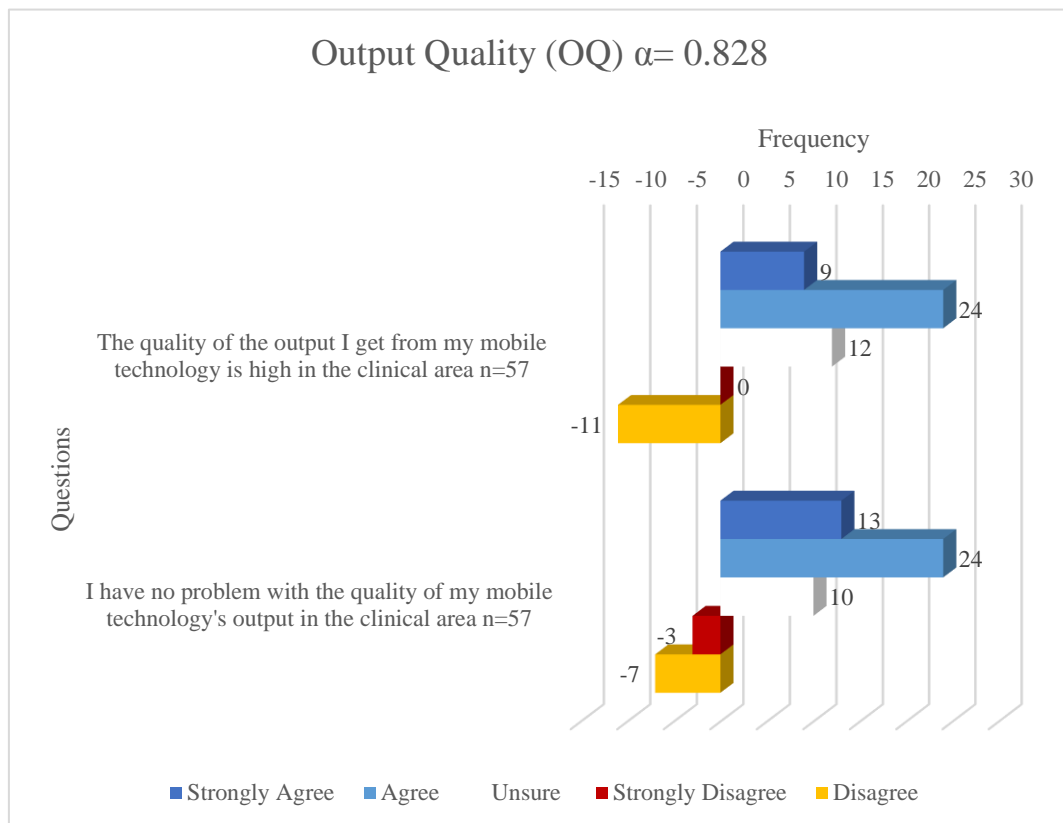


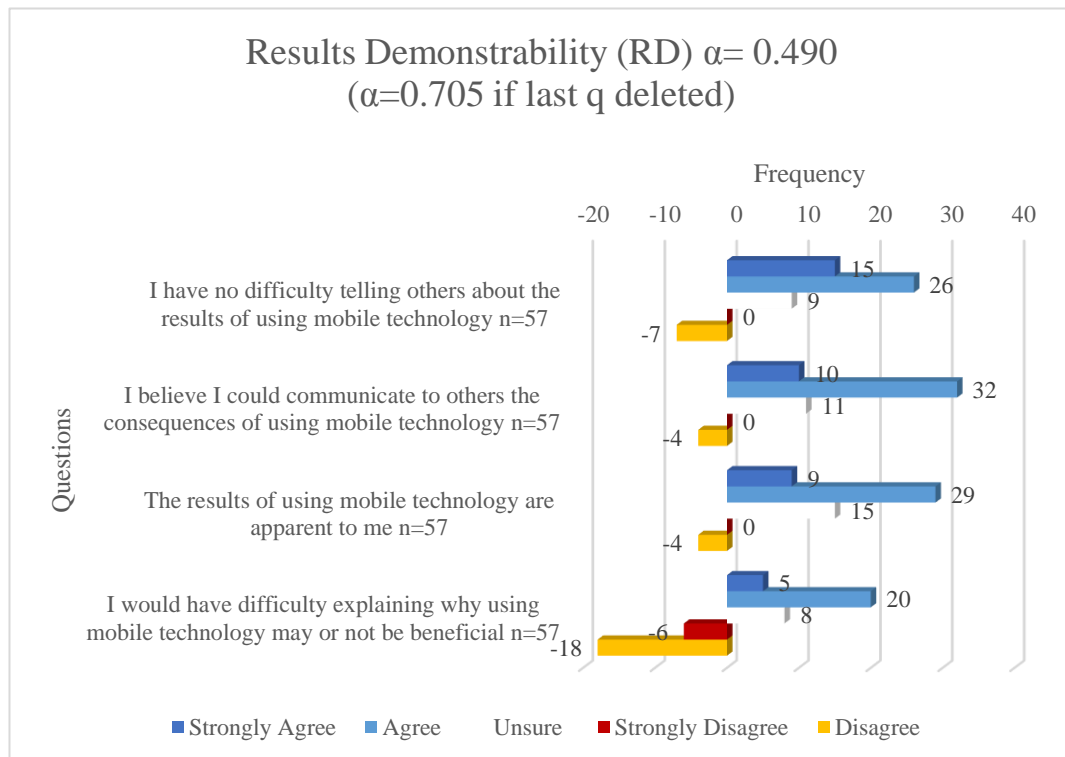
Figure 31. Output Quality (OQ)

### Results Demonstrability (RD).

For the final subheading within the TAM2 model, Results Demonstrability (RD) was measured by four questions. These included: ‘I have no difficulty telling others about the results of using mobile technology’; ‘I believe I could communicate to others the consequences of using mobile technology’; ‘The results of using mobile technology are apparent to me’; and ‘I would have difficulty explaining why using mobile technology may or may not be beneficial’. Cronbach’s alpha was low at  $\alpha=0.490$ , however if the last question was deleted from the analysis, the alpha score increased to  $\alpha=0.705$ .

Over 62% of the participants either strongly agreed or agreed with the statement ‘I have no difficulty telling others about the results of using mobile technology’. Similar results were noted with the question ‘I believe I could communicate to others the consequences of using mobile technology’. Over 63% of participants felt they either strongly agreed or agreed with this statement.

For the question ‘The results of using mobile technology are apparent to me’, 57% either strongly agreed or agreed with the statement. For the final negatively worded question, ‘I would have difficulty explaining why using mobile technology may or may not be beneficial’, participants were split between either strongly agreeing or agreeing (37%) and disagreeing or strongly disagreeing (36%) (see Figure 32).



*Figure 32. Results Demonstrability (RD)*

As previously mentioned some TAM2 researchers have removed the final question from their data analysis. This study, however, provides findings for comparison of the results between RD with the four questions and with the final RD question removed. Results of the Pearson’s product-moment correlations and Adjusted  $R_2$  are

presented in the following sections for both RD with the standard four questions compared to RD with the final question removed.

### **Fisher's exact tests**

#### **Methods**

When the demographic information was compared across all questions in section one and section two (TAM2), a statistical test variant of Chi Square known as Fishers exact test, was applied across the data. The Fishers exact test is a non-parametric statistical test used in the analysis for determining the relationships between the two nominal (categorical) variables (Fain, 2015). The use of Fishers exact test is comparable to Chi square results where there is a lower sample size and the expected minimum cell frequency is five (Pallant, 2013). The  $\chi^2$  (Chi square) statistic can be problematic for smaller samples when expected cell frequencies are less than five (Fain, 2015). Nominal and ordinal data can be described by frequency counts. The frequency data was used along with mutually exclusive categories that compared the count and not the mean, with the result symbolised as  $\chi^2$  (Fain, 2015).

Although a number of results indicated statistical significance initially using Chi squares between variables, a number of cells within the data had less than five. Thus, probability was evaluated to determine if there was a statistically significant difference with the Fishers exact test. Fishers exact test (2 sided) was used as the preferred statistical test for testing the relationship between the variables. Use of the Fishers exact test, however, resulted in less statistically significant results across the data set. Probability was set at  $P < .05$  for all tests in the data analysis.

It was important to compare between the demographic variables to identify patterns in the data to assist in answering the research questions. The results assisted in explaining potential factors and influences from the demographic variables, which may affect whether the graduate decides to use or not use mobile technology clinically. These patterns were also explored in the following qualitative phases of the research.

### **Fishers exact tests results**

Fisher's exact tests were applied with all the demographic variables to all questions in section one and section two to identify patterns in the data. The demographic of age group revealed no significant results between age and all questions in either section one or two. Significant results were however, reported in the following sections. The University biostatistician assisted to ensure correct procedure for the following data analysis results.

#### **Fishers exact Tests and gender.**

The demographic variable of gender was compared with the question from section one in the survey 'Using mobile technology improves my organisational skills' Fisher's exact test revealed a significant difference between males and females (see Table 3). More males than females indicated that using mobile technology improved their organisational skills with most strongly agreeing (66% males 'within gender') compared to (15% females 'within gender'). Most females indicated their organisational skills were improved with mobile technology, however a difference was noted where (17% of the female % 'within gender') either disagreed or strongly disagreed with the statement. No males indicated they disagreed or strongly disagreed with the statement. There was a statistically significant association between gender and the question 'Using mobile technology improves my organisational skills' as assessed by Fishers exact test,  $p=.019$ .



Table 3

*'Gender' Compared To 'Using mobile technology clinically improves my organisational skills'*

Using mobile technology clinically improves my organisational skills (n=63)	<b>Males</b>		<b>Females</b>	
	<i>Frequency, (%)</i>	% within gender	<i>Frequency, (%)</i>	% within gender
Strongly agree	4, (6.3%)	66.7%	9, (14.3%)	15.8%
Agree	0		27, (42.9%)	47.4%
Unsure	2, (3.2%)	33.3%	11, (17.5%)	19.3%
Disagree	0		8, (12.5%)	14%
Strongly Disagree	0		2, (3.2%)	3.5%
<b>Totals</b>	<b>6, (9.5%)</b>	<b>100%</b>	<b>57, (90.5%)</b>	<b>100%</b>

Gender was also compared with the question from section one in the survey 'Using mobile technology clinically improves my learning'. Fisher's exact test revealed a significant difference between males and females where more males strongly agreed (83% males 'within gender') with the statement compared to females (28% females 'within gender') (see in Table 4). There was a statistically significant association between gender and the question, as assessed by Fishers exact test,  $p=0.027$ .

Table 4

*'Gender' Compared To 'Using mobile technology clinically improves my learning'*

Using mobile technology clinically improves my learning (n=63)	<b>Males</b>		<b>Females</b>	
	<i>Frequency, (%)</i>	% within gender	<i>Frequency, (%)</i>	% within gender
Strongly agree	5, (7.9%)	83.3%	16, (25.4%)	28.1%
Agree			30, (47.6%)	52.6%
Unsure	1, (1.6%)	16.7%	9, (14.3%)	15.8%
Disagree			2, (3.2%)	3.5%
Strongly Disagree			0, (0%)	
<b>Totals</b>	<b>6, (9.5%)</b>	<b>100%</b>	<b>57, (90.5%)</b>	<b>100%</b>

The demographic variable of ‘Gender’ was compared to the question from section one in the survey ‘My University encouraged mobile technology for learning within my undergraduate degree’. It is noted that over 72% (% within gender) of females either strongly agreed or agreed with the statement, with only half of males 50% (% within gender) strongly agreeing or agreeing (see Table 5). There was a statistically significant association between gender and the question, as assessed by Fishers exact test,  $p=.024$ .

Table 5

*‘Gender’ Compared To ‘My University encouraged mobile technology for learning within my undergraduate degree’*

‘My University encouraged mobile technology for learning within my undergraduate degree’ (n=60)	<b>Males</b>		<b>Females</b>	
	<i>Frequency, (%)</i>	<i>% within gender</i>	<i>Frequency, (%)</i>	<i>% within gender</i>
Strongly agree	2, (3.3%)	33.3%	23, (38.3%)	42.6%
Agree	1, (1.7%)	16.7%	16, (26.7%)	29.6%
Unsure	1, (1.7%)	16.7%	9, (15%)	16.7%
Disagree	0		6, (10%)	11.1%
Strongly Disagree	2, (3.3%)	33.3%	0, (%)	0%
<b>Totals</b>	<b>6, (10%)</b>	<b>100%</b>	<b>54, (90%)</b>	<b>100%</b>

‘Gender’ as a demographic variable, was compared to the question from section one in the survey ‘I would value being able to use mobile technology to access hospital policies and area specific guidelines for nursing care’. The results are. Ninety two percent of females either strongly agreed 37% (% within gender) or agreed 55% (% within gender) with the statement, compared to the proportion of males only strongly agreeing at 83% (% within gender) (see Table 6). There was a statistically significant association between gender and the question, as assessed by Fishers exact test,  $p=.016$ .

Table 6

*'Gender' Compared To 'I would value being able to use mobile technology to access hospital policies and area specific guidelines for nursing care'*

'I would value being able to use mobile technology to access hospital policies and area specific guidelines for nursing care' (n=60)	<b>Males</b>		<b>Females</b>	
	<i>Frequency, (%)</i>	<i>% within gender</i>	<i>Frequency, (%)</i>	<i>% within gender</i>
Strongly agree	5, (8.3%)	83.3%	20, (33.3%)	37%
Agree	0, (0%)	0%	30, (50%)	55.6%
Unsure	0, (0%)	0%	3, (5%)	5.6%
Disagree	1, (1.7%)	16.7%	1, (1.7%)	1.9%
Strongly Disagree	0, (0%)	0%	0, (%)	0%
<b>Totals</b>	<b>6, (10%)</b>	<b>100%</b>	<b>54, (90%)</b>	<b>100%</b>

'Gender' was compared to the question from section one in the survey 'Using mobile technology improves my performance in my job'. A significant difference was noted with males strongly agreeing with the statement 83% (% within gender) with only 13% (% within gender) of females strongly agreeing or agreeing 52% (% within gender) (see Table 7). There was a statistically significant association between gender and the question, as assessed by Fishers exact test,  $p=.002$ .

Table 7

*'Gender' Compared To 'Using mobile technology improves my performance in my job'*

'Using mobile technology improves my performance in my job' (n=57)	<b>Males</b>		<b>Females</b>	
	<i>Frequency, (%)</i>	<i>% within gender</i>	<i>Frequency, (%)</i>	<i>% within gender</i>
Strongly agree	5, (8.8%)	83.3%	7, (12.3%)	13.7%
Agree	0, (0%)	0%	27, (47.4%)	52.9%
Unsure	1, (1.8%)	16.7%	15, (26.3%)	29.4%
Disagree	0, (0%)	0%	2, (3.5%)	3.9%
Strongly Disagree	0, (0%)	0%	0, (%)	0%
<b>Totals</b>	<b>6, (10.5%)</b>	<b>100%</b>	<b>51, (89.5%)</b>	<b>100%</b>

The participants' gender was compared with the question 'Interacting with mobile technology does not require a lot of my mental effort' from the TAM2 framework in section two of the survey. There was a significant difference between males and females with more males strongly agreeing with the statement 83% (% within gender), compared to 23% (% within gender) strongly agreeing and 58% agreeing (% within gender) (see Table 8). There was a statistically significant association between gender and the question, as assessed by Fishers exact test,  $p=.008$ .

Table 8

*'Gender' Compared To 'Interacting with mobile technology does not require a lot of my mental effort'*

'Interacting with mobile technology does not require a lot of my mental effort' (n=57)	<b>Males</b>		<b>Females</b>	
	<i>Frequency, (%)</i>	% within gender	<i>Frequency, (%)</i>	% within gender
Strongly agree	5, (8.8%)	83.3%	12, (21.1%)	23.5%
Agree	0, (0%)	0%	30, (52.6%)	58.8%
Unsure	0, (0%)	0%	5, (8.8%)	9.8%
Disagree	1, (1.8%)	16.7%	4, (7%)	7.8%
Strongly Disagree	0, (0%)	0%	0, (%)	0%
<b>Totals</b>	<b>6, (10.5%)</b>	<b>100%</b>	<b>51, (89.5%)</b>	<b>100%</b>

The participants gender was also compared to the question 'People (nurse managers/supervisors) who are important to me think that I should use mobile technology'. A significant difference was noted between males and females where more males strongly agreed with the statement 50% (% within gender) with females either strongly agreeing 2% (% within gender) or agreed 9% (% within gender). It was also noted 33% of females (% within gender) disagreed with the statement where no males disagreed or strongly disagreed (see Table 9). There was a statistically significant association between gender and the question, as assessed by Fishers exact test,  $p=.003$ .

Table 9

*'Gender' Compared To 'People (nurse managers/supervisors) who are important to me think that I should use mobile technology'*

'People (nurse managers/supervisors) who are important to me think that I should use mobile technology' (n=57)	<b>Males</b>		<b>Females</b>	
	<i>Frequency, (%)</i>	<i>% within gender</i>	<i>Frequency, (%)</i>	<i>% within gender</i>
Strongly agree	3, (5.3%)	50%	1, (1.8%)	2%
Agree	0, (0%)	0%	5, (8.8%)	9.8%
Unsure	3, (5.3%)	50%	28, (49.1%)	54.9%
Disagree	0, (0%)	0%	17, (29.8%)	33.3%
Strongly Disagree	0, (0%)	0%	0, (0%)	0%
<b>Totals</b>	<b>6, (10.5%)</b>	<b>100%</b>	<b>51, (89.5%)</b>	<b>100%</b>

Participants gender was also compared to the question 'People in my organization who use mobile technology have more prestige than those who do not'. A significant difference was noted between gender where more males either strongly agreed 16% (% within gender) or agreed 66% (% within gender) with the statement compared to females strongly agreeing 2% (% within gender) and 19% agreeing (% within gender). It was noted only females felt unsure at 31% (% within gender), with more females disagreeing 35% (% within gender) or strongly disagreeing 11% (% within gender) compared to males disagreeing at 16% (% within gender) (see Table 10). There was a statistically significant association between gender and the question, as assessed by Fishers exact test,  $p=.025$ .

Table 10

*'Gender' Compared To 'People in my organization who use mobile technology have more prestige than those who do not'*

'People in my organization who use mobile technology have more prestige than those who do not' (n=57)	<b>Males</b>		<b>Females</b>	
	<i>Frequency, (%)</i>	% within gender	<i>Frequency, (%)</i>	% within gender
Strongly agree	1, (1.8%)	16.7%	1, (1.8%)	2%
Agree	4, (7%)	66.7%	10, (17.5%)	19.6%
Unsure	0, (0%)	0%	16, (28.1%)	31.4%
Disagree	1, (1.8%)	16.7%	18, (31.6%)	35.3%
Strongly Disagree	0, (0%)	0%	6, (10.5%)	11.8%
<b>Totals</b>	<b>6, (10.5%)</b>	<b>100%</b>	<b>51, (89.5%)</b>	<b>100%</b>

Gender was also compared to the question 'In my job, usage of mobile technology is important'. A significance difference was noted between males and females where more males strongly agreeing 66% (% within gender) or agreeing 16% (% within gender) when compared to females strongly agreeing 11% (% within gender) and agreeing 43% (% within gender). No males disagreed with the statement with females either disagreeing 13% (% within gender) or strongly disagreeing 2% (% within gender) (See Table 11). There was a statistically significant association between gender and the question, as assessed by Fishers exact test,  $p=.041$ .

Table 11

*'Gender' Compared To 'In my job, usage of mobile technology is important'*

'In my job, usage of mobile technology is important' (n=57)	<b>Males</b>		<b>Females</b>	
	<i>Frequency, (%)</i>	<i>% within gender</i>	<i>Frequency, (%)</i>	<i>% within gender</i>
Strongly agree	4, (7%)	66.7%	6, (10.5%)	11.8%
Agree	1, (1.8%)	16.7%	22, (38.6%)	43.1%
Unsure	1, (1.8%)	16.7%	15, (26.3%)	29.4%
Disagree	0, (0%)	0%	7, (12.3%)	13.7%
Strongly Disagree	0, (0%)	0%	1, (1.8%)	2%
<b>Totals</b>	<b>6, (10.5%)</b>	<b>100%</b>	<b>51, (89.5%)</b>	<b>100%</b>

The final question that was compared with the participant's gender was 'The quality of the output I get from my mobile technology is high in the clinical setting'. All males indicated they either strongly agreed with the statement 80% or agreed 20% (% within gender) compared to females 9% strongly agreeing or agreeing 45% (% within gender). However some females indicated they felt unsure 23% or disagreed 21% (% within gender) (see Table 12). There was a statistically significant association between gender and the question, as assessed by Fishers exact test,  $p=.003$ .

Table 12

*'Gender' Compared To 'The quality of the output I get from my mobile technology is high in the clinical area'*

'The quality of the output I get from my mobile technology is high in the clinical area' (n=56)	<b>Males</b>		<b>Females</b>	
	<i>Frequency, (%)</i>	<i>% within gender</i>	<i>Frequency, (%)</i>	<i>% within gender</i>
Strongly agree	4, (7.1%)	80%	5, (8.9%)	9.8%
Agree	1, (1.8%)	20%	23, (41.1%)	45.1%
Unsure	0, (0%)	0%	12, (21.4%)	23.5%
Disagree	0, (0%)	0%	11, (19.6%)	21.6%
Strongly Disagree	0, (0%)	0%	0, (0%)	0%
<b>Totals</b>	<b>5, (8.9%)</b>	<b>100%</b>	<b>51, (91.1%)</b>	<b>100%</b>



### **Fishers exact Tests with hospital location of graduate program.**

The demographic of hospital graduate nurse program location was compared to all questions within section one and section two of the survey. A number of significant results were noted across the hospitals that assisted in addressing the research questions. There were no participants from the SJOGH (Subiaco) hospital site due to a participant not completing the survey in full. Note the results are included from the SJOGH (Murdoch site) as only 2 participants completed the survey. This is in contrasted to the larger numbers of participants at the other hospital sites. The results and percentages within the hospital sites should be considered when interpreting the results in terms of the differences in sample size.

The question from section one in the survey 'I value accessing relevant clinical information on mobile technology' was compared across the hospital graduate nurse program locations. A significance difference was noted between the hospital sites in whether participants strongly agreed or agreed with the statement (see Table 13). Participants at SCGH strongly agreed 34% (% within hospital) compared to FSH at 76% (% within hospital), with RPH at 66% (% within hospital) and the private hospital SJOGH (Murdoch) with 0% (% within hospital). Similar differences were noted between the sites if they agreed with the statement with SCGH 56% (% within hospital), FSH 23% (% within hospital), RPH 16% (% within hospital), and SJOGH (Murdoch) 100% (% within hospital) (see Table 13). There was a statistically significant association between the hospital graduate nurse program location and the question, as assessed by Fishers exact test,  $p=.003$ .

Table 13

*'Hospital graduate program location' Compared To 'I value accessing relevant clinical information on mobile technology'*

'I value accessing relevant clinical information on mobile technology' (n=63)	<b>SCGH</b> <i>Freq, (%)</i> , <b>% within</b>	<b>FSH</b> <i>Freq, (%)</i> , <b>% within</b>	<b>RPH</b> <i>Freq, (%)</i> , <b>% within</b>	<b>SJOGH (Murdoch)</b> <i>Freq, (%)</i> , <b>% within</b>
Strongly agree	8, (12.7%) <b>34.8%</b>	20, (31.7%) <b>76.9%</b>	8, (12.7%) <b>66.7%</b>	0, (0%), <b>0%</b>
Agree	13, (20.6%) <b>56.5%</b>	6, (9.5%), <b>23.1%</b>	2, (3.2%) <b>16.7%</b>	2, (3.2%) <b>100%</b>
Unsure	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>	1, (1.6%) <b>8.3%</b>	0, (0%), <b>0%</b>
Disagree	2, (3.2%) <b>8.7%</b>	0, (0%), <b>0%</b>	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>
Strongly Disagree	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>	1, (1.6%) <b>8.3%</b>	0, (0%), <b>0%</b>
<b>Totals</b>	<b>23, (36.5%)</b> <b>100%</b>	<b>26, (41.3%)</b> <b>100%</b>	<b>12, (19%)</b> <b>100%</b>	<b>2, (3.2%)</b> <b>100%</b>

The demographic of 'Hospital graduate program location' was compared to the question from section one in the survey 'In the clinical area, I use a number of applications (apps) on mobile technology' Significant differences were noted between the sites where graduates at SCGH either strongly agreed or agreed 26% (% within hospital), compared to FSH graduates at 50% (% within hospital), RPH graduates at 83% (% within hospital) and SJOGH Murdoch at 50% (% within hospital) (see Table 14).

Significant differences were noted between the sites when either disagreeing or agreeing with the statement. SCGH either strongly disagreed or disagreed at 65% (% within hospital), FSH at 38% (within hospital), RPH at 16 % (% within hospital), and SJOGH Murdoch at 50% (% within hospital). There was a statistically significant association between the hospital graduate nurse program location and the question, as assessed by Fishers exact test,  $p=.033$ .

Table 14

*'Hospital graduate program location' Compared To 'In the clinical area, I use a number of applications (apps) on mobile technology'*

<i>'In the clinical area, I use a number of applications (apps) on mobile technology' (n=63)</i>	<b>SCGH</b> <i>Freq. (%), % within</i>	<b>FSH</b> <i>Freq. (%), % within</i>	<b>RPH</b> <i>Freq. (%), % within</i>	<b>SJOGH (Murdoch)</b> <i>Freq. (%), % within</i>
Strongly agree	3, (4.8%) <b>13%</b>	2, (3.2%) <b>7.7%</b>	1, (1.6%) <b>8.3%</b>	0, (0%), <b>0%</b>
Agree	3, (4.8%) <b>13%</b>	11, (17.5%), <b>42.3%</b>	9, (14.3%) <b>75%</b>	1, (1.6%) <b>50%</b>
Unsure	2, (3.2%) <b>8.7%</b>	3, (4.8%), <b>11.5%</b>	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>
Disagree	14, (22.2%) <b>60.9%</b>	9, (14.3%), <b>34.6%</b>	1, (1.6%) <b>8.3%</b>	1, (1.6%), <b>50%</b>
Strongly Disagree	1, (1.6%) <b>4.3%</b>	1, (1.6%), <b>3.8%</b>	1, (1.6%) <b>8.3%</b>	0, (0%), <b>0%</b>
<b>Totals</b>	<b>23, (36.5%) 100%</b>	<b>26, (41.3%) 100%</b>	<b>12, (19%) 100%</b>	<b>2, (3.2%) 100%</b>

The demographic of 'Hospital graduate program location' was compared to the question from section one in the survey 'I am encouraged to use mobile technology for educational opportunities' with results presented in Table 15. A significant difference was noted between the sites with graduates at RPH mostly 83% agreeing or strongly agreeing (% within hospital) compared to the other sites with SCGH 21% (% within hospital), FSH with 15% (% within hospital), and SJOGH Murdoch at 0%. It was noted graduates at FSH mostly felt unsure with the statement 46.2% (% within hospital), whilst at SCGH 8% (% within hospital), RPH 0% and SJOGH Murdoch at 50% (% within hospital).

Differences were noted between the sites to whether they disagreed or strongly disagreed with most graduates at SCGH at 69% (% within hospital), followed by SJOGH (Murdoch) at 50% (% within hospital), FSH at 38% (% within hospital), and RPH only at 8% (% within hospital). There was a statistically

significant association between the hospital graduate nurse program location and the question, as assessed by Fishers exact test,  $p=.017$ .

Table 15

*'Hospital graduate program location' Compared To 'I am encouraged to use mobile technology for educational opportunities'*

'I am encouraged to use mobile technology for educational opportunities' (n=63)	<b>SCGH</b> <i>Freq, (%)</i> , <i>% within</i>	<b>FSH</b> <i>Freq, (%)</i> , <i>% within</i>	<b>RPH</b> <i>Freq, (%)</i> , <i>% within</i>	<b>SJOGH (Murdoch)</b> <i>Freq, (%)</i> , <i>% within</i>
Strongly agree	2, (3.2%) <b>8.7%</b>	2, (3.2%) <b>7.7%</b>	1, (8.3%) <b>8.3%</b>	0, (0%), <b>0%</b>
Agree	3, (4.8%) <b>13%</b>	2, (3.2%), <b>7.7%</b>	4, (33.3%) <b>75%</b>	0, (0%) <b>0%</b>
Unsure	2, (3.2%) <b>8.7</b>	12, (19%), <b>46.2%</b>	5, (41.7%) <b>0%</b>	1, (1.6%), <b>50%</b>
Disagree	11, (17.5%) <b>47.8%</b>	9, (14.3%), <b>34.6%</b>	2, (16.7%) <b>8.3%</b>	0, (0%), <b>0%</b>
Strongly Disagree	5, (7.9%) <b>21.7%</b>	1, (1.6%), <b>3.8%</b>	0, (0%) <b>0%</b>	1, (1.6%), <b>50%</b>
<b>Totals</b>	<b>23, (36.5%)</b> <b>100%</b>	<b>26, (41.3%)</b> <b>100%</b>	<b>12, (19%)</b> <b>100%</b>	<b>2, (3.2%)</b> <b>100%</b>

The demographic of 'Hospital graduate program location' was compared to the question from section one in the survey 'I used mobile technology for learning during my clinical practice in rotations'. Differences were noted between the sites where both FSH and RPH graduates either strongly agreed or agreed with the statement 75% (% within hospital), compared to SCGH at 41.7% (% within hospital) and SJOGH Murdoch at 50% (% within hospital) (see Table 16).

Differences were noted across the sites where graduates either disagreed or strongly disagreed with most at SCGH 59% (% within hospital), FSH at 20.8% (% within hospital), RPH at 16% (% within hospital) and SJOGH at 50% (% within hospital). There was a statistically significant association between the hospital

graduate nurse program location and the question, as assessed by Fishers exact test,  $p=.005$ .

Table 16

*'Hospital graduate program location' Compared To 'I used mobile technology for learning during my clinical practice in rotations'*

'I used mobile technology for learning during my clinical practice in rotations' (n=60)	<b>SCGH</b> <i>Freq, (%)</i> <b>% within</b>	<b>FSH</b> <i>Freq, (%)</i> <b>% within</b>	<b>RPH</b> <i>Freq, (%)</i> <b>% within</b>	<b>SJOGH (Murdoch)</b> <i>Freq, (%)</i> <b>% within</b>
Strongly agree	5, (8.3%) <b>22.7%</b>	5, (8.3%) <b>20.8%</b>	6, (10%) <b>50%</b>	1, (1.7%), <b>50%</b>
Agree	4, (6.7%) <b>18.7%</b>	13, (21.7%), <b>54.2%</b>	3, (5%) <b>25%</b>	0, (0%) <b>0%</b>
Unsure	0, (0%) <b>0%</b>	1, (1.7%), <b>4.2%</b>	1, (1.7%) <b>8.3%</b>	0, (0%), <b>0%</b>
Disagree	12, (20%) <b>54.5%</b>	2, (3.3%), <b>8.3%</b>	1, (1.7%) <b>8.3%</b>	1, (1.7%), <b>50%</b>
Strongly Disagree	1, (1.7%) <b>4.5%</b>	3, (5%), <b>12.5%</b>	1, (1.7%) <b>8.3%</b>	1, (0%), <b>0%</b>
<b>Totals</b>	<b>22, (36.7%)</b> <b>100%</b>	<b>24, (40%)</b> <b>100%</b>	<b>12, (20%)</b> <b>100%</b>	<b>2, (3.3%)</b> <b>100%</b>

The demographic of 'Hospital graduate program location' was compared to the question from section one in the survey 'In my experience, it is difficult to access PC/computers in my department/ward'. Graduates at RPH either strongly agreed or agreed with the statement at 75% (% within hospital) followed by SCGH at 63% (% within hospital) with SJOGH Murdoch 50% (% within hospital) and then FSH at 20.9% (% within hospital) (see Table 17).

Differences across the sites were noted where graduates at FSH mostly disagreed or strongly disagreed 70 % (% within hospital) followed by SCGH at 31% (% within hospital), only 16% (% within hospital) and SJOGH Murdoch at 50% (% within hospital). There was a statistically significant association between the hospital

graduate nurse program location and the question, as assessed by Fishers exact test,  $p=.016$ .

Table 17

*‘Hospital graduate program location’ Compared To ‘In my experience, it is difficult to access PC/computers in my department/ward’*

‘In my experience, it is difficult to access PC/computers in my department/ward’ (n=60)	<b>SCGH</b> <i>Freq, (%), % within</i>	<b>FSH</b> <i>Freq, (%), % within</i>	<b>RPH</b> <i>Freq, (%), % within</i>	<b>SJOGH (Murdoch)</b> <i>Freq, (%), % within</i>
Strongly agree	7, (11.7%) <b>31.8%</b>	1, (1.7%) <b>4.2%</b>	6, (10%) <b>50%</b>	0, (0%), <b>0%</b>
Agree	7, (11.7%) <b>31.8%</b>	4, (6.7%), <b>16.7%</b>	3, (5%) <b>25%</b>	1, (1.7%) <b>50%</b>
Unsure	1, (1.7%) <b>4.5%</b>	2, (3.3%), <b>8.3%</b>	1, (1.7%) <b>8.3%</b>	0, (0%), <b>0%</b>
Disagree	7, (11.7%) <b>31.8%</b>	12, (20%), <b>50%</b>	2, (3.3%) <b>16.7%</b>	1, (1.7%), <b>50%</b>
Strongly Disagree	0, (0%) <b>0%</b>	5, (8.3%), <b>20.8%</b>	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>
<b>Totals</b>	<b>22, (36.7%) 100%</b>	<b>24, (40%) 100%</b>	<b>12, (20%) 100%</b>	<b>2, (3.3%) 100%</b>

The demographic of ‘Hospital graduate program location’ was compared to the question from section one in the survey ‘Patients may think I am using mobile technology for unprofessional reasons’. Although most graduates either agreed or strongly agreed with the statement, significant differences were still noted between hospitals (see Table 18). Participants at SCGH indicated they strongly agreed or agreed 100% (% within hospital), with similar results noted at FSH 91% (% within hospital). Seventy five percent of RPH participants either strongly agreed or disagreed, with 50% at SJOGH Murdoch site (% within hospital). There was a statistically significant association between the hospital graduate nurse program location and the question, as assessed by Fishers exact test,  $p=.047$ .

Table 18

*'Hospital graduate program location' Compared To 'Patients may think I am using mobile technology for unprofessional reasons'*

'Patients may think I am using mobile technology for unprofessional reasons' (n=60)	<b>SCGH</b> <i>Freq, (%)</i> , <i>% within</i>	<b>FSH</b> <i>Freq, (%)</i> , <i>% within</i>	<b>RPH</b> <i>Freq, (%)</i> , <i>% within</i>	<b>SJOGH (Murdoch)</b> <i>Freq, (%)</i> , <i>% within</i>
Strongly agree	10, (16.7%) <b>45.5%</b>	14, (23.3%) <b>58.3%</b>	4, (6.7%) <b>33.3%</b>	1, (1.7%), <b>50%</b>
Agree	12, (20%) <b>54.5%</b>	8 (13.3%), <b>33.3%</b>	5, (8.3%) <b>41.7%</b>	0, (0%) <b>0%</b>
Unsure	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>	2, (3.3%) <b>16.7%</b>	1, (1.7%), <b>50%</b>
Disagree	0, (0%) <b>0%</b>	2, (3.3%), <b>8.3%</b>	1, (1.7%) <b>8.3%</b>	0, (0%), <b>0%</b>
Strongly Disagree	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>
<b>Totals</b>	<b>22, (36.7%)</b> <b>100%</b>	<b>24, (40%)</b> <b>100%</b>	<b>12, (20%)</b> <b>100%</b>	<b>2, (3.3%)</b> <b>100%</b>

The demographic of 'Hospital graduate program location' was compared to the question from section two in the survey 'Having mobile technology is a status symbol in my organization'. Significant results were noted between the hospital sites where over 70% (% within hospital) of graduates at FSH either disagreed or strongly disagreed with the statement compared to SCGH who only disagreed 50% (% within hospital), RPH 25% and SJOGH Murdoch at 100% (% within hospital) who only disagreed (see Table 19). It was interesting to note that 35% (% within hospital) of graduates at SCGH either strongly agreed or agreed with the statement, compared to 4% (% within hospital) at FSH and 25% (% within hospital) at RPH. The most contrast was noted at RPH where 50% felt unsure compared to the other sites. There was a statistically significant association between the hospital graduate nurse program location and the question, as assessed by Fishers exact test,  $p=.010$ .

Table 19

*‘Hospital graduate program location’ Compared To ‘Having mobile technology is a status symbol in my organization’*

‘Having mobile technology is a status symbol in my organization’ (n=57)	<b>SCGH</b> <i>Freq, (%)</i> , <b>% within</b>	<b>FSH</b> <i>Freq, (%)</i> , <b>% within</b>	<b>RPH</b> <i>Freq, (%)</i> , <b>% within</b>	<b>SJOGH (Murdoch)</b> <i>Freq, (%)</i> , <b>% within</b>
Strongly agree	2, (3.5%) <b>10%</b>	0, (0%) <b>0%</b>	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>
Agree	5, (8.8%) <b>25%</b>	1 (1.8%), <b>4.3%</b>	3, (5.3%) <b>25%</b>	0, (0%) <b>0%</b>
Unsure	3, (5.3%) <b>15%</b>	6, (10.5%), <b>26.1%</b>	6, (10.5%) <b>50%</b>	0, (0%), <b>0%</b>
Disagree	10, (17.5%) <b>50%</b>	11, (19.3%), <b>47.8%</b>	1, (1.8%) <b>8.3%</b>	2, (3.5%), <b>100%</b>
Strongly Disagree	0, (0%) <b>0%</b>	5, (8.8%), <b>21.7%</b>	2, (3.5%) <b>16.7%</b>	0, (0%), <b>0%</b>
<b>Totals</b>	<b>20, (35.1%)</b> <b>100%</b>	<b>23, (40.4%)</b> <b>100%</b>	<b>12, (21.1%)</b> <b>100%</b>	<b>2, (3.5%)</b> <b>100%</b>

**Fishers exact Tests with Length of time in Graduate program**

The demographic of length of time within hospital graduate nurse program was compared to all questions within section one and section two of the survey. A number of significant results were noted across the length of time graduates spent within the hospitals that assists in addressing the research questions.

The ‘Length of time spent in hospital graduate program location’ was compared to the question from section one in the survey ‘The education and learning department of the hospital supports staff using mobile technology’. A significant result was noted between the variables of length of time within the hospital graduate program.

As an interesting trend, all groups of length of time were evenly split between either strongly agreeing or agreeing at 36% (% within length of time) or disagreeing or strongly disagreeing at 36% (% within length of time). An exception however, was noted with the 4-6 month group, where the majority clearly felt unsure with the statement at 70% (% within length of time) compared to 1-3 months 27%, 7-10



months 28%, and 11 months or longer at 14.3% (see Table 20). There was a statistically significant association between the length of time spent in hospital graduate program location and the question, as assessed by Fishers exact test,  $p=.004$ .

Table 20

*'Length of time spent in hospital graduate program location' Compared To 'The education and learning department of the hospital supports staff using mobile technology'*

'The education and learning department of the hospital supports staff using mobile technology' (n=63)	<b>1-3 months</b> <i>Freq, (%), % within</i>	<b>4-6 months</b> <i>Freq, (%), % within</i>	<b>7-10 months</b> <i>Freq, (%), % within</i>	<b>11 months or longer</b> <i>Freq, (%), % within</i>
Strongly agree	3, (4.8%) <b>27.3%</b>	0, (0%) <b>0%</b>	0, (0%) <b>0%</b>	1, (1.6%), <b>14.3%</b>
Agree	1, (1.6%) <b>9.1%</b>	1 (1.6%), <b>5%</b>	9, (14.3%) <b>36%</b>	2, (3.2%) <b>28.6%</b>
Unsure	3, (4.8%) <b>27.3%</b>	14, (22.2%), <b>70%</b>	7, (11.1%) <b>28%</b>	1, (1.6%), <b>14.3%</b>
Disagree	4, (6.3%) <b>36.4%</b>	5, (7.9%), <b>25%</b>	7, (11.1%) <b>28%</b>	2, (3.2%), <b>28.6%</b>
Strongly Disagree	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>	2, (3.2%) <b>8%</b>	1, (1.6%), <b>14.3%</b>
<b>Totals</b>	<b>11, (17.5%) 100%</b>	<b>20, (31.7%) 100%</b>	<b>25, (39.7%) 100%</b>	<b>7, (11.1%) 100%</b>

The 'Length of time spent in hospital graduate program location' was compared to the question from section one in the survey 'Patients and significant others in my care ask me how to access relevant resources relating to their health by using their mobile technology'. Significant results were noted between length of time and the question, with graduates with 11 months or longer of experience either strongly agreeing or agreeing with the statement 66% (% within length of time) compared to 7-10 months experience 36% (% within length of time), 1-3 months at 20% (% within length of time), and 4-6 months at 15% (% within length of time). (see Table 21).

Similar results were noted between the groups to whether they strongly agreed or agreed with the statement with 1-3 months at 60% (% within length of time), 4-6 months at 50% (% within length of time), 7-10 months at 36% (% within length of time) and finally, 11 months or longer at only 16.7% (% within length of time). There was a statistically significant association between the length of time spent in hospital graduate program location and the question, as assessed by Fishers exact test,  $p=.012$ .

Table 21

*'Length of time spent in hospital graduate program location' Compared To 'Patients and significant others in my care ask me how to access relevant resources relating to their health by using their mobile technology'*

Patients and significant others in my care ask me how to access relevant resources relating to their health by using their mobile technology' (n=60)	<b>1-3 months</b> <i>Freq, (%), % within</i>	<b>4-6 months</b> <i>Freq, (%), % within</i>	<b>7-10 months</b> <i>Freq, (%), % within</i>	<b>11 months or longer</b> <i>Freq, (%), % within</i>
Strongly agree	2, (3.3%) <b>20%</b>	0, (0%) <b>0%</b>	1, (1.7%) <b>0%</b>	1, (1.7%), <b>16.7%</b>
Agree	0, (0%) <b>0%</b>	3 (5%), <b>15%</b>	5, (8.3%) <b>36%</b>	3, (5%) <b>50%</b>
Unsure	2, (3.3%) <b>20%</b>	7, (11.7%), <b>35%</b>	3, (5%) <b>28%</b>	1, (1.7%), <b>16.7%</b>
Disagree	3, (5%) <b>30%</b>	9, (7.9%), <b>45%</b>	14, (23.3%) <b>28%</b>	0, (0%), <b>0%</b>
Strongly Disagree	3, (5%) <b>30%</b>	1, (0%), <b>5%</b>	1, (1.7%) <b>8%</b>	1, (1.7%), <b>16.7%</b>
<b>Totals</b>	<b>10, (16.7%) 100%</b>	<b>20, (33.3%) 100%</b>	<b>24, (40%) 100%</b>	<b>6, (10%) 100%</b>

The 'Length of time spent in hospital graduate program location' was compared to the question from section two in the survey 'I find it easy to get mobile technology to do what I want it to do'. Significant results were noted between the

length of experience of the graduates and the statement. Although most graduates either strongly agreed or agreed with the statement, differences were noted with the 7-10 month group strongly agreeing 13 (% within length of time) compared to the group 1-3 month and 11 months or longer group at 40% (% within length of time), and 4-6 month group at 45% (% within length of time). (see Table 22).

Similar results were noted with each group to whether they agreed with the statement, with 7-10 months at 68% (% within length of time), 1-3 months at 50% (% within length of time), 4-6 months at 35% (% within length of time), followed by 11 months or longer at 20% (% within length of time).

It was also noted 40% (% within length of time) of the 11 months or longer group compared to 15% (% within length of time), within the 4- 6 months group and only 10% for the 1-3 month group. There was a statistically significant association between the length of time spent in hospital graduate program location and the question, as assessed by Fishers exact test,  $p=.025$ .

Table 22

*'Length of time spent in hospital graduate program location' Compared To 'I find it easy to get mobile technology to do what I want it to do'*

'I find it easy to get mobile technology to do what I want it to do' (n=57)	<b>1-3 months</b> <i>Freq, (%), % within</i>	<b>4-6 months</b> <i>Freq, (%), % within</i>	<b>7-10 months</b> <i>Freq, (%), % within</i>	<b>11 months or longer</b> <i>Freq, (%), % within</i>
Strongly agree	4, (7%) <b>40%</b>	9, (15.8%) <b>45%</b>	3, (5.3%) <b>13.6%</b>	2, (3.5%), <b>40%</b>
Agree	5, (8.8%) <b>50%</b>	7, (12.3%), <b>35%</b>	15, (26.3%) <b>68.2%</b>	1, (1.8%) <b>20%</b>
Unsure	1, (1.8%) <b>10%</b>	3, (5.3%), <b>15%</b>	0, (0%) <b>0%</b>	2, (3.5%), <b>40%</b>
Disagree	0, (0%) <b>0%</b>	1, (1.8%), <b>5%</b>	4, (7%) <b>18.2%</b>	0, (0%), <b>0%</b>
Strongly Disagree	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>
<b>Totals</b>	<b>10, (17.5%) 100%</b>	<b>20, (35.1%) 100%</b>	<b>22, (38.6%) 100%</b>	<b>5, (8.8%) 100%</b>

The 'Length of time spent in hospital graduate program location' was compared to the question from section two in the survey 'People in my organization who use mobile technology have more prestige than those who do not'. Most graduates indicated they either agreed or strongly agreed with the statement at 40% (% within length of time) with the exception of the 4-6 month group with only 10% (% within length of time) agreeing (see Table 23).

An interesting finding was noted between the groups, where the 7-10 month group indicated they felt unsure, along with the 11 months or longer group was also at 40% (% within length of time). This was in contrast to only 10% (% within length of time) for the 1-3 month group and 15% (% within length of time) for 4-6 month group.

Graduates with less experience were more likely to strongly disagree or disagree with the statement with the 4-6 month group at 75% (% within length of time) and the 1-3 month group at 50% (% within length of time) in contrast to the 7-10 month group at 18.1% (% within length of time) and the 11 months or longer group at 20% (% within length of time). There was a statistically significant association between the length of time spent in hospital graduate program location and the question, as assessed by Fishers exact test,  $p=.011$ .

Table 23

*‘Length of time spent in hospital graduate program location’ Compared To ‘People in my organization who use mobile technology have more prestige than those who do not’*

‘People in my organization who use mobile technology have more prestige than those who do not’ (n=57)	<b>1-3 months</b> <i>Freq, (%), % within</i>	<b>4-6 months</b> <i>Freq, (%), % within</i>	<b>7-10 months</b> <i>Freq, (%), % within</i>	<b>11 months or longer</b> <i>Freq, (%), % within</i>
Strongly agree	1, (1.8%) <b>10%</b>	0, (0%) <b>0%</b>	0, (0%) <b>0%</b>	1, (1.8%), <b>20%</b>
Agree	3, (5.3%) <b>30%</b>	2, (3.5%), <b>10%</b>	8, (14%) <b>36.4%</b>	1, (1.8%) <b>20%</b>
Unsure	1, (1.8%) <b>10%</b>	3, (5.3%), <b>15%</b>	10, (17.5%) <b>45.5%</b>	2, (3.5%), <b>40%</b>
Disagree	4, (7%) <b>40%</b>	11, (19.3%), <b>55%</b>	3, (5.3%) <b>13.6%</b>	1, (1.8%), <b>20%</b>
Strongly Disagree	1, (1.8%) <b>10%</b>	4, (7%), <b>20%</b>	1, (1.8%) <b>4.5%</b>	0, (0%), <b>0%</b>
<b>Totals</b>	<b>10, (17.5%) 100%</b>	<b>20, (35.1%) 100%</b>	<b>22, (38.6%) 100%</b>	<b>5, (8.8%) 100%</b>

The ‘Length of time spent in hospital graduate program location’ was compared to the question from section two in the survey ‘Having mobile technology is a status symbol in my organization’. A significant difference was noted between the length of time spent within the graduate program and the statement.

Based on the results, the 4-6 month group either strongly disagreed or disagreed with the statement at 80% (% within length of time) along with 60% (% within length of time) for the 1-3 month group. The more experience the graduate had, the less they strongly disagreed or disagreed with the 7-10 month group at 31% (% within length of time) and 40% for the 11 months or longer group (see Table 24).

A strong difference was noted between groups when they felt unsure with the statement with both the more experienced graduates in the 7-10 month and 11 months or longer groups at 40% (% within length of time). This was in contrast to the less experienced groups at 1-3 months at only 10% (% within length of time) and

the 4-6 month at 15% (% within length of time). There was a statistically significant association between the length of time spent in hospital graduate program location and the question, as assessed by Fishers exact test,  $p=.030$ .

Table 24

*'Length of time spent in hospital graduate program location' Compared To 'Having mobile technology is a status symbol in my organization'*

'Having mobile technology is a status symbol in my organization' (n=57)	<b>1-3 months</b> <i>Freq, (%)</i> , <i>% within</i>	<b>4-6 months</b> <i>Freq, (%)</i> , <i>% within</i>	<b>7-10 months</b> <i>Freq, (%)</i> , <i>% within</i>	<b>11 months or longer</b> <i>Freq, (%)</i> , <i>% within</i>
Strongly agree	1, (1.8%) <b>10%</b>	0, (0%) <b>0%</b>	0, (0%) <b>0%</b>	1, (1.8%), <b>20%</b>
Agree	2, (3.5%) <b>20%</b>	1, (1.8%), <b>5%</b>	6, (10.5%) <b>27.3%</b>	0, (0%) <b>0%</b>
Unsure	1, (1.8%) <b>10%</b>	3, (5.3%), <b>15%</b>	9, (15.8%) <b>40.9%</b>	2, (3.5%), <b>40%</b>
Disagree	5, (8.8%) <b>50%</b>	13, (22.8%), <b>65%</b>	5, (8.8%) <b>22.7%</b>	1, (1.8%), <b>20%</b>
Strongly Disagree	1, (1.8%) <b>10%</b>	3, (5.3%), <b>15%</b>	2, (3.5%) <b>9.1%</b>	1, (1.8%), <b>20%</b>
<b>Totals</b>	<b>10, (17.5%)</b> <b>100%</b>	<b>20, (35.1%)</b> <b>100%</b>	<b>22, (38.6%)</b> <b>100%</b>	<b>5, (8.8%)</b> <b>100%</b>

The 'Length of time spent in hospital graduate program location' was compared to the question 'I believe I could communicate to others the consequences of using mobile technology'. An interesting finding was noted that as graduates experience increased, so did their percentage of either strongly agreeing or agreeing with the statement. The 1-3 month group either strongly agreed or agreed at 50% (% within length of time), with the 4-6 month group at 65% (% within length of time), then the 7-10 month group at 90% (% within length of time) with the 11 month group slightly dropping to 80% (% within length of time). (see Table 25).

It was interesting to note that a similar trend was noted between the groups with whether they felt unsure with the statement. The less experienced group 1-3 months felt unsure at 50% (% within length of time), then the next group 4-6 months much less at 15% (% within length of time), with 7-10 months at 9% (% within

length of time) and 11 months or longer increasing slightly to 20% (% within length of time). There was a statistically significant association between the length of time spent in hospital graduate program location and the question, as assessed by Fishers exact test,  $p=.011$ .

Table 25

*'Length of time spent in hospital graduate program location' Compared To 'I believe I could communicate to others the consequences of using mobile technology'*

'I believe I could communicate to others the consequences of using mobile technology' (n=57)	<b>1-3 months</b> <i>Freq, (%), % within</i>	<b>4-6 months</b> <i>Freq, (%), % within</i>	<b>7-10 months</b> <i>Freq, (%), % within</i>	<b>11 months or longer</b> <i>Freq, (%), % within</i>
Strongly agree	3, (5.3%) <b>30%</b>	4, (7%) <b>20%</b>	2, (3.5%) <b>9.1%</b>	1, (1.8%), <b>20%</b>
Agree	2, (3.5%) <b>20%</b>	9, (15.8%), <b>45%</b>	18, (31.6%) <b>81.8%</b>	3, (5.3%) <b>60%</b>
Unsure	5, (8.8%) <b>50%</b>	3, (5.3%), <b>15%</b>	2, (15.8%) <b>9.1%</b>	1, (1.8%), <b>20%</b>
Disagree	0, (0%) <b>0%</b>	4, (7%), <b>20%</b>	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>
Strongly Disagree	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>
<b>Totals</b>	<b>10, (17.5%)</b> <b>100%</b>	<b>20, (35.1%)</b> <b>100%</b>	<b>22, (38.6%)</b> <b>100%</b>	<b>5, (8.8%)</b> <b>100%</b>

#### **Fishers exact Tests with University and use of mobile technology.**

The demographic of University attended to obtain a registered nursing program was compared to all questions within section one and section two of the survey. A number of significant results were noted across the University the graduate attended when answering questions in the survey.

The demographic of 'University attended' was compared to the question 'I use search engines like Google on my mobile technology device to access clinical information' Whilst the majority of graduates from the different universities either strongly agreed or agreed with the statement, there were significant differences noted between the sites.

Graduates from Edith Cowan University strongly agreed with the statement at 81% (% within University), compared to The University of Notre Dame at 45% (% within University), Murdoch University at 42% (% within University) and Curtin University at 29% (% within University) (see Table 26). There was a statistically significant association between University attended and the question, as assessed by Fishers exact test,  $p=.011$ .

Table 26

*'University attended' Compared To 'I use search engines like Google on my mobile technology device to access clinical information'*

'I use search engines like Google on my mobile technology device to access clinical information' (n=62)	<b>The University of Notre Dame</b> <i>Freq, (%), % within</i>	<b>Murdoch University</b> <i>Freq, (%), % within</i>	<b>Curtin University</b> <i>Freq, (%), % within</i>	<b>Edith Cowan University</b> <i>Freq, (%), % within</i>
Strongly agree	9, (14.5%) <b>45%</b>	3, (4.8%) <b>42.9%</b>	7, (11.3%) <b>29.2%</b>	9, (14.5%), <b>81.8%</b>
Agree	9, (14.5%) <b>45%</b>	4, (6.5%), <b>57.1%</b>	15, (24.2%) <b>62.5%</b>	0, (0%) <b>0%</b>
Unsure	1, (1.6%) <b>5%</b>	0, (0%), <b>0%</b>	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>
Disagree	1, (1.6%) <b>5%</b>	0, (0%), <b>0%</b>	1, (1.6%) <b>4.2%</b>	2, (3.2%), <b>18.2%</b>
Strongly Disagree	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>	1, (1.6%) <b>4.2%</b>	0, (0%), <b>0%</b>
<b>Totals</b>	<b>20, (32.3%) 100%</b>	<b>7, (11.3%) 100%</b>	<b>24, (38.7%) 100%</b>	<b>11, (17.7%) 100%</b>

The demographic of 'University attended' was compared to the question 'I valued using mobile technology for learning during my undergraduate nursing degree' Whilst the majority of graduates from the different universities either strongly agreed or agreed with the statement, there were some interesting significant differences noted between the sites.

Graduates from Murdoch University strongly agreed with the statement at 85% (% within University) compared to The University of Notre Dame at 52% (%



within University), followed by Curtin University at 50% (% within University) and lastly Edith Cowan University at 40% (% within University). Only Edith Cowan University graduates disagreed with the statement, however this was still low at 20% (% within University) (see Table 27). There was a statistically significant association between University attended and the question, as assessed by Fishers exact test,  $p=.040$ .

Table 27

*'University attended' Compared To 'I valued using mobile technology for learning during my undergraduate nursing degree'*

'I valued using mobile technology for learning during my undergraduate nursing degree' (n=58)	<b>The University of Notre Dame</b> <i>Freq, (%), % within</i>	<b>Murdoch University</b> <i>Freq, (%), % within</i>	<b>Curtin University</b> <i>Freq, (%), % within</i>	<b>Edith Cowan University</b> <i>Freq, (%), % within</i>
Strongly agree	11, (19%) <b>52.4%</b>	6, (10.3%) <b>85.7%</b>	10, (17.2%) <b>50%</b>	4, (6.9%), <b>40%</b>
Agree	10, (17.2%) <b>47.6%</b>	0, (0%), <b>0%</b>	9, (15.5%) <b>45%</b>	4, (6.9%) <b>40%</b>
Unsure	0, (0%) <b>0%</b>	1, (1.7%), <b>14.3%</b>	1, (1.7%) <b>5%</b>	0, (0%), <b>0%</b>
Disagree	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>	0, (0%) <b>0%</b>	2, (3.4%), <b>20%</b>
Strongly Disagree	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>	0, (0%) <b>0%</b>	0, (0%), <b>0%</b>
<b>Totals</b>	<b>21, (36.2%)</b> <b>100%</b>	<b>7, (12.1%)</b> <b>100%</b>	<b>20, (34.5%)</b> <b>100%</b>	<b>10, (17.2%)</b> <b>100%</b>

### Fisher's Exact Test summary of results

The previous section of this chapter utilised Fisher's exact tests to reveal statistically significant differences between demographic variables and specific questions in section one and two of the survey. Significant differences were noted between specific questions and the demographic variables of gender; graduate program location; the length of time within the graduate program; and what University the

graduate attended. This next section of the chapter will detail the statistical analysis of the TAM2 questions.

### **Section Two of the survey: methods and hypotheses of the TAM2 framework**

The TAM2 framework compared interrelated social influence variables that may have affected whether the individual adopted or rejected mobile technology use within a clinical area. Cognitive variables within the TAM2 related to how the individual formed a Perceived Usefulness (PU) judgement. For example, a comparison between mobile technologies capabilities, and the graduate nurses role (Venkatesh & Davis, 2000).

Pearson's  $r$  correlation coefficients were calculated to describe relationships between TAM2 variables. Basic hypothesis testing was incorporated based on previous research, to compare the statistical significance and strength of relationships between TAM2 variables. Adjusted  $R^2$  scores were calculated to compare  $r$  scores and are included as a percentage. Within the TAM2 model, this represented the percentage of variance in the dependent variable that was explained by the independent variable.

Section two of the survey focused on the TAM2. It has to be noted at this stage of the study, however, that it was not the purpose of the study to test TAM2 rather to use it to assist in answering the research questions. The most important aspect, was to use the modified model to test the data and to obtain the relevant results. Given this proviso, data was analysed based on the method and process utilised by the original authors who made several suggestions regarding TAM2 (Venkatesh & Davis, 2000). The University biostatistician aided in the consistency of statistics in this phase of the study.

In the original TAM2 hypotheses were applied to each variable in order to aid in explaining and predicting user acceptance of information technology in work environments (Venkatesh & Davis, 2000). Likewise, hypothesis testing was utilised in this study, to analyse the impact of relationships between the construct variables of social influence processes and cognitive instrumental processes. The aim of hypothesis testing was assist in answering the research questions.

The two interrelated variables that may affected whether the individual adopts or rejects the clinical use of mobile technology includes the social influence processes of Subjective Norm (SN), and Image. The original TAM2 authors found that the TAM2 variable Subjective Norm (SN) had a direct effect on Intention To Use (ITU) when the technology or system usage was mandatory. This did not however occur in voluntary settings (Venkatesh & Davis, 2000). The TAM2 authors refer to the concept of a ‘compliance’ based effect with mandatory systems, that the ‘person of importance’ wants the individual to use the system or technology (Venkatesh & Davis, 2000). Within this study, however, mobile technology use in clinical settings was considered a voluntary decision by the graduates to either adopt or reject. The addition of the term ‘supervisors/managers’ was added to the two TAM2 questions within Subjective Norm (SN) when referring to ‘people of importance’. This was to identify within the TAM2 construct variables if nurse leaders (supervisors/managers) had direct influence on participants mobile technology use. In light of these variables it was proposed that:

**Hypothesis 1.** Subjective Norm (SN) will have no effect on Intention To Use (ITU) mobile technology in the clinical area.

From the social influence perspective, a study within the tertiary education setting, found the influence of others, was related to the perceived usefulness of the technology (Schepers & Wetzels, 2006). It also suggested social influence was the internalisation effect of interpreting information from important others, as evidence of reality leading to perceived usefulness (Schepers & Wetzels, 2006). The original authors of TAM2 found that the effects of internalisation occurred in both voluntary and mandatory settings (Venkatesh & Davis, 2000). For context within this study, the influence of Subjective Norm (SN) may have a positive effect on the Perceived Usefulness (PU) on the participants’ clinical use of mobile technology. For example, if a supervisor/manager suggests clinical mobile technology may be useful, then this may influence the Perceived Usefulness (PU). Therefore, it was proposed that:

**Hypothesis 2.** Subjective Norm (SN) will have a positive effect on Perceived Usefulness (PU).

The original authors of TAM2 found that Subjective Norm (SN) positively influenced Image. This variable has been defined as “the degree to which use of an

innovation is perceived to enhance one's . . . status in one's social system." (Moore & Benbasat, 1991, p. 195). It was suggested that if 'people of importance' encourage usage of a system or technology, then their usage would then elevate the person's social status in the group (Venkatesh & Davis, 2000). Based on this suggestion it was proposed that:

**Hypothesis 3.** Subjective Norm (SN) will have a positive effect on Image.

Based on the potential positive influence of Image for the graduate, and for context in this study, Image may complement Perceived Usefulness (PU). For example, the graduate may see themselves and others clinical use of mobile technology enhancing their social status within the Multidisciplinary Team. Therefore, it was proposed that:

**Hypothesis 4.** Image will have a positive effect on Perceived Usefulness (PU).

There are four cognitive variables of TAM2: Job Relevance (JR); Output Quality (OQ); Result Demonstrability (RD); and Perceived Ease Of Use (PEOU). These variables relate to how the individual forms a Perceived Usefulness (PU) judgement by comparing the technologies capabilities with what needs to be done in their job or role (Venkatesh & Davis, 2000). These variables were applied to graduates clinical use of mobile technology.

The cognitive variable of Job Relevance (JR) has been defined as the individual's perception of the degree to which the system or technology is applicable to the job or role (Venkatesh & Davis, 2000). Within this study, the participants may have used mobile technology frequently in University and clinical settings, and may find benefits in their role as graduates in clinical settings. Based on this premise it was proposed that:

**Hypothesis 5.** Job Relevance (JR) will have a positive effect on Perceived Usefulness (PU).

Output Quality (OQ) has been described as how well a system or technology performs in assisting to meet the goals of the persons job (Venkatesh & Davis, 2000). As graduates were familiar with their mobile devices from University and within the clinical setting, there may be a positive relationship between quality of the

output when using mobile technology, and its perceived usefulness at the point of care. Given this supposition, it was proposed that:

**Hypothesis 6.** Output Quality (OQ) will have a positive effect on Perceived Usefulness (PU).

Results Demonstrability (RD) referred to the ability of the individual to share with others the results of using the technology (Venkatesh & Davis, 2000). Within the context of this study, the participants may note tangible results of using mobile technology at the point of care. Consequently, this benefit may have a positive effect on the Perceived Usefulness (PU). If graduates are familiar with their mobile devices, and have seen and used mobile technology in the University and the clinical setting, then they may form a more positive perception of its use. Given this assumption it was proposed that:

**Hypothesis 7.** Result Demonstrability (RD) will have a positive effect on Perceived Usefulness (PU).

Perceived Ease Of Use (PEOU) is linked to the concept that if a system or technology is easy to use, then the individual is more likely to use it to increase their job performance (Venkatesh & Davis, 2000). In previous research, Perceived Ease Of Use (PEOU) has been significantly linked to Intention To Use (ITU), both directly and indirectly, by its Perceived Usefulness (PU) (Davis, et al. 1989; Venkatesh & Davis, 2000; Venkatesh, 1999). Within this study, as the participants were familiar with mobile technology use in the University and clinical settings, there may be a positive relationship between the Perceived Ease Of Use (PEOU) and the Perceived Usefulness (PU) for their role. Therefore, it was proposed that:

**Hypothesis 8.** Perceived Ease Of Use (PEOU) will have a positive effect on Perceived Usefulness (PU).

The strength of the relationship between the TAM2 variables was referred to as effect size. The effect sizes were defined by reviewing the significance levels with sample size (Maltby, Williams, McGarry & Day, 2010). The TAM2 variables were measured using parametric statistics such as Pearson's R correlation coefficients and regression analysis.

Previous research utilising the TAM2 for health professional applications, have included both Pearson's *r* correlation coefficients and regression analysis of the variables (Austermann, 2014; Chang, 2004; Kowitlawakul, 2011; Zhang, Cocosila & Archer, 2010). Some TAM2 researchers employed only Pearson's *r* correlation coefficients, however, to explore the relationship between the TAM2 variables (Cowen, 2009). Most health professional researchers, however, also apply regression analysis of the TAM2 variables (Chismar & Wiley-Patton, 2002; Ketikidis, Dimitrovski, Lazuras & Bath, 2012; Kummer, Schafer & Todorova, 2012; Putzer & Park, 2010; Venkatesh & Davis, 2000).

This study employed Pearson's *r* correlation coefficients to answer the hypotheses questions. Regression analysis was later used to further examine the relationships between the TAM2 variables to assist in answering the proposed research questions. The TAM2 model variables were slightly modified to include the term 'mobile technology' in place of the term 'system' by the original authors (Venkatesh & Davis, 2000) (see Appendix 12). The addition of the term 'supervisors/managers' was added to the two TAM2 variables within Subjective Norm (SN) when referring to 'people of importance'. This was to identify within the variables, if nurse leaders influenced graduates clinical use of mobile technology (see Appendix 12). The TAM2 variables of 'voluntariness' and 'experience' were not included in the model. An explanation for the exclusion of these two variables was provided in the methodology chapter and will again be discussed under the heading of limitations in the final chapter of this thesis.

### **Correlation method.**

Pearson's *r* correlation coefficient's describes the intensity and direction of a relationship (Polit, Beck & Hungler, 2001). This statistic can measure and determine the nature and size of the relationships between two variables (Fain, 2015; Schneider, Whitehead, Elliott, LoBiondo-Wood & Haber, 2012). A correlation coefficient calculates the relationship between variables as either positive +1.0 or negative -1.0 (Fain, 2015). A positive correlation indicates that high scores for one variable pairs with high scores on another variable. A negative correlation reflects an

inverse relationship between the two variables, with the direction of the relationship not affecting the strength (Fain, 2015).

In considering the results from the data analysis, the strength and size of the correlation was considered along with the  $p$  values obtained. The following correlation coefficient categories were considered along with  $p$  values for the data analysis for the TAM2 model in section two of the survey, with: 0.90 to 0.99 indicating very high correlation; 0.70 to 0.89 indicating high correlation; 0.50 to 0.69 indicating moderate correlation; 0.26 to 0.49 indicating low correlation; and 0.00 to 0.25 indicated little correlation between the variables (Fain, 2015).

In addition to the  $r$  value, an adjusted  $R^2$  value was calculated to explain how well the TAM2 model fitted the data and how well the model clarified the variability of data (Saunders, Lewis, & Thornhill, 2009). It is suggested that if the  $R^2$  is close to 1, the model explained the data perfectly; if the  $R^2$  was close to 0, it was likely that the data occurred by chance (Saunders et al., 2009). The following section presents the analysis and results with  $r$  values, and  $R^2$  values for each of the TAM2 variables.

### **Correlation analysis and results.**

To assist in answering the research questions and proposed hypotheses, the two interrelated variables and social influence processes of Subjective Norm (SN), and Image were explored with Pearson product-moment correlation co-efficients since these variables may have affected whether the individual adopted or rejected mobile technology use within a clinical area. Significant results were 2 tailed unless otherwise specified.

A Pearson product-moment correlation coefficient was computed to assess the relationship between the social influence process Subjective Norm (SN) and Intention To Use (ITU) in relation to clinical mobile technology use. There was a positive correlation between the two variables,  $r = 0.227$ ,  $n = 57$ ,  $p = 0.090$ . Overall, there was a small, positive correlation between Subjective Norm (SN) and Intention To Use (ITU) however the result was not significant. An increase in the social influence of Subjective Norm (SN) was not significantly correlated with an increase in the Intention To Use (ITU) of the mobile technology. The  $R^2 = 0.052$  with SN only explaining 5.1% of the variation in ITU. A scatterplot summarizes the results (see Figure 33).

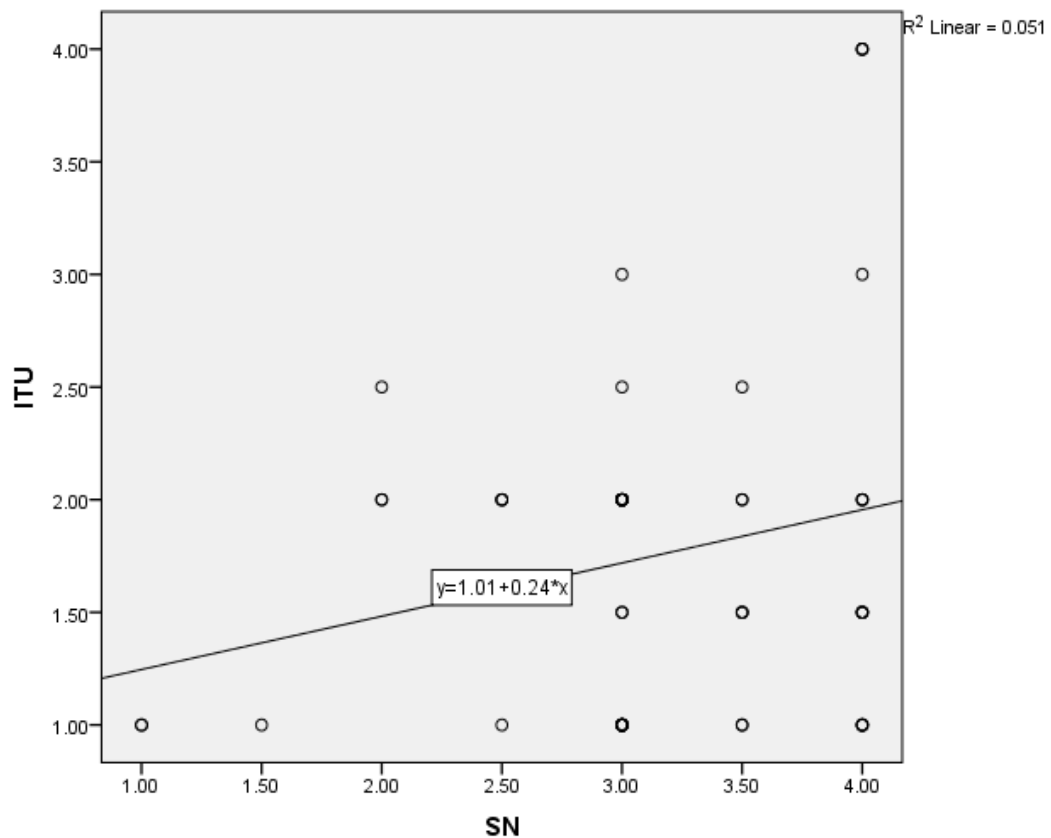


Figure 33. Scatterplot comparing ITU (Y axis) to SN (X axis)

A Pearson product-moment correlation coefficient was computed to assess the relationship between the social influence process Subjective Norm (SN) and Perceived Usefulness (PU) in relation to clinical mobile technology use. There was a positive correlation between the two variables,  $r = 0.348$ ,  $n = 57$ ,  $p = 0.008$ . Overall, there was a low, positive correlation between Subjective Norm (SN) and Perceived Usefulness (PU). An increase in the social influence of Subjective Norm (SN) was correlated with an increase in the Perceived Usefulness (PU) of mobile technology.  $R^2 = 0.121$  with SN explaining 12% of the variation in PU. A scatterplot summarizes the results (see Figure 34).



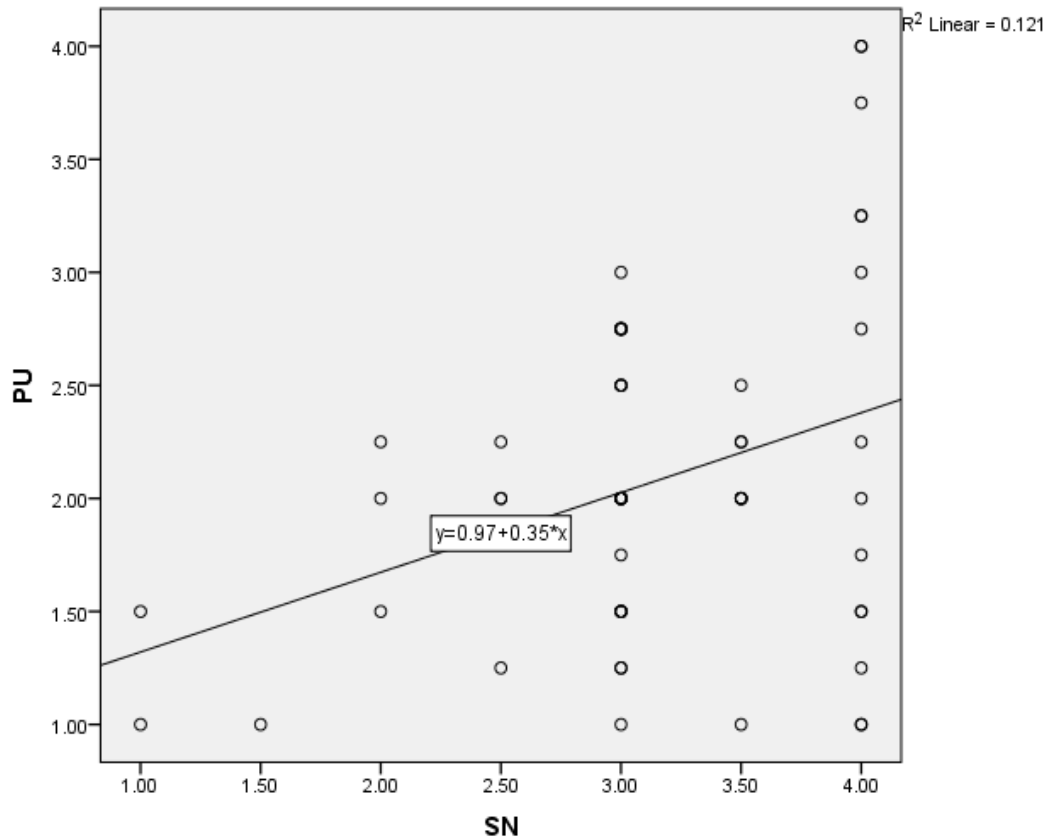


Figure 34. Scatterplot comparing PU (Y axis) to SN (X axis)

A Pearson product-moment correlation coefficient was computed to assess the relationship between the social influence process Subjective Norm (SN) and Image in relation to clinical mobile technology use. There was a positive correlation between the two variables,  $r = 0.516$ ,  $n = 57$ ,  $p = 0.000$ .

Overall, there was a moderate, positive correlation between Subjective Norm (SN) and Image. An increase in the social influence of Subjective Norm (SN), was correlated with an increase in the other social influence of Image when using mobile technology.  $R^2 = 0.266$  with SN explaining 27% of the variation in PU. A scatterplot summarizes the results (Figure 35).

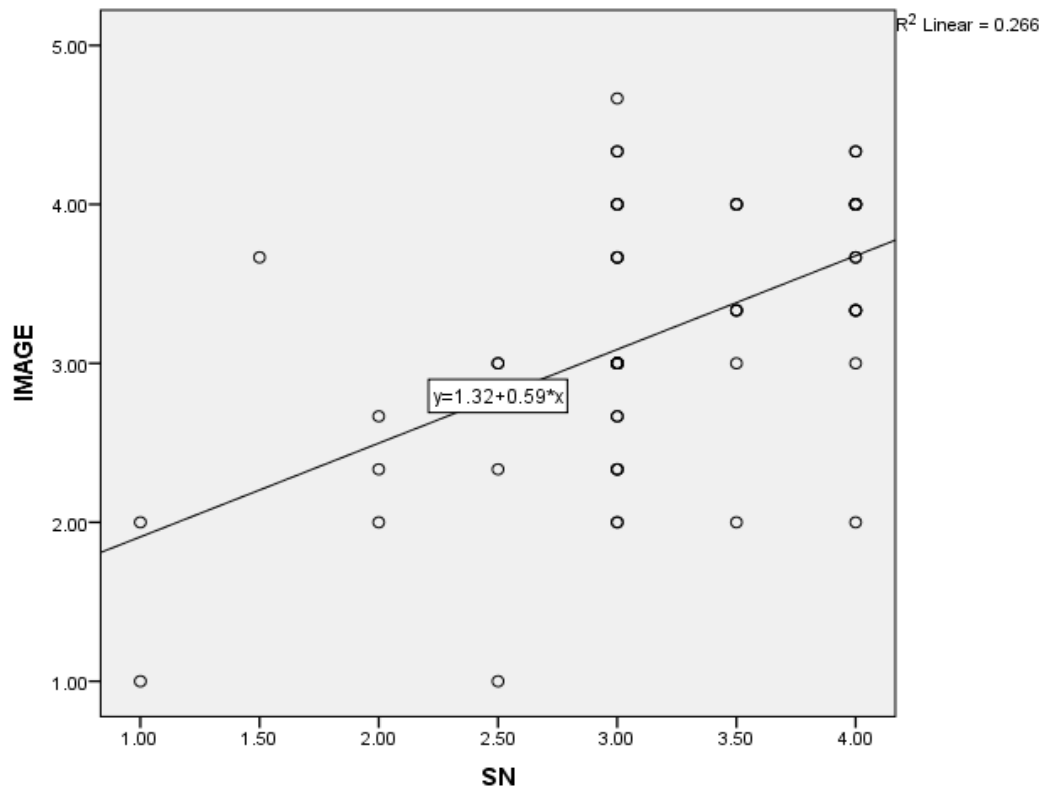


Figure 35. Scatterplot comparing Image (Y axis) to SN (X axis)

A Pearson product-moment correlation coefficient was computed to assess the relationship between the social influence process Image and Perceived Usefulness (PU) in relation to clinical mobile technology use. There was a positive correlation between the two variables,  $r = 0.339$ ,  $n = 57$ ,  $p = 0.010$ .

Overall, there was a low, positive correlation between Image and Perceived Usefulness (PU). An increase in the social influence of Image was correlated with an increase in Perceived Usefulness (PU) when using mobile technology.  $R^2 = 0.115$  with Image explaining 11% of the variation in SN. A scatterplot summarizes the results (see Figure 36).

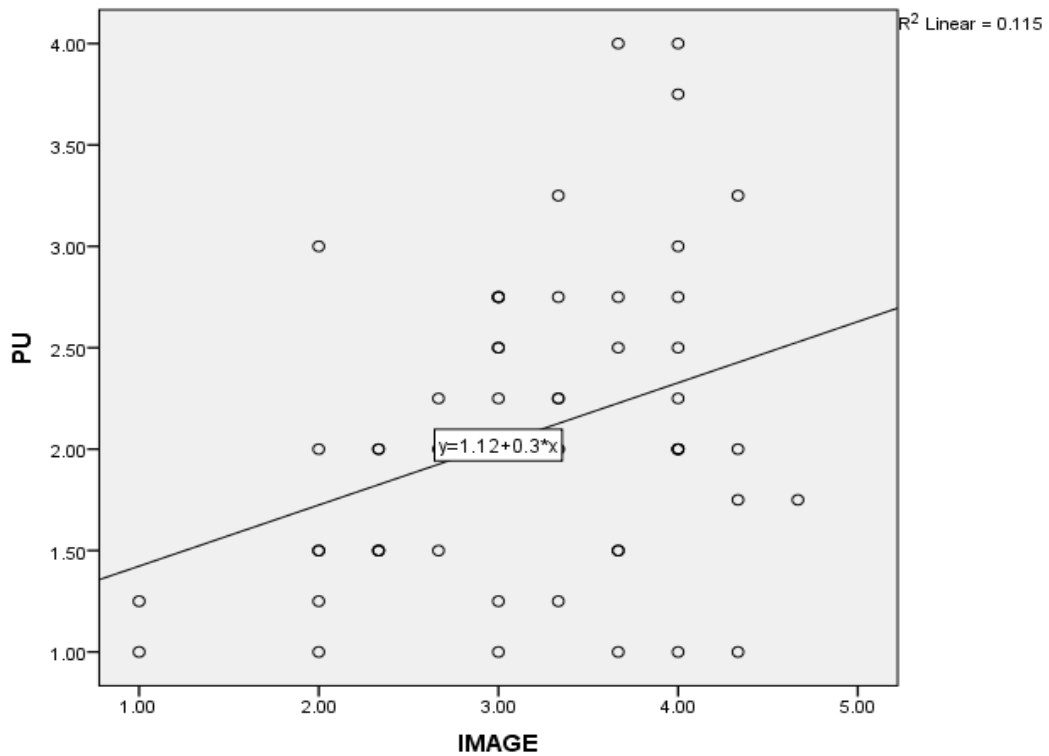


Figure 36. Scatterplot comparing PU (Y axis) to Image (X axis)

The four cognitive variables of TAM2 included Job Relevance (JR), Output Quality (OQ), Result Demonstrability (RD), and Perceived Ease Of Use (PEOU). These variables related to how the individual forms a Perceived Usefulness (PU) judgement, by comparing the technologies capabilities with what needs to be done in their job (Venkatesh & Davis, 2000). Pearson product-moment correlation coefficients were computed to assess the relationship between these four cognitive variables and Perceived Usefulness (PU).

A Pearson product-moment correlation coefficient was computed to assess the relationship between the cognitive variable Job Relevance (JR) and Perceived Usefulness (PU) in relation to clinical mobile technology use. There was a positive correlation between the two variables,  $r = 0.716$ ,  $n = 57$ ,  $p = 0.000$ .

Overall, there was a very high, positive correlation between Job Relevance (JR) and Perceived Usefulness (PU). An increase in the cognitive variable Job Relevance (JR) was correlated with an increase in Perceived Usefulness (PU) when using mobile technology.  $R^2 = 0.512$  with JR explaining 51% of the variation in PU. A scatterplot summarizes the results (Figure 37).

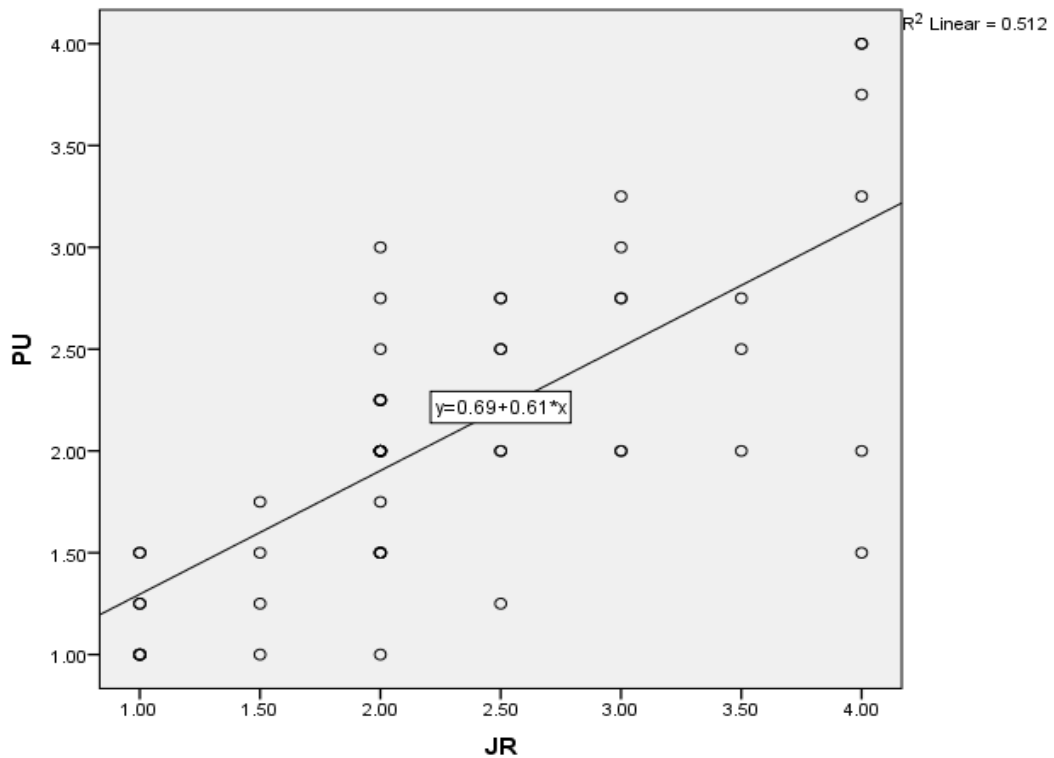


Figure 37. Scatterplot comparing PU (Y axis) to JR (X axis)

A Pearson product-moment correlation coefficient was computed to assess the relationship between the cognitive variable Output Quality (OQ) and Perceived Usefulness (PU) in relation to clinical mobile technology use. There was a positive correlation between the two variables,  $r = 0.572$ ,  $n = 57$ ,  $p = 0.000$ .

Overall, there was a moderate, positive correlation between Output Quality (OQ) and Perceived Usefulness (PU). An increase in the cognitive variable Output Quality (OQ) was correlated with an increase in Perceived Usefulness (PU) when using mobile technology.  $R^2 = 0.327$  with OQ explaining 33% of the variation in PU. A scatterplot summarizes the results (Figure 38).

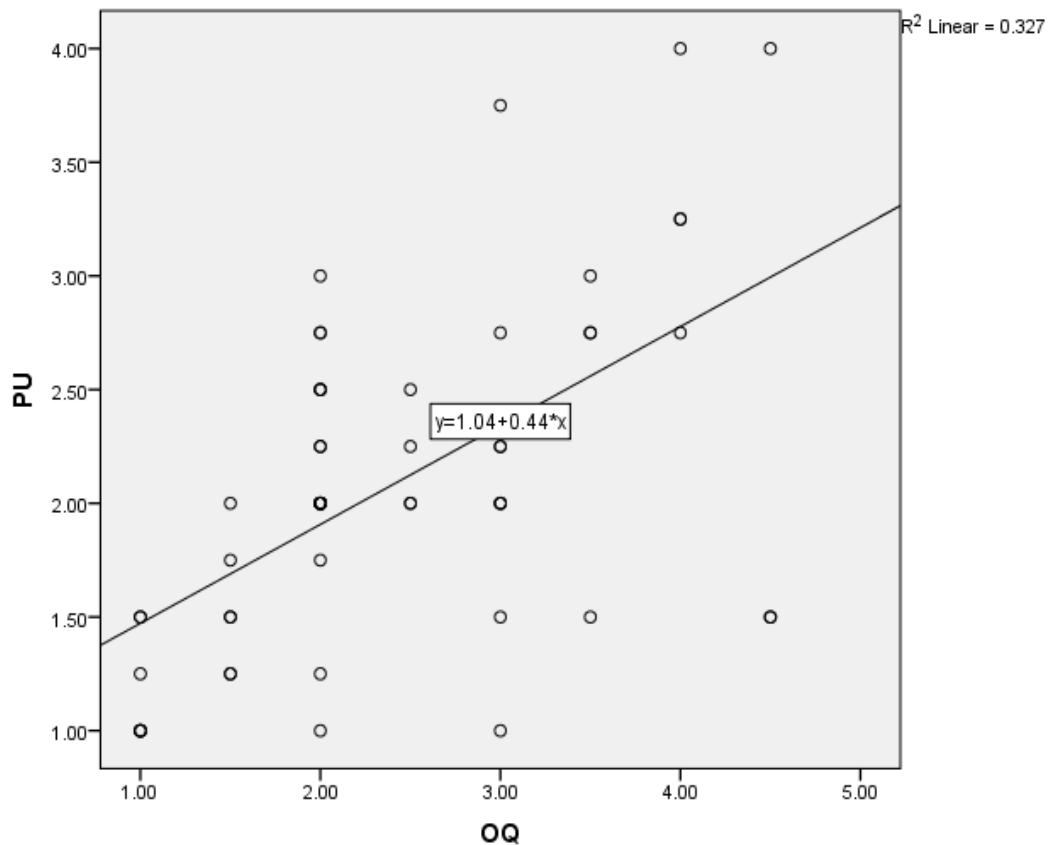


Figure 38. Scatterplot comparing PU (Y axis) to OQ (X axis)

A Pearson product-moment correlation coefficient was computed to assess the relationship between the cognitive variable Result Demonstrability (RD) and Perceived Usefulness (PU) in relation to clinical mobile technology use. There was a positive correlation between the two variables,  $r = 0.545$ ,  $n = 57$ ,  $p = 0.000$ .

Overall, there was a moderate, positive correlation between Result Demonstrability (RD) and Perceived Usefulness (PU). An increase in the cognitive variable (RD) was correlated with an increase in Perceived Usefulness (PU) when using mobile technology.  $R^2 = 0.297$  with Result Demonstrability (RD) explaining 30% of the variation in PU. A scatterplot summarizes the results (Figure 39).

To compare a potential difference between the original Result Demonstrability (RD) and RD with the final question removed as mentioned in the Methods chapter, Pearson's  $r$  was correlated to see if there was a more positive, significant result. For example, it was noted during the testing of the model with semester five students, that a higher Cronbach's alpha score was noted with the reverse scoring of the 4<sup>th</sup> question in the TAM2 variable of Results Demonstrability

(RD). Within the graduate survey, a similar finding was noted, where Cronbach's alpha was low at  $\alpha=0.490$ , however, if the last question was deleted from the analysis, the alpha score would increase to  $\alpha=0.705$ .

As predicted, a more positive correlation was noted, with a stronger finding of  $r = 0.650$ .  $R^2 = 0.422$  with Result Demonstrability (RD) with only three questions explained 42% of the variation in Perceived Usefulness (PU). Both Result Demonstrability (RD) results are presented in Table 28. This was an interesting finding, and could be considered for further studies to remove this question from the TAM2 model.

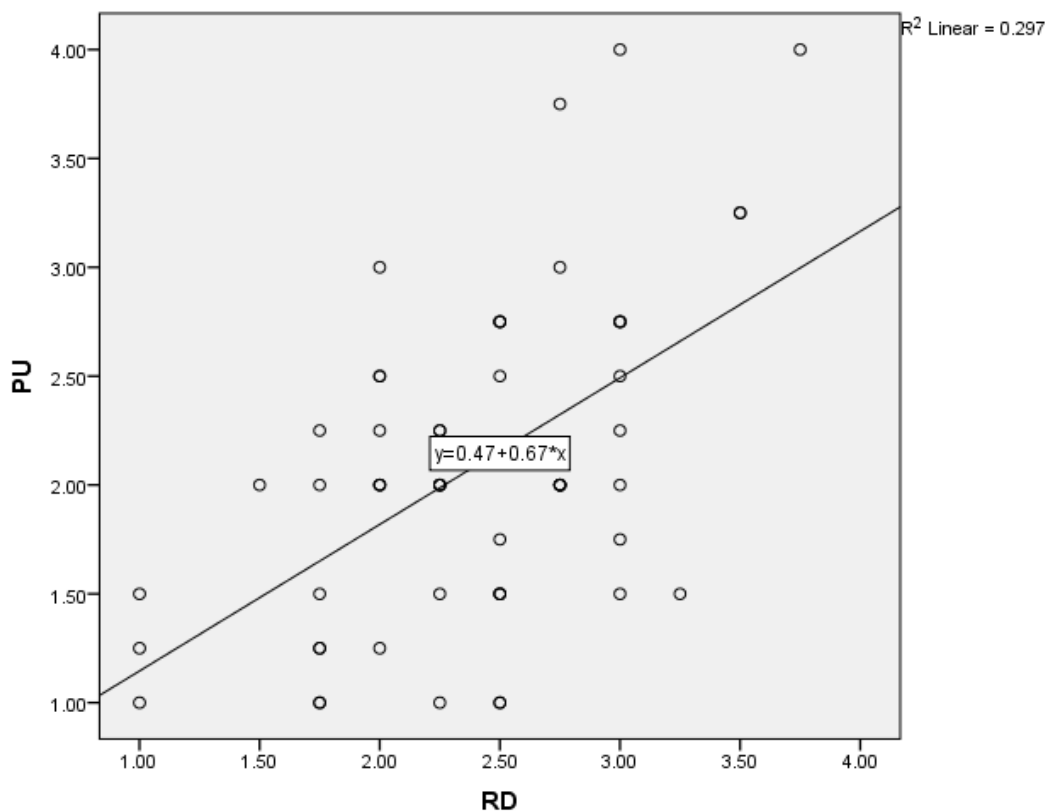


Figure 39. Scatterplot comparing PU (Y axis) to RD (X axis)

A Pearson product-moment correlation coefficient was computed to assess the relationship between the cognitive variable Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) in relation to clinical mobile technology use. There was a positive correlation between the two variables,  $r = 0.568$ ,  $n = 57$ ,  $p = 0.000$ .

Overall, there was a moderate, positive correlation between Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). An increase in the cognitive variable

Perceived Ease of Use (PEOU) was correlated with an increase in Perceived Usefulness (PU) when using mobile technology.  $R^2 = 0.322$  with PEOU explaining 32% of the variation in PU. A scatterplot summarizes the results (see Figure 40).

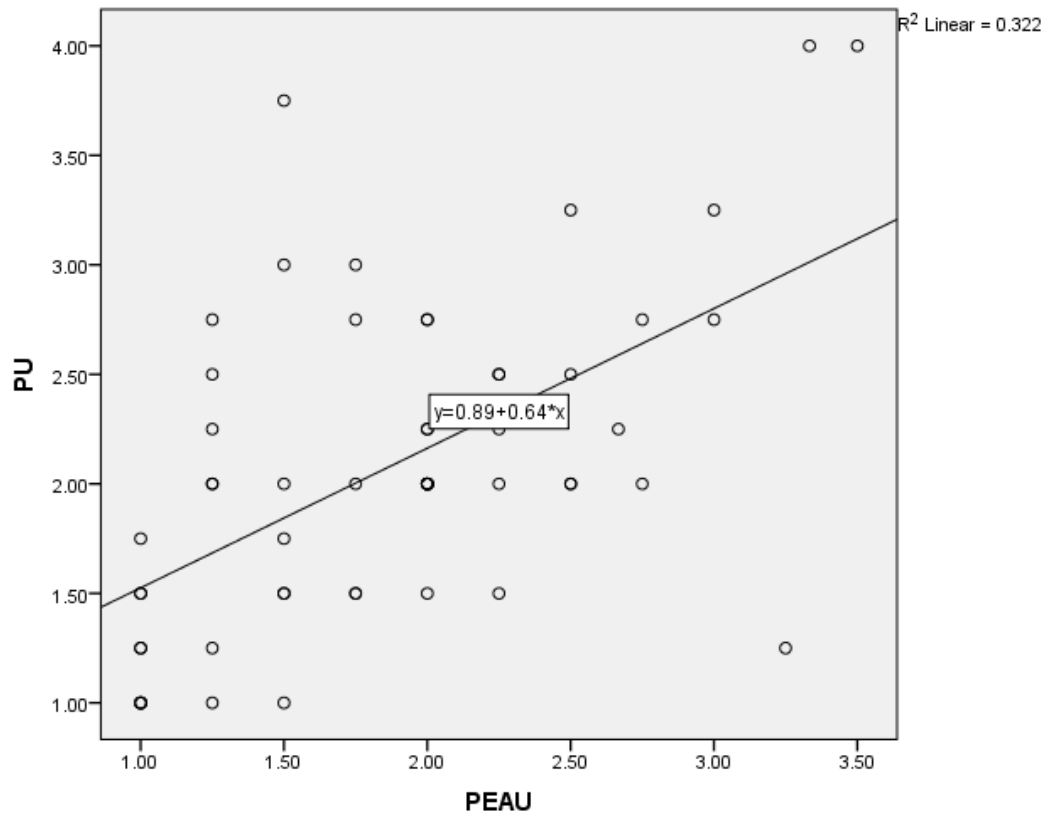


Figure 40. Scatterplot comparing PU (Y axis) to (PEOU) (X axis)

The following table, presents a summary of the independent TAM2 variables, with the dependent variable of Perceived Usefulness (PU) (see Table 28). As presented, the TAM2 variable of Job Relevance (JR) presented the strongest relationship with Perceived Usefulness (PU), implying that graduates felt that mobile technology was relevant for their role. Social influences of SN and Image influenced the Perceived Usefulness (PU) of the clinical use of mobile technology by graduates, however, the cognitive influences of Output Quality (OQ), Result Demonstrability (RD) & Perceived Ease of Use (PEOU) appeared as stronger influences (see Table 28).

Table 28

*Pearson Product-Moment Correlations Between TAM2 Independent Variables and the Dependent Variable Perceived Usefulness (PU)*

<b>TAM2 variables</b>	<b>r</b>	<b>R<sup>2</sup></b>		
Subjective Norm (SN)	0.348*	12%		
Image	0.339**	11%		
Job Relevance (JR)	0.716**	51%		
Output Quality (OQ)	0.572**	33%		
Result Demonstrability (RD)	0.545**	<sup>a</sup> 0.650**	30%	<sup>a</sup> 42%
Perceived Ease of Use (PEOU)	0.568**	32%		

\* $p < 0.01$  (2-tailed),  
 \*\* $p < 0.00$ ,  
<sup>a</sup>RD with 4<sup>th</sup> question removed

Pearson product-moment correlation coefficients were computed to assess the relationship between the TAM2 variables of Perceived Usefulness (PU), Perceived Ease Of Use (PEOU) and Subjective Norm (SN) to Intention To Use (ITU). These TAM2 independent variables may influence the dependent variable of Intention To Use (ITU) the mobile technology in clinical settings. As explained by the original TAM, the Intention To Use (ITU) technology or system, leads to its Actual use (Davis, Bagozzi & Warshaw, 1989).

A Pearson product-moment correlation coefficient was computed to assess the relationship between the variable Perceived Usefulness (PU) and Intention To Use (ITU) in relation to clinical mobile technology use. There was a positive correlation between the two variables,  $r = 0.752$ ,  $n = 57$ ,  $p = 0.000$ . Overall, there was a high, positive correlation between Perceived Usefulness (PU) and Intention To Use (ITU) An increase in the variable Perceived Usefulness (PU) was correlated with an increase in Intention To Use (ITU) when using mobile technology.  $R^2 = 0.566$  with PU explaining 56% of the variation in ITU. A scatterplot summarizes the results (see Figure 41).



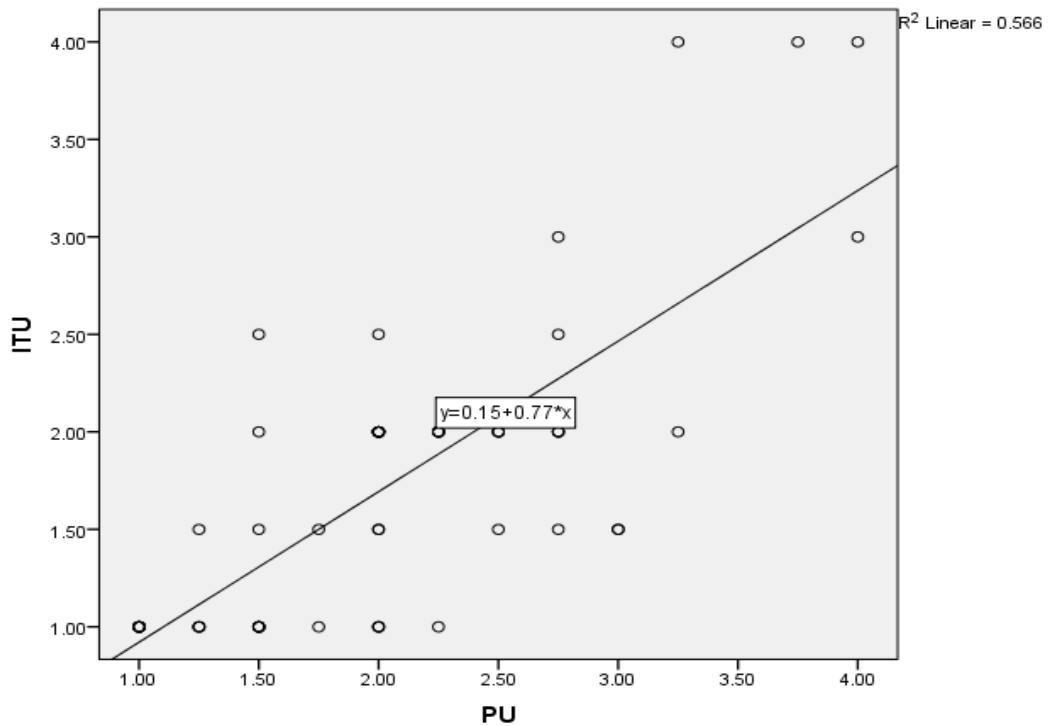


Figure 41. Scatterplot comparing ITU (Y axis) to (PU) (X axis)

A Pearson product-moment correlation coefficient was computed to assess the relationship between the variable Perceived Ease of Use (PEOU) and Intention to Use (ITU) in relation to clinical mobile technology use. There was a positive correlation between the two variables,  $r = 0.552$ ,  $n = 57$ ,  $p = 0.000$ .

Overall, there was a moderate, positive correlation between Perceived Ease of Use (PEOU) and Intention To Use (ITU) An increase in the variable Perceived Ease of Use (PEOU) was correlated with an increase in Intention To Use (ITU) when using mobile technology.  $R^2 = 0.304$  with PEOU explaining 30% of the variation in ITU. A scatterplot summarizes the results (see Figure 42).

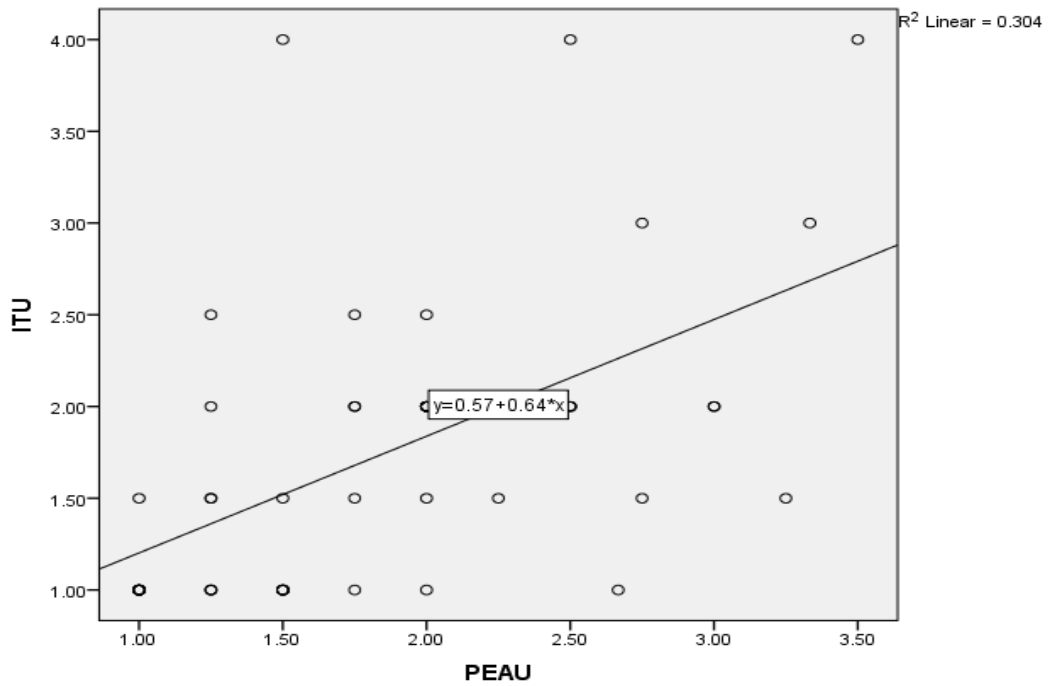


Figure 42. Scatterplot comparing ITU (Y axis) to (PEOU) (X axis)

A summary of the independent TAM2 variables, with the dependent variable of Intention To Use (ITU) is presented table 29. As can be seen, from the table, the TAM2 variable of Perceived Usefulness (PU), was the strongest relationship with Intention To Use (ITU). Graduates indicated that mobile technology was useful, which then influenced their intention to use in clinical settings. Another significantly correlated cognitive influence was the Perceived Ease Of Use (PEOU) of mobile technology. The social influences of SN was not significantly correlated with graduates Intention To Use (ITU) mobile technology (see Table 29).

Table 29

*Pearson Product-Moment Correlations Between TAM2 Independent Variables and the Dependent Variable Intention To Use (ITU)*

TAM2 variables	r	R <sup>2</sup>
Perceived Usefulness (PU)	0.752*	57%
Perceived Ease of Use (PEOU)	0.552*	30%
Subjective Norm (SN)	0.227 (ns)	5.1%

\* $p < 0.01$  (2-tailed)

### **Pearson's correlation results summary**

Pearson product-moment correlation coefficients were calculated along with R<sup>2</sup> scores to assess the relationships between the TAM2 interrelated variables. Variables from the TAM2 model included social influences and cognitive aspects of technology that influenced the use by nurse graduates. Hypothesis testing was applied to the TAM2 variables, to explain relationships between potential factors that may have influenced the participant to use or not use technology in the clinical setting.

#### **Hypothesis one**

In relation to the social influences of the TAM2, hypothesis one was supported, as Subjective Norm (SN) had no effect on Intention To Use (ITU) mobile technology in the clinical area. It was assumed from the findings that nurse leaders did not significantly influence graduates compliance for Intention To Use (ITU) mobile technology. The reason for this finding will be explored in more depth within the qualitative phase of the study.

#### **Hypothesis two**

Hypothesis two was supported as Subjective Norm (SN) had a positive effect on Perceived Usefulness (PU). There was a significant positive correlation between the social influence of Subjective Norm (SN), on graduate's Perceived Usefulness (PU) of mobile technology in the clinical setting. A relationship between 'people of importance' ('supervisors/managers') and the graduates perceptions about the usefulness of mobile technology in clinical settings was noted.

#### **Hypothesis three**

Hypothesis three was supported, where the social influence of Subjective Norm (SN) had a positive effect on Image. It can be assumed if the 'people of importance' ('supervisors/managers') encouraged participant usage of mobile technology, then the graduates usage would then elevate their social status in the clinical setting.

#### **Hypothesis four**

Similarly, hypothesis four was supported, as Image had a positive effect on Perceived Usefulness (PU). It is possible that participants may see themselves and

others using mobile technology, enhancing their social status within the multidisciplinary team. These findings could suggest an aspect of role modelling. This aspect of Image is explored in the qualitative phase of the study.

#### **Hypothesis five**

Hypothesis 5 was supported as the cognitive factors significantly influenced graduates Perceived Usefulness (PU) and Intention To Use (ITU). The strongest relationship between the TAM2 variables was noted where Job Relevance (JR) had a significant positive effect on Perceived Usefulness (PU). Graduates found the clinical use of mobile technology was relevant for their role, and, therefore, influenced Perceived Usefulness (PU).

#### **Hypothesis six**

Hypothesis six was supported where Output Quality (OQ) of mobile technology use in clinical settings had a positive effect on Perceived Usefulness (PU).

#### **Hypothesis seven**

Hypothesis seven was supported as Demonstrability (RD) had a positive effect on Perceived Usefulness (PU).

#### **Hypothesis eight**

Hypothesis eight was supported since participants' perceived mobile technology was easy to use Perceived Ease Of Use (PEOU) in the clinical setting and had a positive effect on its Perceived Usefulness (PU).

The above findings demonstrated mainly positive correlations between the TAM2 variables, with an increase in one variable increasing the other variable. As there were mostly statistically significant relationships between the variables, the null hypotheses can be rejected to accept the alternative hypotheses as presented (Laerd Statistics, 2015). A summary of these findings, are presented in table 30.

Table 30

*Summary of Hypothesis Results with Pearson Product-Moment Correlations and R<sup>2</sup>*

#	Question	<i>r</i>	R <sup>2</sup>	Hypothesis Supported /Not supported
1.	Subjective Norm (SN) will have no effect on Intention To Use (ITU).	0.227 (ns)	5.1%	Supported
2.	Subjective Norm (SN) will have a positive effect on Perceived Usefulness (PU).	0.348*	12%	Supported
3.	Subjective Norm (SN) will have a positive effect on Image.	0.516**	27%	Supported
4.	Image will have a positive effect on Perceived Usefulness (PU).	0.339**	11%	Supported
5.	Job relevance (JR) will have a positive effect on Perceived Usefulness PU).	0.716**	51%	Supported
6.	Output Quality (OQ) will have a positive effect on Perceived Usefulness (PU).	0.572**	33%	Supported
7.	Result Demonstrability (RD) will have a positive effect on Perceived Usefulness (PU).	0.545**	30%	Supported
8.	Perceived Ease of Use (PEOU) will have a positive effect on Perceived Usefulness PU).	0.568**	32%	Supported

\* $p < 0.01$  (2-tailed), \*\* $p < 0.001$  (2-tailed)

### Regression methods

To further investigate the relationships between the TAM2 variables, regression analysis was utilised. As correlation is a measure of the relationship between two variables, regression analysis of the variables is the assessment of the line of fit to that relationship and further extends correlation (Pallant, 2013).

Regression analysis provided a way to predict the relationships between two variables if one value of a variable predicts the corresponding value of another variable (Nagy, Mills, Waters & Birks, 2010). Multiple regression for TAM2 provided information on how well the TAM2 variables were able to predict a

particular outcome; which variable in the set of variables was the best predictor of an outcome; and whether a particular predictor variable was still able to predict an outcome when the effects of another variable was controlled for (Pallant, 2013).

The original authors of the TAM2 utilised regression analysis to explain the variables contributing to Perceived Usefulness (PU) and the Intention To Use (ITU) the technology (Venkatesh & Davis, 2000). Despite the relatively small sample size results across multiple sites (Venkatesh & Davis, 2000) demonstrated significant findings with meaningful effect sizes. The author's construct scales also indicated adequate reliability and factorial validity across these smaller sample sizes (Venkatesh & Davis, 2000). This study, however, applied regression calculations to a larger sample size (n=57) in order to demonstrate similar significance. At this juncture in the chapter, it again must be stressed that this study did not set out to investigate the validity of the original TAM2, rather it aimed to use the framework as a relevant model for investigating graduates clinical use of mobile technology.

Before undertaking a multiple regression analysis a number of assumptions about the data were considered. It has been concluded that these assumptions include:

- continuous nature of both the independent and dependent variables;
- a linear relationship exists between the dependent and independent variables (as evidenced by the scatterplot P-P Plot and histogram with no major deviations from normality);
- evidence of multicollinearity which refers to the correlational relationship between the independent variables and the dependent variable (usually above 0.3) and measured by a Tolerance value above .20 and a Variance inflation factor [VIF] below 10;
- no significant outliers by screening the scatterplot data (very high or low scores); and
- the data shows homoscedasticity which indicates that the variance of the errors (residuals) is constant across all the values of the independent variable (viewed on the residuals scatterplot with a rectangular distribution and most scores along the centre 0 point) (Laerd Statistics, 2015; Pallant, 2013).

To indicate that there is no correlation between residuals a Durbin-Watson statistic was also calculated. This calculation can range from 0 to 4, with a value of approximately 2 being the ideal (Laerd Statistics, 2015). These assumptions are outlined in the results section, along with the inclusion of the relevant statistical information and scatterplots from the SPSS™ Ver.24 (IBM SPSS, 2016) output of the data.

Although an  $R^2$  calculation is provided with regression analysis, an adjusted  $R^2$  statistic accounts for a better estimate of the true population value when there are smaller sample sizes (Tabachnick & Fidell, 2013; Pallant, 2013). The original authors of the TAM2 model reported adjusted  $R^2$  statistics when reporting their significant findings across their four studies (Venkatesh & Davis, 2000). For consistency with the TAM2 model design and for the smaller sample size, an adjusted  $R^2$  was reported. The adjusted  $R^2$ , explained as a percentage (simply multiplying by 100), represented the percentage of variance in the dependent variable and explained by the independent variable. Results were reported to indicate whether the regression model was statistically significant and whether there was a statistically significant relationship between the variables.

Perceived Usefulness (PU) was the dependent variable with six independent variables that included: Subjective Norm (SN); Image; Job relevance (JR); Output Quality (OQ); Result Demonstrability (RD); and Perceived Ease of Use (PEOU). These variables were entered in SPSS™ Ver.24 (IBM SPSS, 2016). Multiple regression analysis was used to provide information about the relative contribution of each of these variables, to the dependent variable (Pallant, 2013). This was important within the study, as multiple regression aids in addressing the research questions. The TAM2 independent variables for example, provided details on how much variance in Perceived Usefulness (PU) was explained as a group or block (Pallant, 2013). For the second calculation, Intention To Use (ITU) was the dependent variable, with Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and Subjective Norm (SN) as the group or block of independent variables.

Correspondence during this phase of the research with Professor Viswanath Venkatesh, included the suggestion to run ‘a block regression if you want to see the added value of interactions over main effects’ and add ‘coding for mean scores’

(personal communication, Professor Viswanath Venkatesh, 19<sup>th</sup> May 2017). As the TAM2 model incorporated known independent variables based on the model criteria, a regression variant known as stepwise regression (block regression) was incorporated. Stepwise regression allowed the statistical program SPSS™ Ver.24 (IBM SPSS, 2016) to select, which variable it will enter and in which order they enter into the equation based on TAM2 (Pallant, 2013). All of the variables in TAM2 were assessed in the equation to see if they should be removed. This approach was useful in this exploratory study. Limitations may exist, however, if this study is replicated with different samples (Field, 2016).

Previous research using the TAM2 model has incorporated stepwise regression to compare the TAM2 to the study samples (Venkatesh & Davis, 2000). For consistency across the research, stepwise regression was included as part of the data analysis to review if there were significant findings with the sample population. Use of this method of regression assisted in answering the research questions to identify and explain patterns in the data.

### **Regression analysis and results**

Three types of regression calculations were applied for all the TAM2 questions (n=57). Multiple regression reviewed the main dependent variables of Perceived Usefulness (PU), and Intention To Use (ITU). Simple linear regression was applied to the variable Subjective Norm (SN) to the variable Image. The final regression variant included stepwise regression to assist in answering the research questions.

### **Multiple regression**

When entered in SPSS™ Ver.24 (IBM SPSS, 2016), Perceived Usefulness (PU) was the dependent variable with six independent variables that included Subjective Norm (SN), Image, Job Relevance (JR), Output Quality (OQ), Result Demonstrability (RD) and Perceived Ease of Use (PEOU). This method of multiple regression, was used to provide information about the TAM2 model as a whole and the relative contribution of each of the variables (Pallant, 2013). This was important to aid in addressing the research questions. The TAM2 independent variables for example, provided details on how much variance in Perceived Usefulness (PU) was explained



as a group or block (Pallant, 2013). For the second calculation, Intention To Use (ITU) was the dependent variable, and with Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and Subjective Norm (SN) as the group or block of independent variables. An adjusted R Square ( $R^2$ ) is displayed in Tables 31 and 32. For consistency with the TAM2 framework and for the smaller sample size, an adjusted R square is reported in the stepwise regression summaries on Tables 34 and 35.

**Multiple regression for Perceived Usefulness (PU).**

A multiple regression was run to predict Perceived Usefulness (PU) from Subjective Norm (SN), Image, Job relevance (JR), Output Quality (OQ), Result Demonstrability (RD) and Perceived Ease of Use (PEOU). There was linearity as assessed by partial regression scatterplots (Figure 43); as evidenced by the scatterplot P-P Plot (Figure 44); and histogram (Figure 45) with no major deviations from normality.

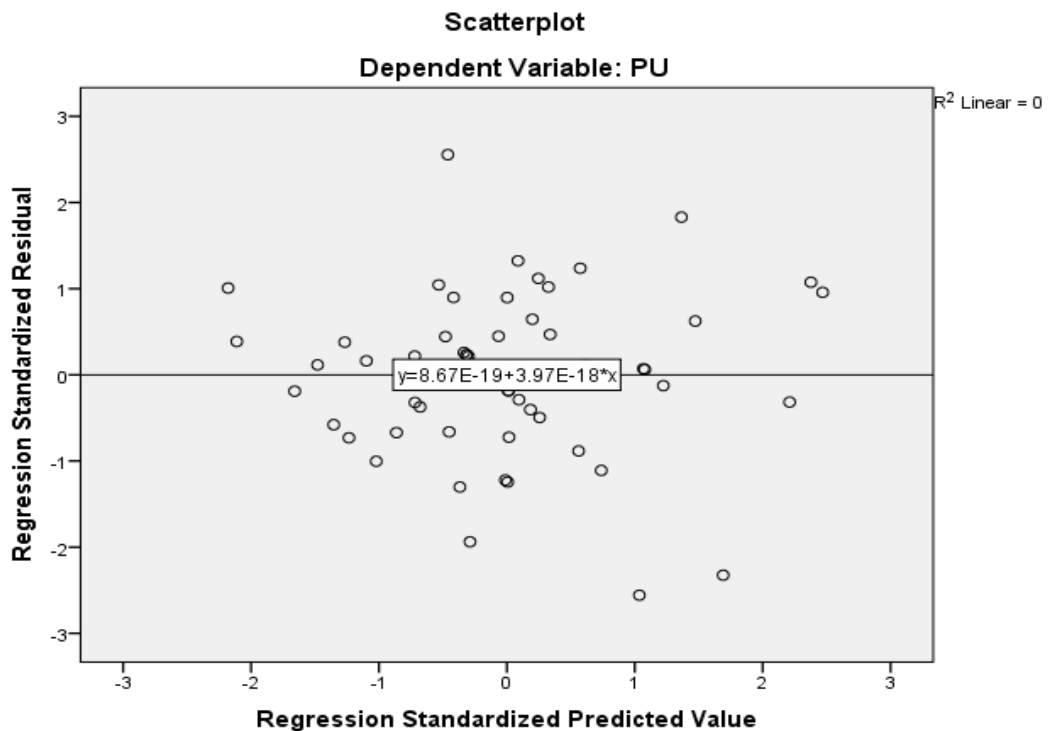


Figure 43. Standardised residuals with dependent TAM2 variable of Perceived Usefulness (PU) with most scores along the 0 point.

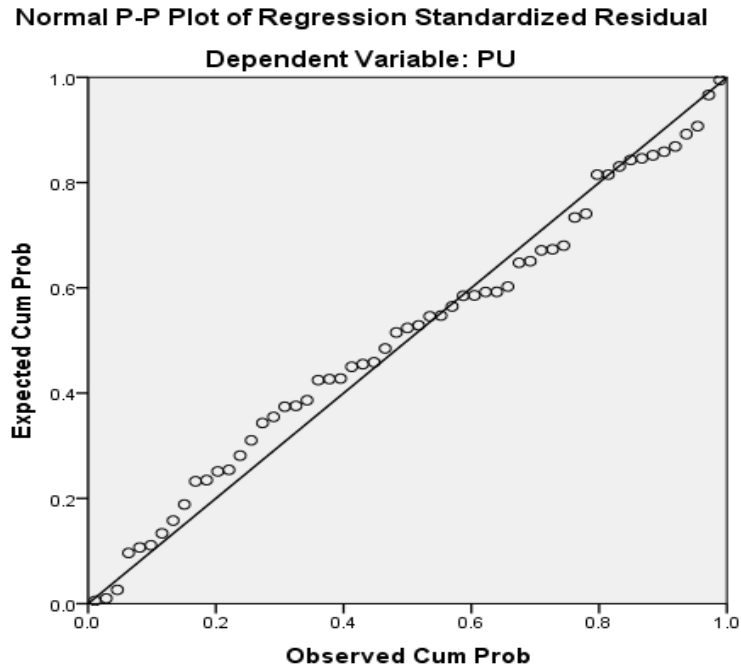


Figure 44. Scatterplot of P-P Plot with dependent TAM2 variable of Perceived Usefulness (PU) with no deviations from normality

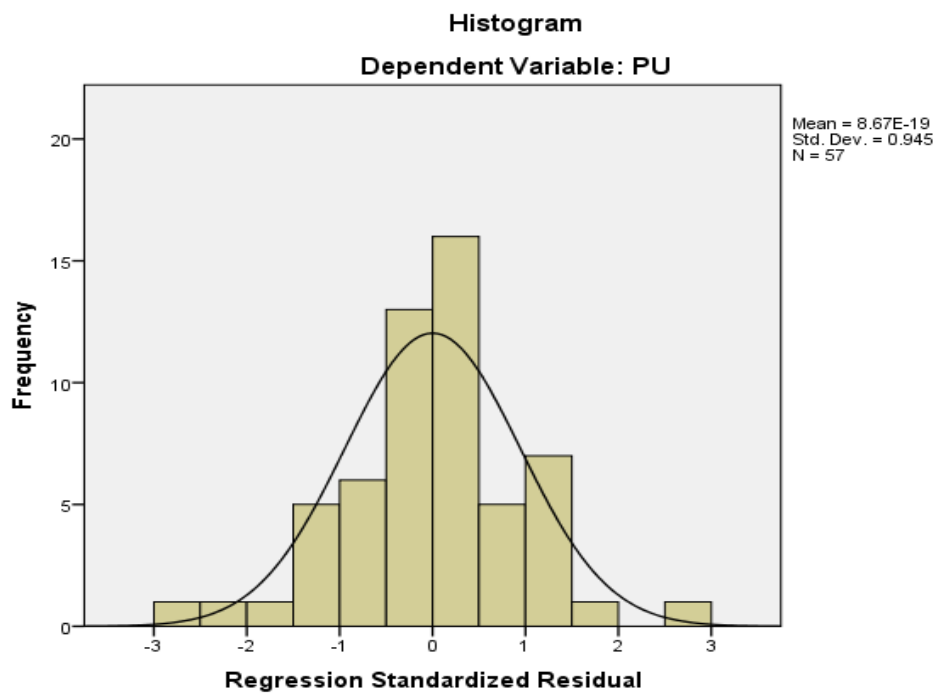


Figure 45. Histogram with dependent TAM2 variable of Perceived Usefulness (PU)

There was independence of residuals, as assessed by a Durbin-Watson statistic of 2.199. There was homoscedasticity, and no evidence of multicollinearity, as assessed

by tolerance values greater than 0.1 and VIF below 10 (see Table 31). It was noted JR had an  $r$  value of .716, however, the tolerance and VIF values were within range for collinearity with only one variable close to .7 noted in the same analysis. It is not recommended to have more than two variables with  $r$  values of .7 or more in the same analysis, therefore, this assumption was safely met in the analysis (Pallant, 2013).

Results Demonstrability (RD) with the final question removed revealed higher correlation and improved Cronbach alpha scores as identified previously. The final question in RD was negatively worded, whilst the other three questions in the RD variable were positively worded. The final RD question was: 'I would have difficulty explaining why using the mobile technology may or may not be beneficial'. Participants in this study may have experienced confusion to the meaning of the question, based on the wording.

To compare if the TAM2 framework, predicting PU, was improved with RD in the final question removed, regression was repeated. All parameters were included as per the above for PU, with RD with the final question removed. The multiple regression of SN, Image, JR, OQ, RD (final question removed) and PEOU statistically significantly predicted Perceived Usefulness (PU),  $F(6, 50) = 17.087$ ,  $p < .001$ ,  $\text{adj. } R^2 = .63$ . It was noted these TAM2 variables explained an improvement up to 63% of the variance in Perceived Usefulness (PU), with RD with the final question removed providing significance at  $p = .020$  along with JR  $p < .001$ .

Results Demonstrability (RD) with the final question removed contributed to a  $\beta$  of .270 (standardized regression coefficients), SE .123 (Standard Error) with a CI .049-.541 (95% Confidence Intervals for B). This finding could be considered for further research using the TAM2 with the final question addressing the variable RD removed.

The multiple regression of SN, Image, JR, OQ, RD and PEOU statistically significantly predicted Perceived Usefulness (PU),  $F(6, 50) = 15.164$ ,  $p < .001$ ,  $\text{adj. } R^2 = .60$ . Only one of the six variables (JR), however, added statistical significance to the prediction,  $p < .001$ . Regression coefficients and standard errors can be found in Table 31, with an overall summary being presented in Figure 51. As

can be seen in Table 31, the TAM2 variables explained up to 60% of the variance in Perceived Usefulness (PU).

Table 31

*TAM2 Multiple Regression Results Explaining Perceived Usefulness (PU)*

<b>Independent variables</b>	<b>R<sup>2</sup></b>	<b>β</b>	<b>SE</b>	<b>CI</b>	<b>Tolerance</b>	<b>VIF</b>
	0.603					
Constant (PU)			.333	-.823-.513		
SN		-0.69	.112	-.295-.154	.586	1.707
Image		0.150	.089	-.045-.312	.706	1.416
JR		0.479*	.086	.233-.579	.687	1.455
OQ		0.171	.086	-0.42-.302	.557	1.794
RD		0.142	.139	-.105-.454	.558	1.792
PEOU		0.177	.126	-.055-.453	.561	1.783

*Note: n=57. \*p<0.001 (2-tailed). Adjusted R<sup>2</sup> is shown. β: standardized regression coefficients. SE: Standard Error. CI: 95% Confidence Intervals for B.*

### **Multiple regression for Intention To Use (ITU).**

A multiple regression was run to predict Intention To Use (ITU) from Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and Subjective Norm (SN). There was linearity as assessed by partial regression scatterplots (Figure 46); as evidenced by the scatterplot P-P Plot (Figure 47) and histogram (Figure 48) with no major deviations from normality.

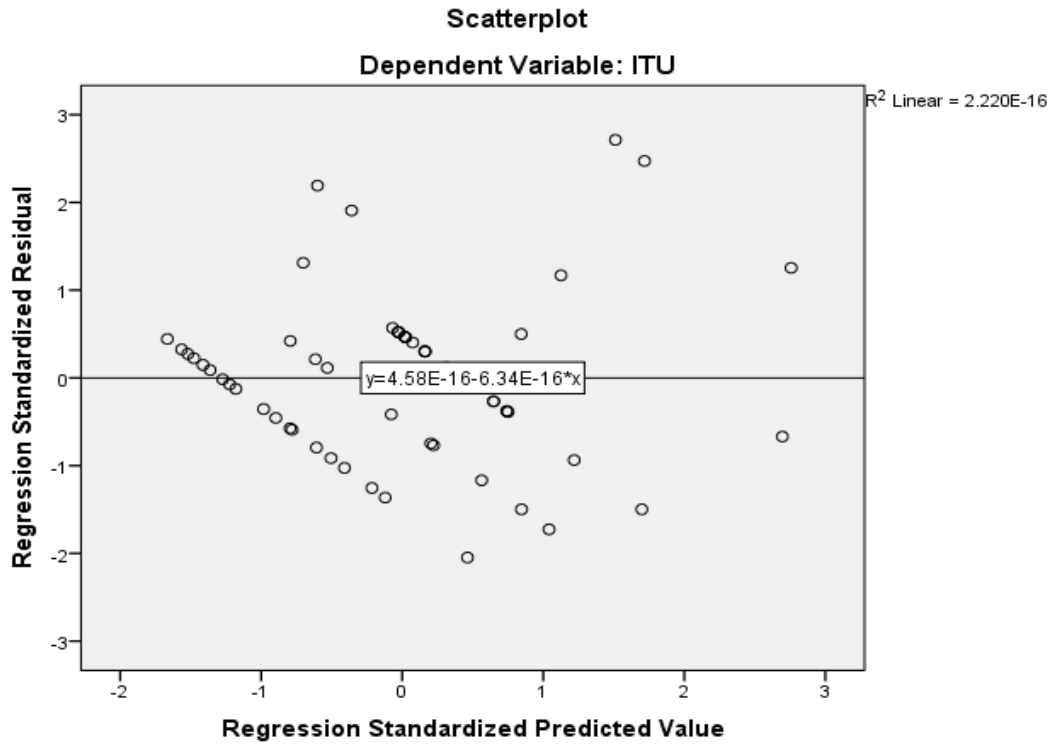


Figure 46. Standardised residuals with dependent TAM2 variable of Intention to Use (ITU) with most scores along the 0 point.

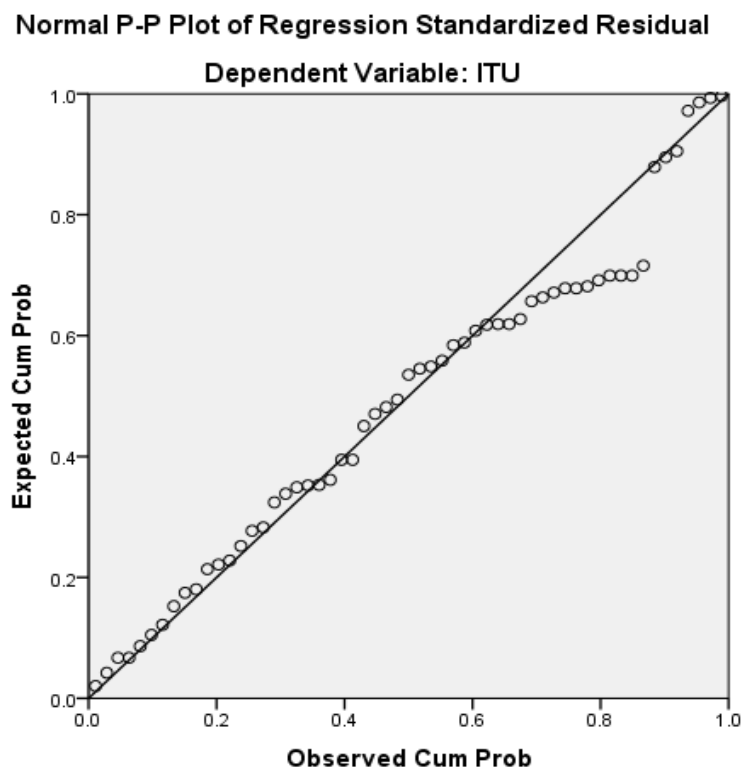


Figure 47. Scatterplot of P-P Plot with dependent TAM2 variable of Intention To Use (ITU) with no deviations from normality

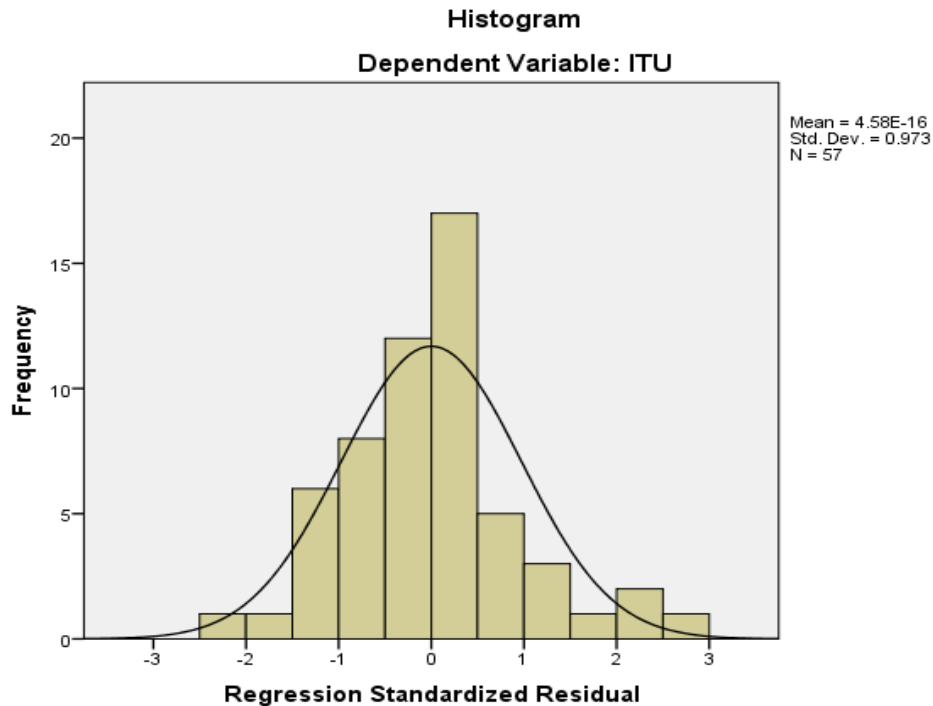


Figure 48. Histogram with dependent TAM2 variable of Intention To Use (ITU)

There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.889. There was homoscedasticity, and no evidence of multicollinearity, as assessed by tolerance values greater than 0.1 and VIF below 10 (see table 32). It was noted PU had a  $r$  value of .752, however, the tolerance and VIF values were within range for collinearity with only one variable close to .7 noted in the same analysis. It is not recommended to have more than two variables with  $r$  values of .7 or more in the same analysis, therefore, this assumption was safely met in the analysis (Pallant, 2013).

The multiple regression TAM2 model of PU, PEOU and SN statistically significantly predicted Intention To Use (ITU)  $F(3, 53) = 25.573, p < .001, \text{adj. } R^2 = .57$ . Only one of the six variables (PU) however, added statistical significance to the prediction,  $p < .001$ . Regression coefficients and standard errors can be found in Table 32 with an overall summary of the model presented in Figure 51. As shown in Table 32, the TAM2 variables explained up to 57% of the variance in Intention To Use (ITU).

Table 32

*TAM2 Multiple Regression Results Explaining Intention To Use (ITU)*

<b>Independent variables</b>	<b>R<sup>2</sup></b>	<b>β</b>	<b>SE</b>	<b>CI</b>	<b>Tolerance</b>	<b>VIF</b>
	0.568					
Constant (ITU)			.319	-.526-.754		
PU		.664*	.113	.455-.908	.639	1.566
PEOU		.191	.124	-0.28-.468	.670	1.492
SN		-.057	.098	-.256-.138	.870	1.150

*Note: n=57. \*p<0.001 (2-tailed). Adjusted R<sup>2</sup> is shown. β: standardized regression coefficients. SE: Standard Error. CI: 95% Confidence Intervals for B.*

#### **Simple linear regression for Subjective Norm (SN) on Image.**

A simple linear regression was run to understand the effect of the TAM2 variable Subjective Norm (SN) on Image. To assess linearity, a scatterplot of Subjective Norm (SN) against Image with superimposed regression line was plotted. Visual inspection of these two plots indicated a linear relationship between the variables (Figure 49). There was homoscedasticity, as assessed by visual inspection of a plot of standardized residuals versus standardized predicted values (Figure 50) and normality of the residuals.

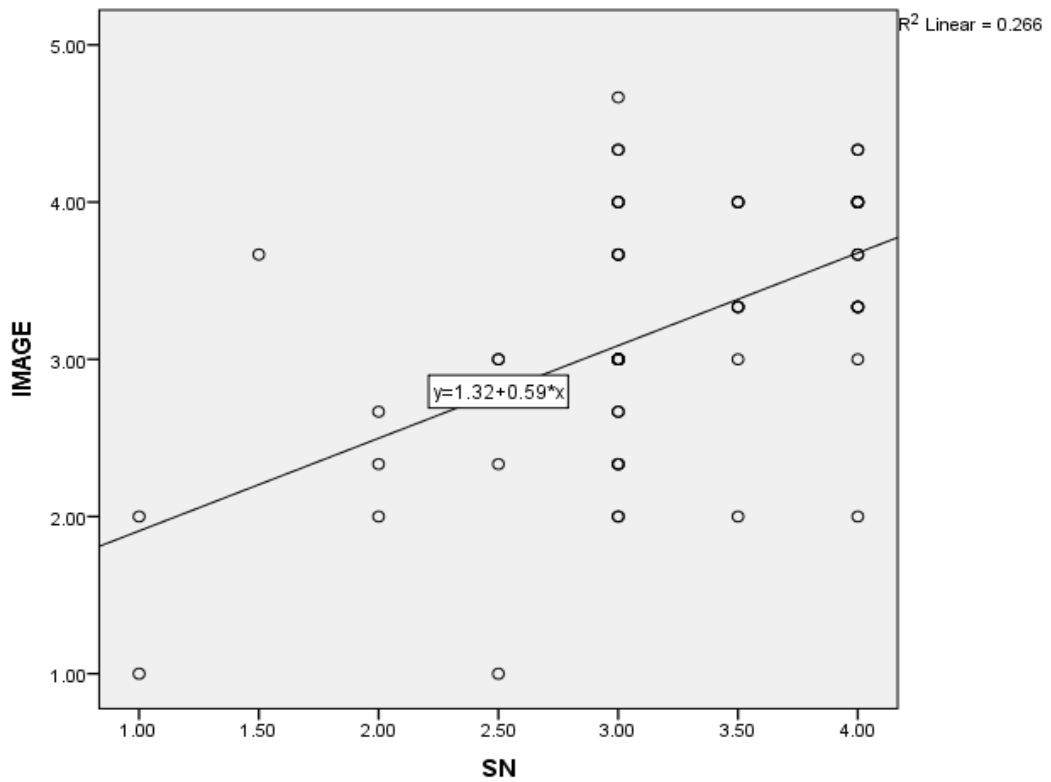


Figure 49. Scatterplot of Subjective Norm (SN) against Image with superimposed regression line

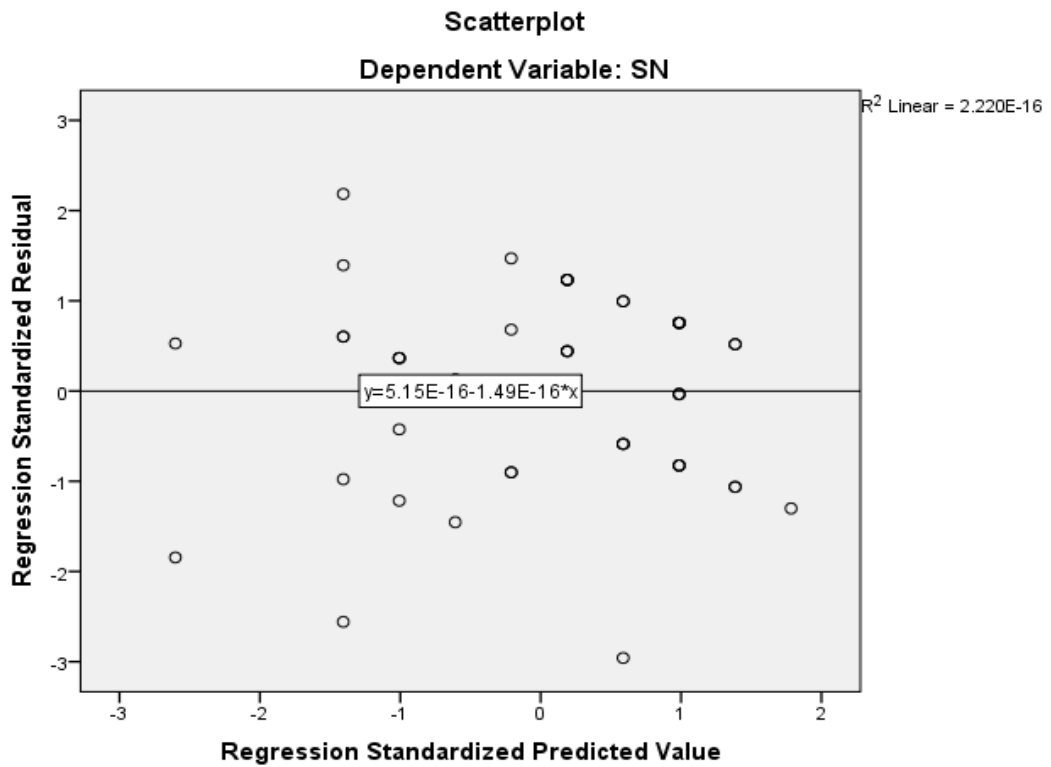


Figure 50. Scatterplot of standardized residuals Subjective Norm (SN) against Image



Subjective Norm (SN) statistically significantly predicted Image,  $F(1, 55) = 19.959, p < .001$ , accounting for 27% of the variation in Image with adjusted  $R^2 = 25\%$ . Regression coefficients and standard errors can be found in Table 33 with an overall summary of the model presented in Figure 51.

Table 33

*TAM2 Simple Linear Regression Results of Subjective Norm (SN) to Image*

<b>Independent variables</b>	<b><math>R^2</math></b>	<b><math>\beta</math></b>	<b>SE</b>	<b>CI</b>	<b>Tolerance</b>	<b>VIF</b>
	0.253					
Constant (SN)			.332	1.050-2.380		
Image		.516*	.101	.249-.654	1.000	1.000

*Note: n=57. \*p<0.001 (2-tailed). Adjusted  $R^2$  is shown.  $\beta$ : standardized regression coefficients. SE: Standard Error. CI: 95% Confidence Intervals for B.*

### **Multiple Regression summary**

For multiple regression for PU, only the variable (JR) added statistical significance to the prediction,  $p < .001$ . The TAM2 variables together however, explained up to 60% of the variance in Perceived Usefulness (PU). The multiple regression TAM2 model of PU, PEOU and SN statistically significantly predicted Intention To Use (ITU). Only one of the six variables (PU) however, added statistical significance to the prediction,  $p < .001$ . These TAM2 variables explained up to 57% of the variance in Intention To Use (ITU).

In addition, a simple linear regression was run to understand the effect of the TAM2 variables Subjective Norm (SN) onto Image. Based on the results, Subjective Norm (SN) had a statistical significant influence on the variable of Image. This accounted for 27% of the variation in Image with adjusted  $R^2 = 25\%$ . A summary of the combined results is presented in Figure 51.

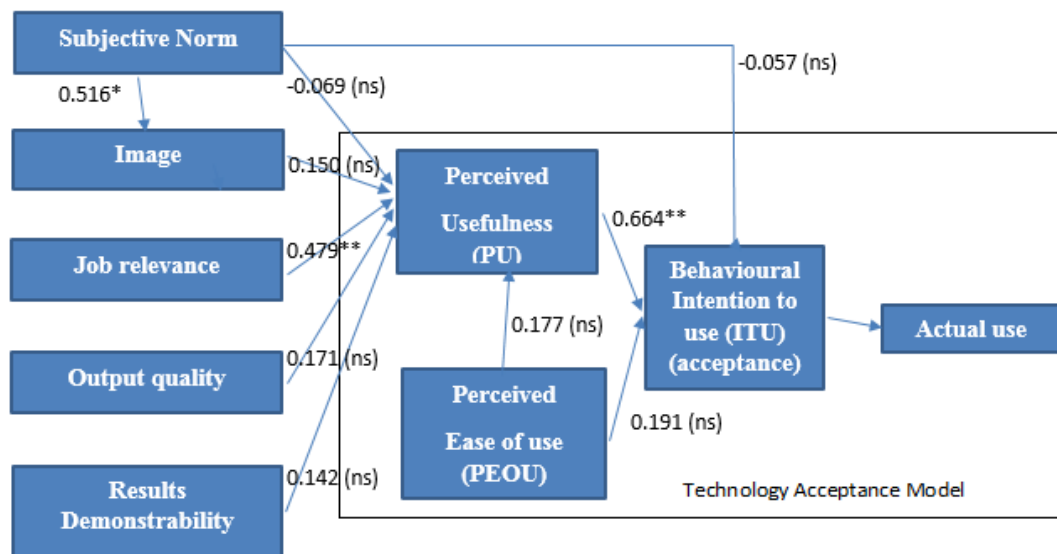


Figure 51. The Technological Acceptance Model 2 (TAM2) summary of  $\beta$ : standardized regression coefficients

Notes:

1. \*\* $p < 0.001$ .
2. Adjusted  $R^2$  for PU is 0.60; Adjusted  $R^2$  for ITU is 0.57; Adjusted  $R^2$  for Image is 0.25

**Stepwise regression**

Stepwise regression allows the statistical program SPSS™ Ver.24 (IBM SPSS, 2016) to select which variables it will enter and in which order they enter into the equation based on the model (Pallant, 2013). All of the variables in TAM2 were assessed in the equation to see if any should be removed. This approach was useful in this exploratory study (Field, 2016).

**Stepwise regression for Perceived Usefulness (PU).**

A stepwise regression was run to predict the dependent variable Perceived Usefulness (PU) from independent variables of Subjective Norm (SN), Image, Job relevance (JR), Output Quality (OQ), Result Demonstrability (RD) and Perceived Ease of Use (PEOU). There was linearity as assessed by partial regression scatterplots (Figure 52), as evidenced by the scatterplot P-P Plot (see Figure 53) and histogram (see Figure 54) with no major deviations from normality. There was independence of residuals, as assessed by a Durbin-Watson statistic of 2.247. There

was homoscedasticity, and no evidence of multicollinearity, as assessed by tolerance values greater than 0.1 and VIF below 10 (see Table 34).

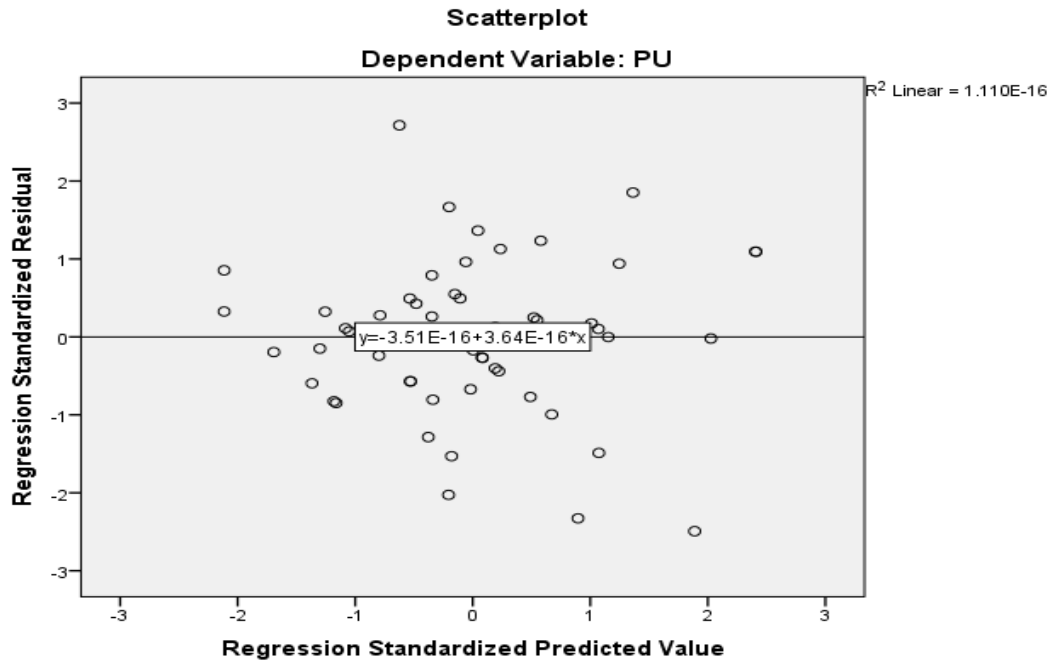


Figure 52. Standardised residuals with dependent TAM2 variable of Perceived Usefulness (PU) with most scores along the 0 point

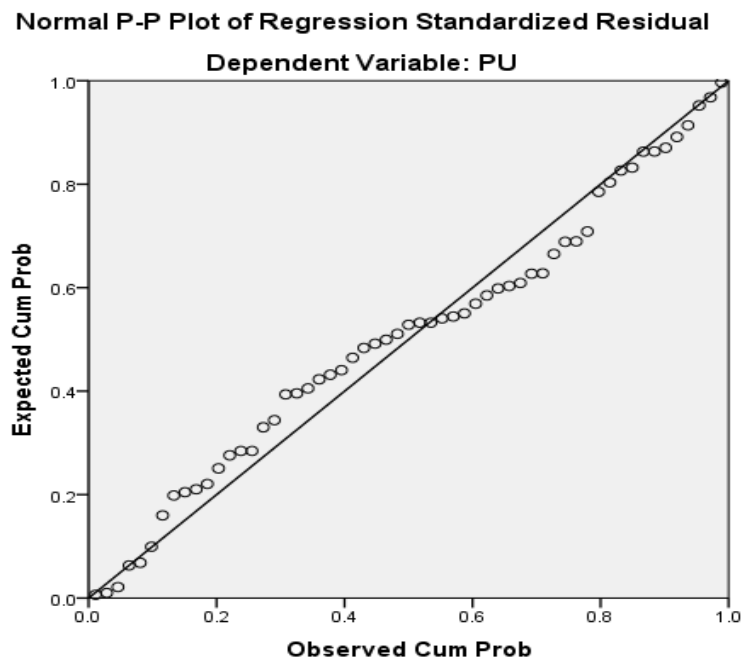


Figure 53. Scatterplot of P-P Plot with dependent TAM2 variable of Perceived Usefulness (PU) with no deviations from normality

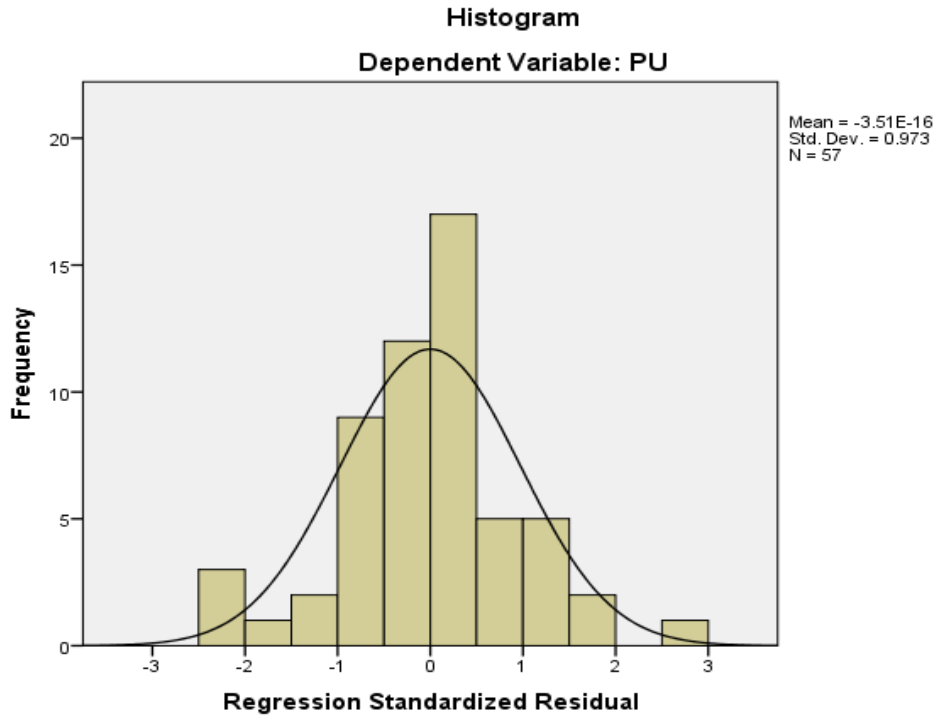


Figure 54. Histogram with dependent TAM2 variable of Perceived Usefulness (PU)

The stepwise regression removed SN, OQ, and RD, but kept the variables of JR, PEOU and Image as displayed in Table 34. The stepwise regression model statistically significantly predicted Perceived Usefulness (PU),  $F(3, 53) = 28.329$ ,  $p < .001$ ,  $\text{adj. } R^2 = .59$ . Regression coefficients and standard errors can be found in Table 34 with the revised TAM2 model following Stepwise regression in Figure 58.

Table 34

*TAM2 Stepwise Regression Model Results Explaining Perceived Usefulness (PU)*

<b>Model</b>	<b>Independent variables</b>	<b>R<sup>2</sup></b>	<b>β</b>	<b>SE</b>	<b>CI</b>	<b>Tolerance</b>	<b>VIF</b>
<b><u>Model 1</u></b> <b>(JR)</b>	Constant (PU)	.503					
	JR		.716**	.080	.477-.767	1.000	1.000
<b><u>Model 2</u></b> <b>(JR, PEOU)</b>	Constant (PU)	.568					
	JR		.576**	.084	.320-.657	.787	1.270
	PEOU		.302**	.111	.116-.562	.787	1.270
<b><u>Model 3</u></b> <b>(JR, PEOU, Image)</b>	Constant (PU)	.594					
	JR		.539**	.083	.291-.623	.762	1.313
	PEOU		.295**	.108	.116-.568	.786	1.272
	Image		.184*	.078	.008-.319	.952	1.051

*Note: n=57. \* p<0.05, \*\*p<0.001 (2-tailed). Adjusted R<sup>2</sup> is shown. β: standardized regression coefficients. SE: Standard Error. CI: 95% Confidence Intervals for B.*

### **Stepwise regression for Intention To Use (ITU).**

A stepwise regression was run to predict the dependent variable Intention To Use (ITU) from the independent variables of Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and Subjective Norm (SN). There was linearity as assessed by partial regression scatterplots (see Figure 55), as evidenced by the scatterplot P-P Plot (Figure 56) and histogram (Figure 57), with no major deviations from normality. There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.857. There was homoscedasticity, and no evidence of multicollinearity, as assessed by tolerance values greater than 0.1 and VIF below 10 (see Table 35).

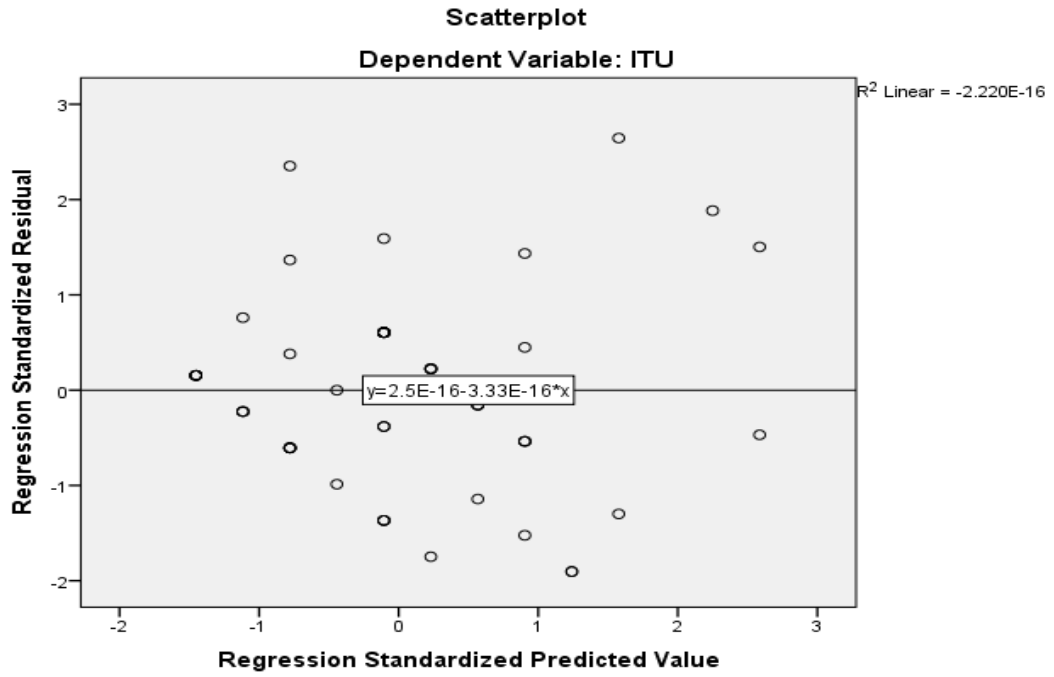


Figure 55. Scatterplot of standardized residuals for Intention To Use (ITU)

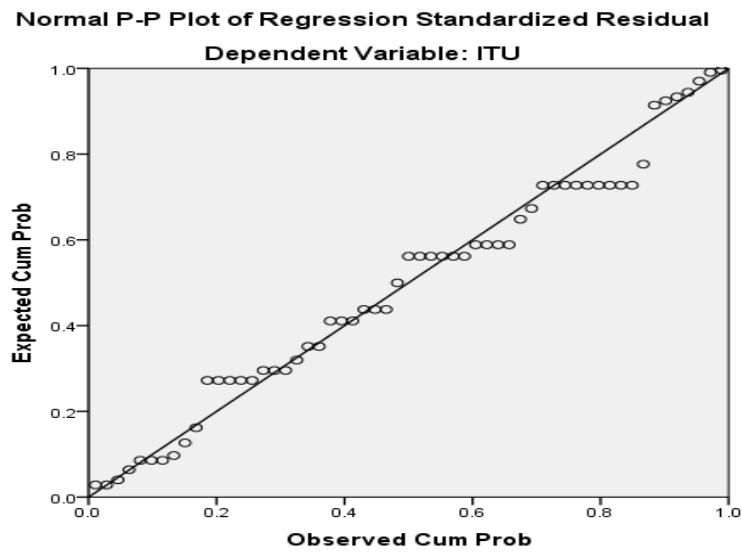


Figure 56. Scatterplot of P-P Plot with dependent TAM2 variable of Intention To Use (ITU) with no deviations from normality

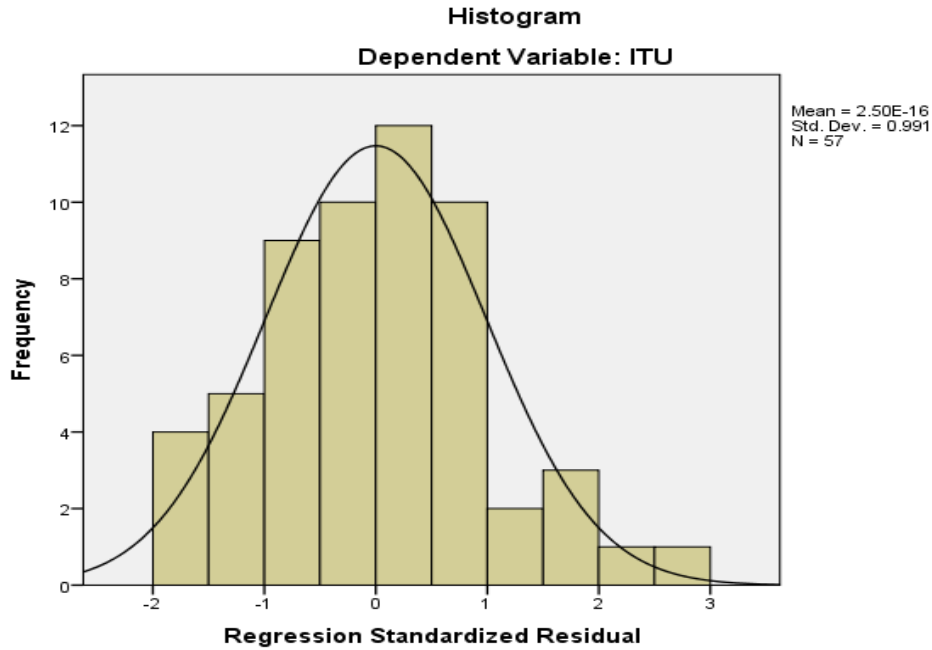


Figure 57. Histogram with dependent TAM2 variable of Intention To Use (ITU)

The stepwise regression removed PEOU, and SN, but kept the variable PU in Model 1 as displayed in Table 35. The stepwise regression model statistically significantly predicted Intention To Use (ITU)  $F(1, 55) = 71.639, p < .001, \text{adj. } R^2 = .56$ . Regression coefficients and standard errors can be found in Table 35 with the revised TAM2 model following stepwise regression in Figure 58.

Table 35

TAM2 Stepwise Regression Results Explaining Intention To Use (ITU)

Model	Independent variables	$R^2$	$\beta$	SE	CI	Tolerance	VIF
<b>Model 1</b> <b>(PU)</b>	Constant (ITU)	.558					
	PU		.752**	.091	.589-.955	1.000	1.000

Note:  $n=57$ . \*  $p < 0.05$ , \*\*  $p < 0.001$  (2-tailed). Adjusted  $R^2$  is shown.  $\beta$ : standardized regression coefficients. SE: Standard Error. CI: 95% Confidence Intervals for B.

### Stepwise regression summary

The final stepwise regression was used to predict PU and ITU. Within the results, the analysis removed SN, OQ, and RD, but kept the variables of JR, PEOU and Image in Model 3 as displayed in table 34. The stepwise regression model statistically significantly predicted Perceived Usefulness (PU),  $p < .001$ , with an adj.  $R^2 = .59$ . In addition, Stepwise regression was used to predict ITU. The TAM2 model removed PEOU, and SN, but kept the variable PU in Model 1 as displayed in Table 35. The stepwise regression model statistically significantly predicted Intention To Use (ITU) with an adj.  $R^2 = .56$ . A summary of the revised TAM2 model predicting PU and ITU for the study sample, is displayed in Figure 58.

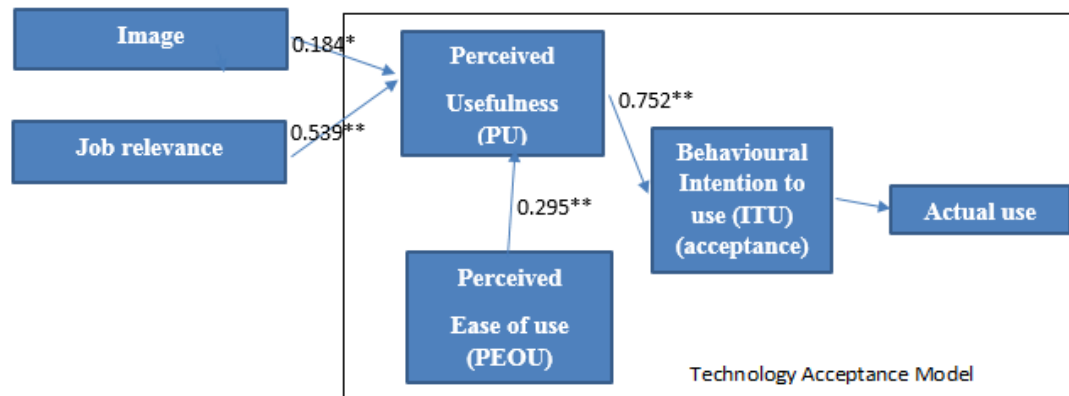


Figure 58. Revised TAM2 model following Stepwise regression for PU (Model 3) and ITU (Model 1) with  $\beta$ : standardized regression coefficients

Notes:

1.  $n=57$ . \*  $p < 0.05$ , \*\*  $p < 0.001$  (2-tailed).
2. Adjusted  $R^2$  for PU is 0.59; Adjusted  $R^2$  for ITU is 0.56.

### Regression analysis results summary

Regression analysis of the data was used to predict the relationships between the TAM2 multiple independent variables and the TAM2 model continuous dependent variables (PU and ITU). This statistic provided an overall fit (variance explained) of the model and the relative contribution of each of the predictors to the total variance explained (Laerd Statistics, 2015). Variables from the TAM2 model included social



influences and cognitive aspects of technology that influenced its use by the participants.

Three types of regression were included within this phase of the research to assist in answering the research questions, with the main dependent TAM2 model variables of Perceived usefulness (PU) and Intention To Use (ITU). The final regression variant included stepwise regression to assist in consistency with previous TAM2 research and to assist in answering the research questions.

Results from the three types of regression analyses, identified specific trends of variables that may influence a new nurse graduate to use or not to use mobile technology. For multiple regression for PU, only the variable (JR) added statistical significance to the prediction,  $p < .001$ . The TAM2 variables together however, explained up to 60% of the variance in Perceived Usefulness (PU). To follow on from the previous results with removing the final question from RD, it was noted the TAM2 variables explained an improved up to 63% of the variance in Perceived Usefulness (PU), providing significance at  $p .020$  along with JR  $p < .001$ . This finding could be considered for further research in this area using the TAM2 model with the final question removed in the TAM2 variable of RD. The multiple regression TAM2 model of PU, PEOU and SN statistically significantly predicted Intention To Use (ITU). Only one of the six variables (PU) however, added statistical significance to the prediction,  $p < .001$ . These TAM2 variables explained up to 57% of the variance in Intention To Use (ITU).

A simple linear regression was run to understand the effect of the TAM2 variables Subjective Norm (SN) to Image. Based on the results, Subjective Norm (SN) had a statistical significant influence on the variable of Image. This accounted for 27% of the variation in Image with adjusted  $R^2 = 25\%$ .

The final stepwise regression TAM2 model was used to predict PU. Within the results, the analysis removed SN, OQ, and RD, but kept the variables of JR, PEOU and Image in Model 3 as displayed in Table 34. The stepwise regression model statistically significantly predicted Perceived Usefulness (PU),  $p < .001$ , with an adj.  $R^2 = .59$ . Stepwise regression was used to predict ITU. The TAM2 model removed PEOU, and SN but kept only the variable PU in Model 1 as displayed in

Table 35. The stepwise regression model statistically significantly predicted Intention To Use (ITU) with an adj.  $R^2 = .56$ . A summary of the revised TAM2 predicting PU and ITU for the study sample, is displayed in Figure 58.

As noted above, some TAM2 variables had a stronger impact than others for the dependent variables within the model for Perceived Usefulness (PU) and Intention To Use (ITU). The implications of these results are compared to other findings of the study within the discussion chapter. The results within this chapter assisted in answering the two research questions of ‘What factors influence nurse graduates use of mobile technology in the clinical setting?’, and ‘To what extent and in what ways do nurse graduates currently use mobile technology in the clinical setting?’. The second research question was explored in more depth within the qualitative phase of this study.

### **Chapter Summary**

The first section of this chapter presented the descriptive statistics with frequencies and percentages of responses to questions regarding mobile technology use for learning and for clinical applications. Section one of the survey revealed that participants felt the clinical use of mobile technology had benefits for the participants’ role at the point of care. These benefits may have included factors such as: improved self-confidence; time efficiency; improvement in safety and quality of care, and an improvement in organisational skills. Mobile technology was used when the participant was a University student in clinical settings, which would account for its use as a preferred learning tool. Most graduates regularly observed other health professionals and their patients using mobile technology in the clinical areas. A major concern of the participants indicated concern that other staff and patients would think they used their personal mobile technology unprofessionally. Challenges such as a lack of hospital support in terms of policies and support from management emerged from the analysis of the data.

The second section of the chapter utilised Fisher’s exact tests to reveal statistically significant differences between demographic variables and specific questions in section one and two of the survey. Significant differences were noted

between some questions and the demographic variables of gender, where it was shown that more males perceived benefits of mobile technology. Other significant results indicated differences in graduate program location at which hospital, where differences in levels of support and mobile technology use was noted. The length of time within the graduate program, assisted to identify the level of experience as a possible factor in the use of mobile technology. Finally, what University the graduate attended may influence the graduate's clinical use of mobile technology if it was encouraged for their learning. The trends identified were explored in the following qualitative phases of the research.

The third and fourth sections of the chapter analysed data from section two of the survey. Basic frequencies and percentages from the TAM2 were further explored within the correlation and regression analysis of the data. The TAM2 demonstrated that participants were influenced by both cognitive and social influences factors when deciding to adopt clinical use of mobile technology.

Hypothesis testing was incorporated with Pearson's  $r$  correlation coefficients to compare the statistical significance and strength of relationships between the TAM2 variables. Most of the relationships between them were significant and further explored in the regression analysis.

Regression analysis was applied to TAM2 to further explain the independent variables contributing to the dependent variables of Perceived Usefulness (PU) and the Intention To Use (ITU) mobile technology. Three types of regression analysis further extended the trends and patterns in the data, to assist in answering the research questions. Multiple regression reviewed the TAM2 model main dependent variables of Perceived Usefulness (PU) and Intention To Use (ITU). Simple linear regression was applied to the variable Subjective Norm (SN) to the variable Image.

Stepwise regression was applied to see if the results were consistent with the previous studies located in the literature review. Generally, regression analysis revealed that JR significantly influenced PU. Participants felt that the clinical use of mobile technology was relevant in their role, and influenced its perceived usefulness, and subsequent intention to use. The social influence of Image was also noted in the clinical use of mobile technology, and was further explored in the qualitative phase.

## **Conclusion**

Based on the results from this phase of the research, open ended questions were developed from the results that required further explanation. This was to assist in answering the first two research questions involved cognitive based questions such as: ‘how’ relevant and ‘useful’ is mobile technology in clinical settings; what are the barriers and enablers; and how the participants’ University influenced the participants’ current use. Specific examples of positive and negative use were explored together with the extent, and methods participants used mobile technology in the clinical setting.

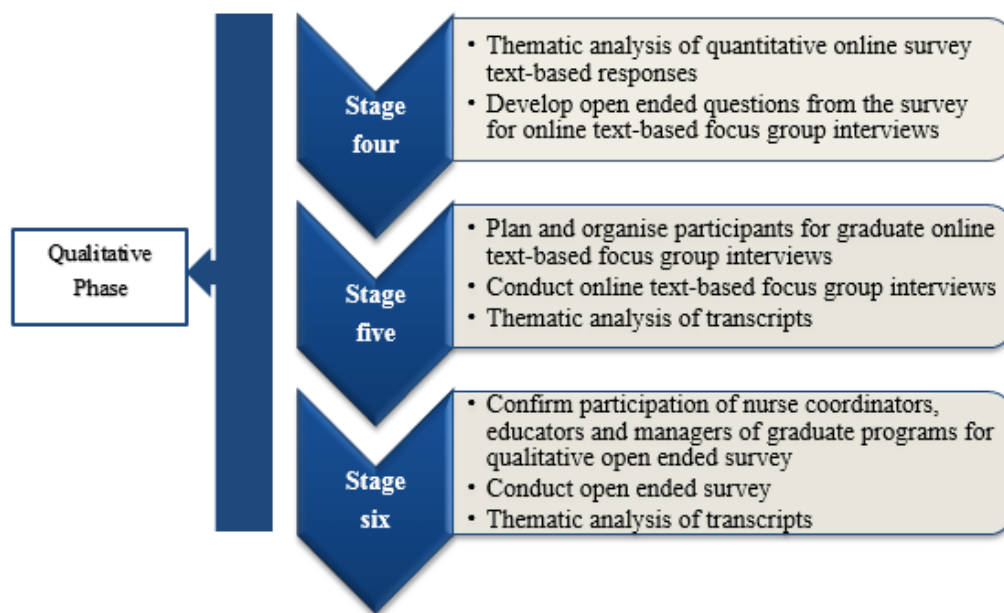
All findings were collated and analysed to see if further clarification and explanation was needed (Creswell & Plano Clark, 2011). The results from this procedure assisted in forming the open-ended questions for the focus group interviews, detailed in phase 2 of the study. Text based responses on the survey will be analysed in the following chapter (see Appendix 13).

## Chapter Five

### Qualitative Phase

#### Introduction

The previous chapter described the methods, analysis, and the results of the quantitative phase of this mixed methods study. This chapter describes the second qualitative phase: the methods, analysis, and the findings. An illustration of the qualitative phase is presented in Figure 59.



*Figure 59.* Design of the qualitative phase of this study

The qualitative phase of the study was divided into three stages with each being sequentially conducted. As can be seen from the above diagram in each stage thematic analysis of data was used (see Figure 59). Since the same process was used in all stages, as a prelude to this qualitative phase of the study, the following narrative provides an explanation of the thematic analysis process.

## Thematic analysis

Initially the researcher became familiar with the content, and the depth of information provided within the responses from across all qualitative data sets. This step involved reading the data separately multiple times, and transcribing the data into a consistent format (Braun & Clarke, 2006). A constant comparative analysis of the data assisted to identify patterns, trends and relationships between data sets. Data was grouped together, named into categories, and patterns were arranged into relationships (Casey & Kruger, 2009).

Specific questions posed in the text-based responses from stage four; focus groups in stage five; and open ended interviews in stage six, were placed in a Microsoft Word® table. This process provided consistency across each data set during the analysis, and aided in a structured approach to identifying initial categories. The data was reviewed and checked for accuracy and by using this systematic approach, it was possible to identify interesting aspects and repeated patterns (see Appendix 14). The next step in the analysis was to generate further categories. These were then transferred into a concept map with each research question subheading at the centre (See Figure 60).

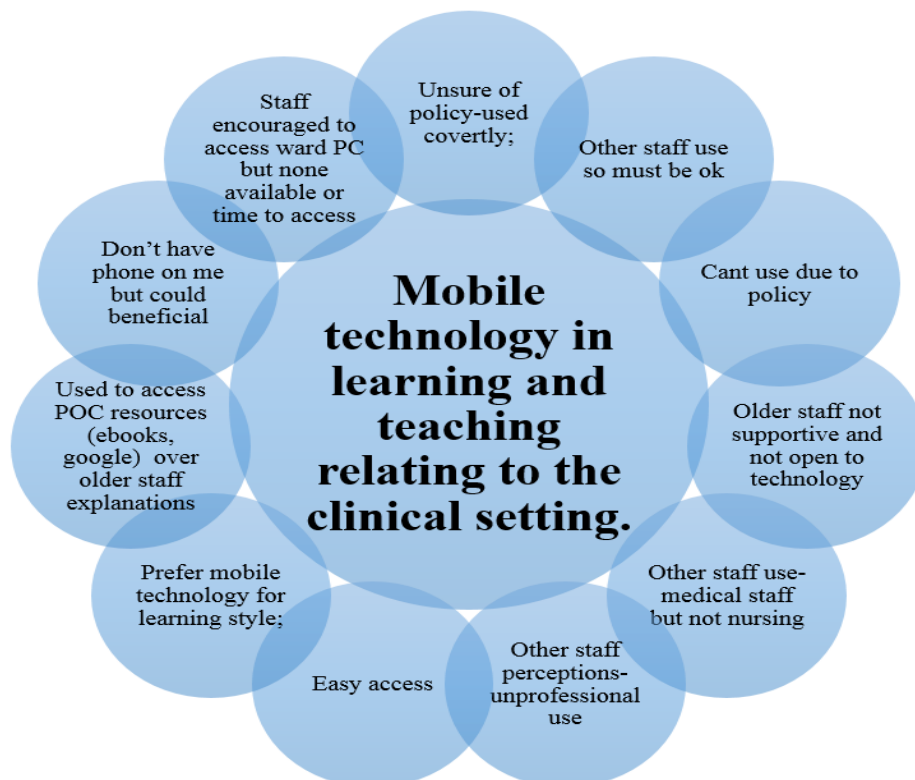


Figure 60. Concept map sample with initial codes

The process of creating a concept map enabled direct visualisation of specific categories. The third step in the analysis of the data combined the categories into potential overarching themes (Braun & Clarke, 2006).

The fourth step in the thematic framework used in this study, involved defining and naming the potential themes (see Figure 61). Patterns in the data from all the potential themes within all the concepts maps, combined into a final concept map (see Figure 63 for an example from stage four). The final concept map contained the main research question at the centre, which focused on the aim and objectives of the study. It enabled visualisation of the final themes and subthemes, (See Figure 64).

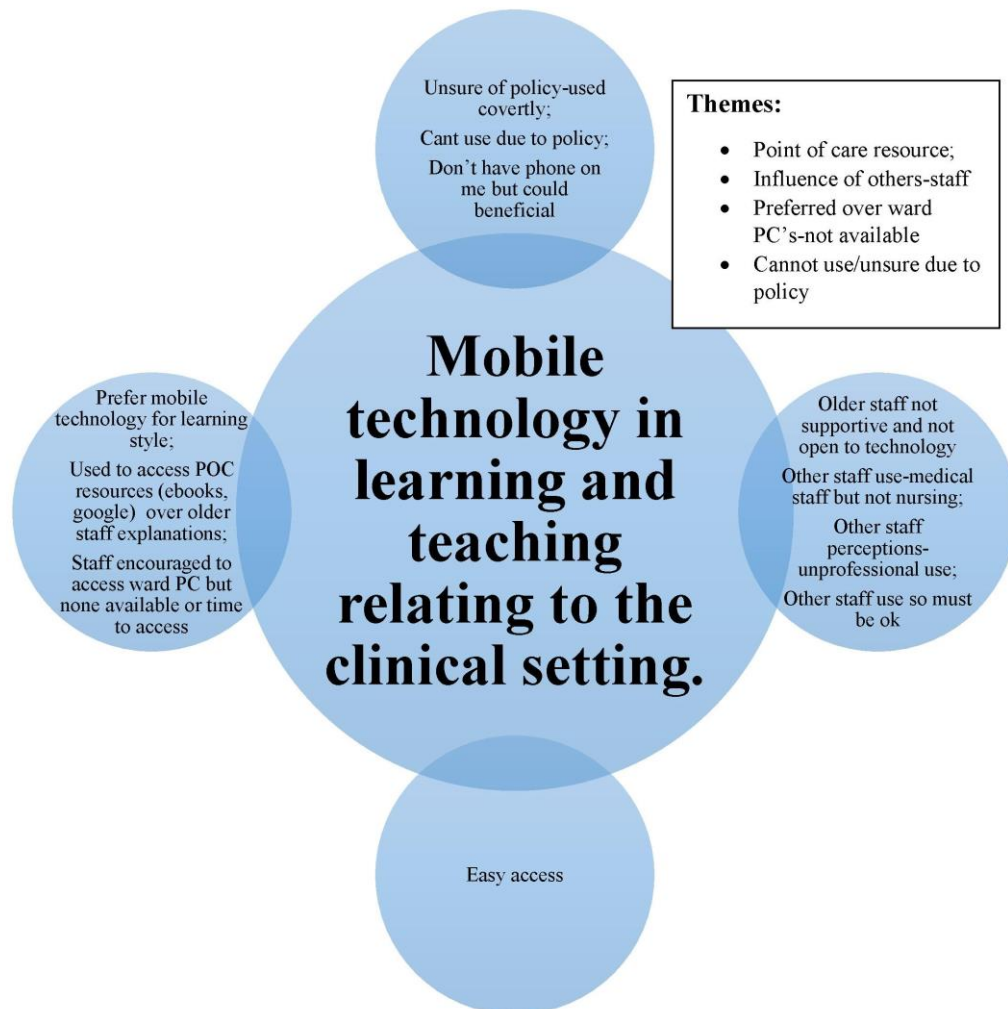
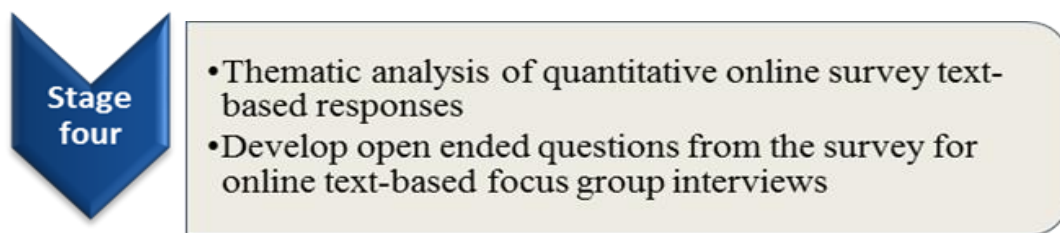


Figure 61. Concept map sample with initial codes combined into potential themes

The structured approach to thematic analysis of data maintained a sequential nature of the study, and consistency across all the three stages in this qualitative phase of the study. This framework facilitated identification of patterns and trends to compare one segment of data with another and to identify similarities and differences. It also enabled the researcher to identify interesting aspects, repeated patterns and significant statements that further explained participants' experiences (Braun & Clarke, 2006).

Within the stages four to six, a systematic, separate process for the data collection and analysis was utilised (Casey & Kruger, 2009). The next part of this chapter details the sequence of events in each stage of the qualitative phase of this study.



*Figure 62.* Stage four of the qualitative phase

#### **Stage four**

Stage four of the qualitative phase of the study involved reviewing the findings from the quantitative phase of the study that required further explanation and clarification. The pertinent findings were used to develop the open-ended questions for the focus groups. This process connected the two phases of the study in an effort to minimise the threats to validity (Creswell & Plano Clark, 2011).

Participants responding to the quantitative online survey provided comments and statements at the end of each subheading. These subheadings included:

#### **Section One subheadings**

- Mobile technology in learning and teaching relating to the clinical setting



- Nursing graduates use of mobile technology in the clinical setting
- Mobile technology in learning and teaching relating to the University setting.
- Mobile technology use by nurses and other health professionals
- Policies and guidelines associated with mobile technology in the clinical setting

### **Section Two subheading**

- Factors influencing the use of mobile technology in healthcare (TAM2 framework)

Analysis of the comments and statements from each sub heading enabled development of open-ended questions for the online text-based focus group interviews. Only two text-based responses were noted in the TAM2 section. These two separate responses reflected general feelings and perceptions of mobile technology. It appeared that some participants might have thought this was the final chance to a comment about the survey. In fact there was space provided at the bottom of the survey for participants to write a final comment.

The following process was utilised to identify the participants from each set of data. To protect their identity, all responses were given a number. For example, text-based responses from the quantitative online survey were titled: Text-Based Responses (TBR 4) with the number following the abbreviation belonged to the individual participant. For consistency within the qualitative phase, stage five online focus group interview responses were titled: Focus Group Interview (FGI 4). Stage six incorporated open-ended responses with nurse leaders. These titled: Open Ended Survey (OES 4).

The first part of stage four, involved thematic analysis of the text-based responses using the framework as previously described. It was noted there were text responses to each of the subheading/s from section one and two. All questions in section two the survey randomised so participants could not identify potential themes that related to the TAM2. This procedure also contributed to the robustness of the study.

Analysis of the findings resulted in the creation of seven concept maps based on the five subheadings in section one, section two and the final question in the survey which was directed to the perceptions of nurse coordinators, educators and managers of graduate programs, regarding mobile technology use in the clinical setting. The concept maps enabled visualisation of the categories. Each map enabled further refinement into potential themes, and the development of a final concept map (see Figure 63).

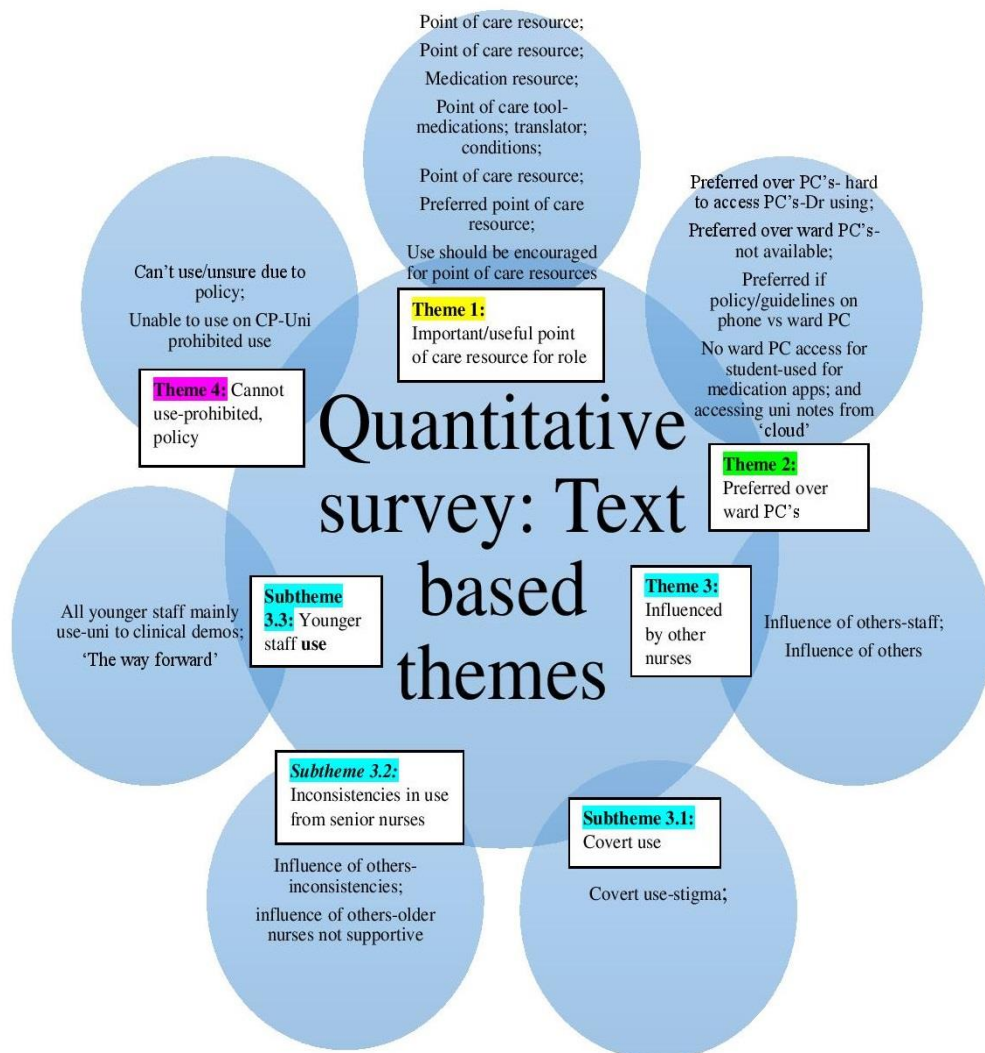


Figure 63. Stage four final concept map sample with potential themes combined into themes/subthemes

In this final concept map, potential themes were collapsed into categories to create the final themes and subthemes (see Figure 64). Analysis of the final themes and subthemes, addressed the following two research questions:

1. What factors influence nurse graduates use of mobile technology in the clinical setting?
2. To what extent and in what ways do nurse graduates currently use mobile technology in the clinical setting?

Four broad themes emerged from the analysis of the quantitative text-based responses (see Figure 64).

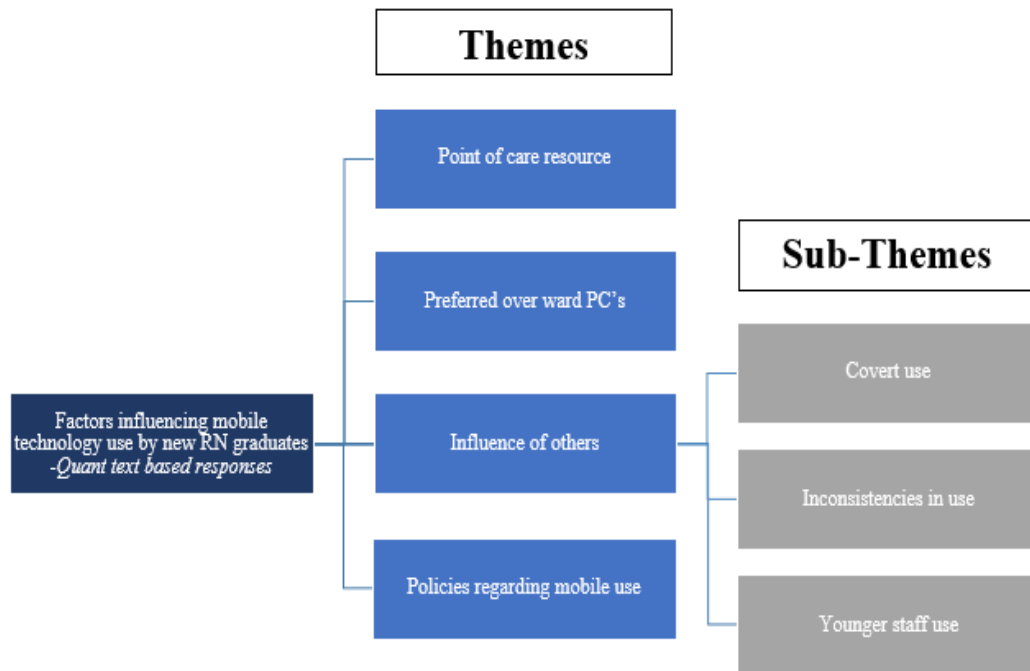


Figure 64. Final themes and subthemes from text-based responses from quantitative phase

## **Themes and subthemes from the text-based responses from the quantitative phase**

Three subthemes relating to the theme ‘Influence of others’ were also identified. The following narrative details the comments from the participants. It is worth noting, that the comments were written as online responses and may at times have been grammatically incorrect. Care has been taken to provide an explanation where appropriate.

### **Point of care resource.**

The first and recurrent theme identified from the text-based responses was that mobile technology was used at the point of care. Usefulness could be seen as an influencing factor on the role of the graduate registered nurse.

Participant’s provided examples of mobile technology as a preferred point of care tool in relation to medication administration and calculation; education and communication with patients; and as a learning tool. As an example, one participant commented that:

I find the use of mobile technology assists me with medication rounds. For example, a patient of mine had a low bp [blood pressure] and I was unsure whether the drug I was giving would make it drop further. I looked it up and discussed the side effects of the drug, we decided to withhold it (TBR 62).

Similarly, another participant stated: “I use my smart phone to access MIMS [Monthly Index of Medical Specialties®] and other apps, however, most nurses do not know it’s available (TBR 52)”. Another participant stated: “Mobile technology is a good tool for quick references like generic names of medications (TBR 36)”. In regards to ease of use with medication administration, one participant wrote: “Using my phone to look up medications is super easy and fast in the morning med round. It would be nice if there was a device we could use without breaching policy (TBR 4)”. It was interesting to note that at the participant’s hospital site, no policy or guideline existed for the use of mobile technology. As explored in the following qualitative stages, graduates might have been directed by other staff in the use of mobile technology when no policy or guideline was available. The term ‘policy’ may refer to senior staff direction/s in the example.

Another participant highlighted the use of mobile technology for safety in calculating medication doses. This was stated as: “I sometimes use my mobile phone in the medication/treatment (only accessible by staff) room to calculate dosage of medications when I don't have my calculator with me (TBR 9)”. This statement was also confirmed by: “Another thing I use my phone for is medication calculations, due to the risk of infection and the med area being a clean room, we can't have calculators, therefore we use our phones (TBR 14)”.

In terms of mobile technology as a point of care tool for education and communication with patients, a participant wrote: “It allows me to have access to the most up to date information that can help assist in giving education to patients as well as increasing my knowledge (TBR 37)”. It was also pointed out that mobile technology was useful when communication difficulties and language barriers were experienced at the point of care. For example, another participant indicated: “I once used my mobile phone to assist with Google translate for a patient speaking Portuguese, when a translator or family was not available (TBR 21)”. This response was further supported by another participant:

I've also found language translation technology extremely useful at the bedside as we encounter a number of non-English speaking patients and given the nature of The ED [Emergency Department] environment it becomes extremely useful in communication between myself and the patient when doing secondary assessments and understanding patient needs, - also in communicating what I require the patient to do (TBR 26).

A common view amongst the participants in regards to the perceived usefulness of mobile technology at the point of care, was summed up in the following comment:

I think it would be very useful if hospital policies, nursing practice guidelines and other information such as about medications (e.g. MIMS) could be accessed on mobile phone or tablets, so that it can be taken to patient bedside or the treatment room. It would also be helpful in providing patient education as it can act as a visual aid and may assist in increased understanding and compliance by patients (TBR 9).

In relation to the use of mobile technology as a learning tool at the point of care, one participant indicated mobile technology suited their learning style when using the

resource at the point of care. Surprisingly, one participant preferred their own familiar learning tool when they transitioned to the clinical setting as a graduate:

I find that I am a visual learner, therefore when I do not understand the process of a procedure I like to research and find videos and diagrams. This is rather than having a senior staff member explain it to me, I find this harder to understand. In such a case I turn to trusty google and for back up I'll check an evidence based book or go into my eBook's (TBR 14).

Currently, within a University undergraduate nursing program, students are taught how to access and critique a variety of evidenced based care resources. Many of these resources can be accessed through mobile devices. Linking University to the clinical setting as a graduate, a participant wrote: "Many evidence based apps are available to access health care information and medication safety (TBR 23)". This link between University and the point of care as a graduate, was also described by another participant:

I used the noteability app to take notes on my iPad during Uni. I still have all my Uni notes available to me through the iCloud and information is easily accessible through the noteability<sup>[TM]</sup> app on my phone via device sharing (TBR 3).

Using mobile technology within a specialty area at the point of care may also be a factor which influences its use. In regards to one specialty area, one participant wrote:

I work in ED and am frequently encountering unfamiliar patient conditions and medications which I will research on my phone to gain a better clinical picture of what's going on with the patient etc, all staff carry their mobile in their pockets and use them frequently in clinical practice (TBR 26).

In contrast, and in response to not being able to use mobile technology as a learning tool at the point of care, a participant stated: "nurses should be allowed to research conditions and access MIMS. Also there should be a tablet or portable device we can access on each ward (TBR 8)".

### **Preferred over ward personal computers.**

A variety of perspectives were expressed by participants, who reflected on their personal preference for using their own personal mobile technology device instead of the ward personal computers (PCs). A common view amongst the participants was that difficulties existed with accessing ward PCs. Some of the difficulties from the participants were associated with the time taken to log into the ward PC, or that ward PCs were inaccessible or unavailable. One example of the difficulty relating to the time taken to access the ward PC from one participant was:

I see many health professionals using mobile technology to look up drug names and dosages as well as health conditions. We have a good amount of computers to access in the department, however, it can take up to 5mins to log into one to be able to use it so I find mobile technology much quicker to access relevant information (TBR 60).

In terms of the challenges in accessing personal logins on the ward PCs, another participant stated: “Imagine having an app whereby you’re able to pull up your hospitals policies and guidelines, on your phone without having to wait 15mins to get into your VMware! [Hospital software program] (TBR 14)”. A similar response in regards to ward PC availability: “It is often not possible to access one of the ward computers due to high demand so it is useful to be able to check out MIMS on line or other apps such as Medscape, JBI etc (TBR 56)”. In addition, another participant stated: “(Staff) encouraged to use ward computers but they're always in use or there's not enough time during work hours to use them (TBR 4)”.

A preference for tablet, or portable access over ward PCs was evidenced by another participant who wrote:

I feel that there is mixed feelings about mobile tech. I work in a high IT environment, but using your phone to google something quick is frowned upon. Getting to use a computer can be hard sometime as all of the doctors take them over. If tablet access was available it would make a huge difference (TBR 19).

Similarly, another participant suggested that an improvement to efficiency of their care could be: “Filing and note systems should be moved over to iPad devices that are portable (TBR 54)”.

Some graduates indicated they were not allowed to use mobile technology to access other resources. An example included: “At times computers are unavailable - therefore online MIMS and clinical data bases are unable to be accessed. Word of mouth from other nurses is then obtained (TBR 23)”. Another example: “In the clinical setting I don't have my mobile device on me. However, I will often look up information on the hospital computer (policies etc) (TBR 6)”. This was in contrast to another participant however, referring to their clinical practice rotations when they were a student: “If I didn't know a medication and couldn't log onto a computer (as I didn't have a HE [Hospital login account] I would use my MIMS app online. I'd find out about the medication and then educate my patient with my preceptor (TBR 14)”. The example implies, that student access may be limited to ward PCs and resources. To maintain safety when administering medications to a patient for example, students may access point of care resources they are familiar with from University, by using their own mobile technology.

### **Influence of others.**

It was clear from the participants' responses, that others influenced them in the use of mobile technology. Firstly, mobile technology was used covertly due to the negative perceptions from other staff. Secondly, some participants felt there were inconsistencies in mobile technology use when directed by older staff. Whilst some were supportive others were not. Finally, some participants argued that some younger staff used mobile technology for clinical applications as a link from University to clinical settings. The following examples provide evidence of these recurrent subthemes that included covert use of mobile technology in clinical settings; inconsistencies in mobile technology use; and younger staff usage.

### **Subtheme: Covert use.**

A common view amongst the participants was that they were not trusted by other staff, in the use of mobile technology. As one participant said: “It sometimes feels like you are being judged by other nurses for using your phone at work even if it is



for clinical reasons (TBR 63)”. Discrepancies within the multidisciplinary team (MDT) in using mobile technology created confusion for one participant:

I'm unsure as to the hospitals exact policy. We are told to only use our phones in the clinical area in case of receiving an emergency call. I usually duck off to the medication room or nurses station if I need to use my phone. As a student it was forbidden to have your phone on the floor at all. Many JMO's [Junior Medical Officers] also use their phone at the bedside if unsure of medications/dosages/diagnosis etc which makes me feel like it isn't a problem to do so (TBR 60).

The above participant's example could be considered multifactorial in providing valuable context to understanding the influence of others in the use of mobile technology. Firstly, the participant stated that based on their experience as a student, they were not permitted to use their phones. As a graduate, however, the participant used her phone covertly as she was unsure of hospital policy. Seeing many doctors use mobile technology at the bedside, the participant may have diagnosed an unfair situation. This participant's example of mixed messages lead to the covert use of mobile technology and highlights the discrepancies faced by graduates' in the clinical setting.

One participant felt that the staff and patients negative perceptions of mobile technology use, motivated her to its covert use:

Patients and other staff are likely to think that I am using mobile technology for unprofessional reasons because it is a hospital policy (? as we were told in our orientation/induction session for the graduate program) to not use mobile phones in the clinical area. I sometimes use my mobile phone in the medication/treatment (only accessible by staff) room... (TBR 9).

A similar response regarding covert use: "...I have seen maybe nurses use their mobiles to find out certain patients conditions and medications, yet they are somewhat having to hide due to a stigma about mobile technology...(TBR 14)".

In contrast to the covert nature of mobile technology use and the perceived negative perception of use, one participant noted an alternative solution. This view was expressed by a participant who works within a hospital that utilised work stations on wheels (WOW's) or computers on wheels (COW's): "The work stations

on wheels [WOW's] help with accessing information and have a less 'unprofessional' aspect than looking at your mobile phone (TBR 62)".

Behaviour in regards to the covert nature of mobile technology use, may be explained from the participants' experiences as student nurse on clinical practice in the following examples. The participant indicated: "I currently only use mobile technology during my breaks as it is not generally acceptable practice whilst out on the ward (TBR 56)". Another stated: "We were told never to have our phones when on prac as a student as it looked unprofessional (TBR 63)". Interestingly, one participant wrote in upper case letters: "FORBIDDEN (TBR 21)"; and another further confirmed this view by stating: "The use of mobile phones on prac was always strictly prohibited (TBR 2)".

As a final example of the covert nature of mobile technology use when transitioning from a student to a graduate, one participant, indicated:

I would use my phone on my break to lookup anything I wasn't sure of due to the University threats if we were to use our phone on the clinical floor. I even had a facilitator tell me I couldn't use my phone on my 30min break as the Uni rules were not to have it on you at all. Needless to say I didn't sit with her on my break again (TBR 60).

The above example provided an interesting perspective on the nature of mobile technology use as student, that may have impacted their use as a graduate. It was noted the participant distanced herself from the staff member, who did not support personal use of mobile technology. This example provides linkage into the next subtheme of the 'inconsistencies' of staff in their use of mobile technology and the negative attitude, or positive support provided to the graduates.

#### **Subtheme: Inconsistencies in mobile technology use.**

A subtheme uncovered in the participants' responses was the inconsistencies from in staff in the use of mobile technology. Generally, participants believed that older staff were not supportive of using these devices. For example, one participant stated that "A few senior nurses have made negative comments about the use of my phone to look things up, however others have commented that it's a good idea (TBR 4)".

Since mobile technology is a recent innovation used for learning some of the older staff may have been unfamiliar with its use as learning resource. They may have less trust around clinical mobile technology use, and therefore, focused on potential negatives associated with its use. For example, one respondent wrote: “Some of the senior nursing staff discourage about using technology re: confidentiality issues. Also some believe that using textbooks was the right way and are not open to new technology (TBR 37)”. This example leads into the next subtheme where it was noted younger staff appear to use mobile technology more than older staff in the clinical setting. The impact of senior nurses influencing the use of mobile technology in the clinical setting, was explored further in stage six of the qualitative phase of the study.

#### **Subtheme: Younger staff use.**

In contrast to older nurses generally being unsupportive of using mobile technology in the clinical area, some participants argued that younger nurses were more likely to make use of their devices. As stated previously, this issues may be related to education and experience in the use of mobile technology in the University setting. The following comment highlighted the differences between younger nurses and older nurses:

It is apparent that the majority of people that are open to the use of mobile technology in my workplace are newer nurses that have received education through their respective universities to use mobile technology in the workplace. "Older" nurses (the majority) are against it and have issues such as confidentiality and unsure of the education one can receive from mobile technology (TBR 37).

A similar comment was that mobile technology is the ‘way forward’ for education and for safety of patient care. The example highlights differences in older and younger nurses and the influence of others in the clinical setting. Challenges, however, exist due to perceptions of misuse from their peers, which might have led to younger staff using mobile technology covertly:

Given that it was purely for work intended purposes and not misused then I feel mobile technology is the way forward. Anything that improves

patient outcome and aids the Nurse to educate their patients is important and deserves a chance. I have seen maybe Nurses use their mobiles to find out certain patients conditions and medications, yet they are somewhat having to hide due to a stigma about mobile technology (TBR 14).

### **Policies regarding mobile use.**

The final theme that may have influenced the graduate registered nurse use of mobile technology, were related to the policy or guidelines regarding its use in the clinical area. For example:

It allows me to have access to the most up to date information that can help assist in giving education to patients as well as increasing my knowledge. I don't use mobile technology for NPS [nursing practice] due to RPH policy though (TBR 37).

Another participant considered that: "It would be nice if there was a device we could use without breaching policy (TBR 4)". Some participants were unsure of policy but used the resource covertly. As previously indicated, one participant stated:

I'm unsure as to the hospitals exact policy. We are told to only use our phones in the clinical area in case of receiving an emergency call. I usually duck off to the medication room or nurses station if I need to use my phone (TBR 60).

Another participant confirmed the covert use due to instructions at hospital orientation that related to a policy. It was noted for this participant in the data collection, that their hospital site has no specific policy or guideline available for staff. This was reflected in their response where they wrote:

Patients and other staff are likely to think that I am using mobile technology for unprofessional reasons because it is a hospital policy (? as we were told in our orientation/induction session for the graduate program) to not use mobile phones in the clinical area. I sometimes use my mobile phone in the medication/treatment (only accessible by staff) room... (TBR 60).

One participant expressed disappointment at not being able to use their mobile technology: "As policy notes mobile phones aren't to be used we aren't able to access mobile information unfortunately (TBR 49)". This was an interesting

comment, considering this same hospital did not have specific policy or guideline on mobile technology use. It would appear that participants were directed by senior staff and nurse leaders, such as the nurse coordinators, educators and managers of graduate programs.

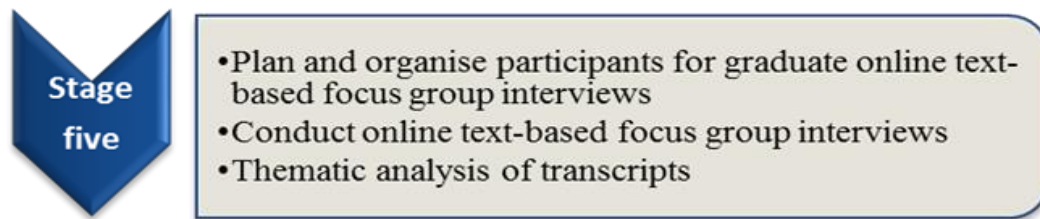
The themes and subthemes that emerged from the quantitative online survey were used to develop open-ended questions for the focus group interviews. This process linked the quantitative and qualitative phases of the study.

### **Development of open ended questions for text-based focus group interviews**

The researcher continuously referred back to the research questions, prior to developing the open-ended questions for the text-based focus group interviews. The major benefits of open-ended questions included: the participants determining the direction of the responses; responses based on personal specific situations; and unexpected responses (Krueger & Casey, 2009).

A number of specific techniques were employed to maximise the quality of data collected from the open ended questions. These techniques involved: asking participants to ‘think back’ to relevant experiences for context of the responses; avoiding asking ‘why’ to reduce impulsive or habitual responses; keeping the questions simple to get to the core of the topic; creating conversational questions; sequencing the questions with care for a focus of moving from general to specific examples; estimating the timing for each question; gaining feedback; and revising the questions (Krueger & Casey, 2009).

A total of 14 open- ended questions were created for the text-based focus group interviews. The planning, organisation, conducting and analysis of these interviews are described in stage five of the study.



*Figure 65.* Stage five of the qualitative phase

### **Stage five**

Stage five of this phase of the study incorporated the planning and organisation of the online text-based focus group interviews; data collection; and the subsequent thematic analysis of the responses.

#### **Planning and organisation of the sample group**

An introductory personal email with basic instructions (see Appendix 15) was forwarded to the 26 participants who had consented on the quantitative on-line survey to being contacted. An attachment to the email included the information sheet from the participant's specific hospital, which contained details about the study and how to participate (See Appendix 8). The email included a hyperlink to pre-recorded personal YouTube® video (2.39mins) narrated by the researcher. The video provided a basic summary of the study, together with an invitation to be part of the qualitative study.

A reminder email was forwarded a week later, with instructions to a link for an online scheduling poll for the focus group interviews. The poll enabled all potential participants to view and select a number of times/dates, to maximise involvement. For flexibility of involvement, both weekdays, weekends and afternoon/evenings times were included as options. This flexible approach was based on the challenges around shift work patterns. The online scheduler also provided the researcher with updates whenever a time/date was selected.

It was noted, however, some of the graduates had forgotten their self-nominated time and date. The researcher contacted the participant and negotiated a different schedule. On reflection, although the online scheduler was promoted to

provide benefits of using online options and flexibility, the researcher also had to be flexible in negotiating alternative arrangements with the participants. Such flexibility included a weekend interview, and the rescheduling of a number of interviews via email.

Twenty six potential participants indicated on the quantitative online survey their consent to be contacted regarding the online text-based focus group interviews. Following the initial emails to all these people, five email addresses were incorrect, or bounced back as errors. This reduced the cohort of participants to twenty one potential participants. It was noted during this stage, one participant who responded preferred an open-ended survey to be emailed instead of using the online focus group software. A total of four online focus group interviews were conducted, with one participant completing the open-ended survey of the same questions. One of the focus groups had two participants logged into the interview from separate locations. This resulted in six participants being involved in this stage of the research. To increase the trustworthiness of the data: the same participants from the quantitative survey took part in the qualitative phase (Creswell & Plano Clark, 2011).

Data collection for the online text-based focus group was defined as data collected in real-time similar to an instant message conversation.(O'Connor, Madge, Shaw & Wellens, 2008). A similar example of data collection would be an email conversation interview (Wilkerson, Iantaffi, Grey, Bockting & Rosser, 2014). It was argued that online qualitative data collection interactions was equivalent and considered superior when compared to face-to-face (Campbell, Meier, Carr, Enga, James, Reedy & Zhang, 2001; Hinchcliffe & Gavin, 2009; Kenny, 2005; Reid & Reid, 2005).

The online text-based focus group interviews, were facilitated using Skype™ (version 7.27.32.101; Skype™, 2016): a communication software. This is a proprietary Voice Over Internet Protocol (VOIP) service, and has been used in qualitative research as a useful alternative, or replacement to face-to-face interviews (Deakin & Wakefield, 2013). It is available on many mobile platforms, enabling easy and flexible access for participants who have time and place limitations for face-to-face interviews. It encouraged increased participation, whilst providing the researcher with a cost-effective tool (Cater, 2011; Deakin & Wakefield, 2013).

Skype™ also had the potential to overcome low numbers of participants in face-to-face focus groups. Use of the text-based function, had the additional benefit of a degree of anonymity for the participants. It also aided in minimising the power differentials that can occur with in-person focus groups (Krueger & Casey, 2009). In addition, the mobile app Skype™ was the third most popular application used by students in a pilot investigation by the researcher on the evaluation of tablet technology and social media with first year nursing students (Clark-Burg, Carr, Hay & McNaught, 2014).

The focus groups were effective in eliciting data on the cultural norms of the participants within their clinical settings, and for generating overviews of concerning issues (Mack, Woodson, MacQueen, Guest & Namey, 2005). The focus groups aimed to find the range of opinions of participants across several groups or sites, in order to compare and contrast data. Conducting focus group interviews were also important to identify trends (Krueger & Casey, 2009).

To minimise unseen challenges and to test the tool, a pilot online, text-based focus group interview was undertaken with academic colleagues and the researcher's supervisor prior to conducting the formal interviews with graduates. The prior testing of the technology; process; questions; and feedback from participants, was found to be useful activity (NPS Medicinewise, 2012).

The process of managing the online focus groups was similar to the current use of Learning Management Systems used by staff and students schools of nursing across the universities in Perth, WA. When using the text-only function within Skype™, participants were able to write responses to questions prompted by the facilitator, whilst simultaneously seeing each other's responses. An additional benefit of using the Skype™ platform was that participants could remain anonymous to each other since no video, or audio was recorded or utilised. This process enabled a less confronting environment for the participants. Moreover, participants could also use Skype™ from any of their mobile devices, thus providing a measure of flexibility.

During the focus group interviews, text-based entries were moderated throughout the discussions by the researcher. A title was provided before and after



the questions for easier identification (NPS Medicinewise, 2012). To maintain consistency across the groups, the same questions were asked in all focus groups (Creswell & Plano Clark, 2011). During this process the researcher was able to clarify questions by responding to previous responses and cut and paste questions into the Skype™ platform. Previous interview transcripts were easily referred to during the interview by the researcher for identification of trends or patterns in the responses.

Some unexpected benefits of using this platform included: while waiting for the participant to respond to the question posed, Skype™ displayed the message that a ‘person was typing’. This provided the opportunity for the researcher to reflect and consider the previous response by the participant, while the participant was typing their next comment. Similarly, the other participants could respond to questions and make comments and clarifications based on what all participants were reading in the live responses. This process enabled the researcher to easily clarify and refer to previous comments to questions as the interview evolved. As there were smaller numbers of participants, the interview did not feel rushed.

A major benefit of using the Skype™ platform, was that on completion of each interview, the responses were copied and pasted into a Microsoft Word® document for later analysis. Using this online method for qualitative data provided easy access to transcripts, which facilitated collation and identification of themes (Markham, 2008).

Two facilitators (researcher and supervisor) managed and organised the online focus group interviews. The researcher asked and facilitated the questions, which included probing further as required. The researcher’s supervisor could also keep track of the comments and emerging trends in the data (NPS Medicinewise, 2012).

Distinct patterns and themes were noted within the groups, and based on the findings a saturation point was achieved (Polit & Beck, 2014; Schneider, Whitehead, Elliot, Lobiondo-Wood & Haber, 2012). A saturation point had been achieved earlier in the data collection process, as specific patterns and trends became repetitive (Polit & Beck, 2014; Schneider, Whitehead, Elliot, Lobiondo-Wood & Haber, 2012). The

researcher, however, decided to continue with all planned interviews with the participants as they were keen to contribute their time to the study.

To enhance credibility of this stage, a final question at the end of the interview asked participants if they would consent to being contacted again to review the findings. This involved an email attachment, which included the opportunity to provide brief comments and feedback on the final themes and subthemes.

### **Themes and subthemes from the focus group interviews**

The consistent approach to the thematic analysis of data, as previously mentioned, was utilised throughout stage five of the qualitative phase of the study. A total of twelve concept maps were created from each question. The central focus of the concept maps was research question concerning the factors influencing mobile technology use by new RN graduates. The responses to this question were collapsed into categories, which facilitated the identification of themes and subthemes. This process is illustrated in Figure 66.

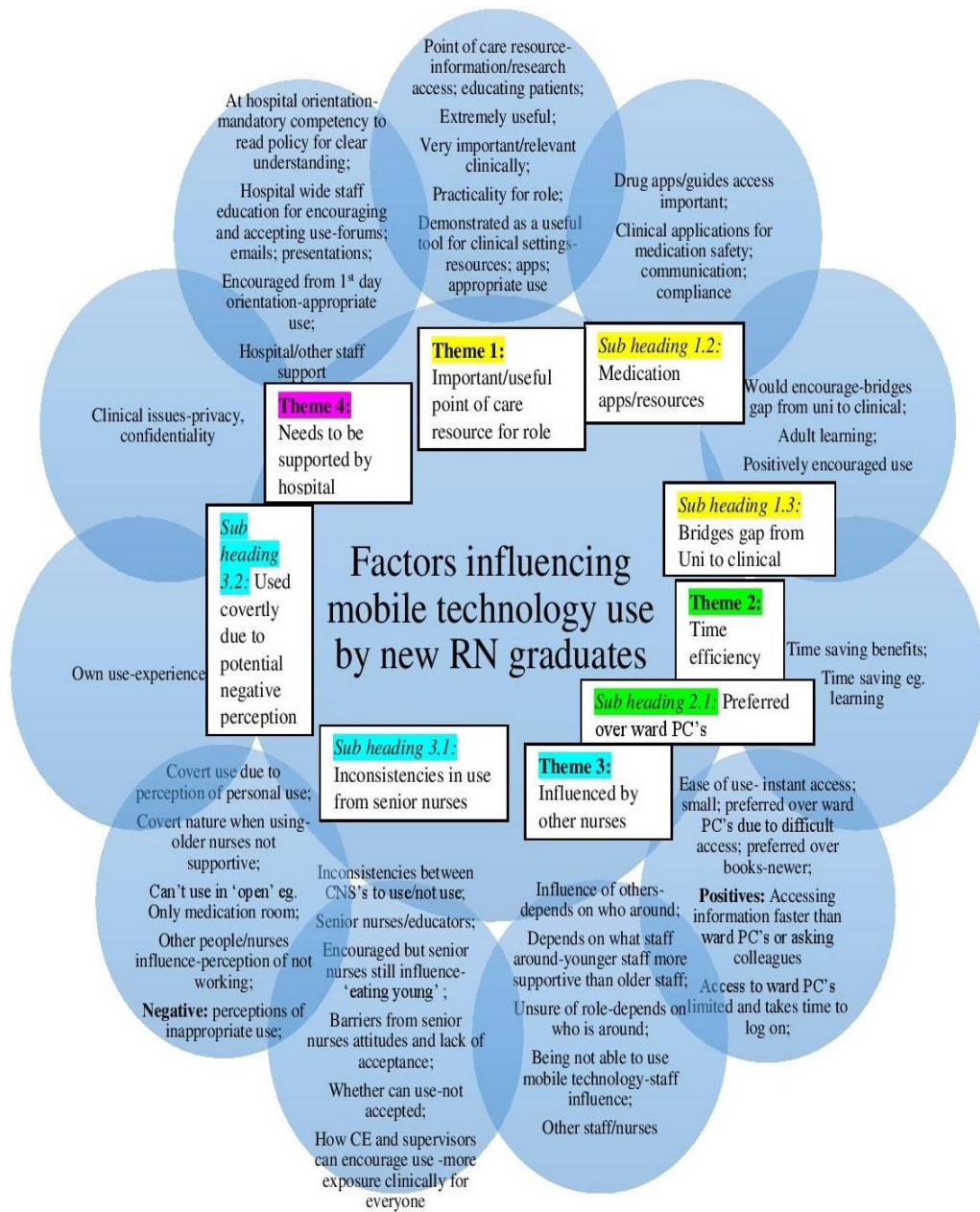


Figure 66. Stage five example of the final concept map with potential themes combined into themes/subthemes

The themes and sub themes were collated and named into a final figure diagram (See Figure 67).

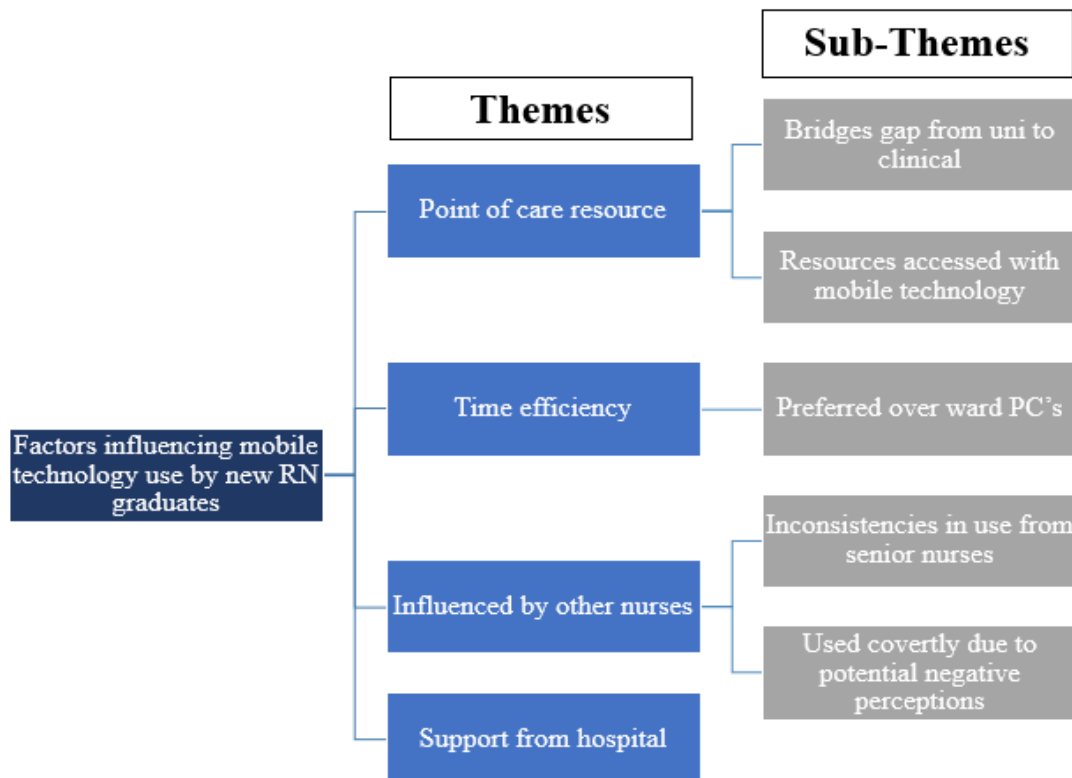


Figure 67. Final themes and subthemes from the online focus group interviews

### Point of care resource.

The theme of mobile technology being useful or important resource at the point of care, was a constant theme noted in both the text-based responses from the quantitative phase of the study and in this qualitative phase. The benefits of using mobile technology included personal learning as well as educating patients. One participant remarked that:

Mobile technology is very relevant to my role as a RN in my current clinical setting. I am currently based in a General Medicine ward which has a variety of complex cases that present on a daily basis. I use mobile technology not just as a portable MIMS but use it as a visual tool that I explain procedures such as a TOE (Transoesophageal echocardiogram) to patients who may not understand the entire procedure just from a verbal discussion with the doctor (TGI 6).

From a personal learning perspective, mobile technology was considered: “extremely useful” (FGI 1); (FGI 2); (FGI 4) (FGI 5) & (FGI 6); “relevant” (FGI 1);

(FGI 3), “very important” (FGI 4) “and helpful” (FGI 1). One interesting example, was based on the participant’s interaction with a medical company who regularly used mobile apps to assist nurses learning. This unexpected finding could be seen as providing safe patient care:

I feel the only way to expand my knowledge and skill set is to embrace technology as a variety of the medical companies that I have dealt with prefer to use mobile technology. For example: Fisher and Paykel produce the AIRVO2 which a high flo nasal delivery system which I had no experience using. I contacted the wards representative of F&P which they advised me of an AIRVO simulator app which I practice playing around with settings in a mock environment, rather than trying it out on an oxygen deprived patient! (FGI 6).

Another example of using mobile technology as an ongoing educational tool at the point of care, was highlighted by another participant:

My patients influence my use of mobile technology by asking me questions that I do not know. I can tend to gauge what kind of patients appreciate things such a diagram of a procedure vs just verbally talking them through a procedure (FGI 6).

Encouraging mobile technology apps and resources successfully for patient care may further influence its use at the point of care. For patient care, the communication app Skype™ was utilised by one participant, which demonstrated a perceived improvement in communication and compliance with care:

Helping a patient that lived overseas and was admitted to our ward while on holidays. They did not know how to contact their family other than expensive phone calls. A colleague and myself set up Skype™ for the patient as well as assisted their family on the other end so they could do video calls on a daily basis while keeping costs to a minimum as well as the patient stated they felt better talking face to face with loved ones vs just on the phone. I feel it contributed to positive things such as an increase in the patient’s compliance to the treatment which is a great outcome for all (FGI 6).

Mobile technology, as a point of care tool, might have been influenced by how familiar the participant was with the resource. This is discussed within the following subheading with examples from the participants.

### **Subtheme: Bridges gap from University to clinical areas.**

The first subtheme identified, related to mobile technology providing a bridge to point of care from University. One participant stated: “Uni really encouraged us to use mobile technology so in that regard I went into my grad program with an understanding of the benefits of using mobile technology appropriately in the work place (FGI 4)”. Another participant confirmed this view: “...it was demonstrated very clearly what a useful tool it could become in the workplace... (FGI 2)”.

A further comment from one participant implied that the use of mobile technology, lead to encouraging and sharing the same resources with colleagues in the clinical area. The participant stated: “[my University] always actively encourage me to use mobile technology in all of the units that I studied over my three years... I was also introduced to a variety of apps that I have now shared with fellow colleagues (FGI 6)”. This example highlighted the potential impact of quality learning and point of care resources acquired within the University setting, that had application to the clinical area. A similar response from another participant said: “Other staff who use mobile technology influence the way I communicate with them on a daily basis ie sharing new apps / teaching” (FGI 6). The same participant stated benefits within the multidisciplinary team when sharing these point of care resources: “I am now on a ward where both Doctors and Nurses use mobile technology on a daily basis to not only educate themselves but actively encourage others to learn new things (FGI 6)”.

One participant, when discussing how mobile technology bridges gaps in knowledge from University to the clinical area, highlighted the concept of adult learning. The participant highlighted an important aspect for their learning, by first clarifying the information, and then seeking senior staff for further understanding. This suggests mobile technology in the clinical area may enhance learning for nurse graduates in the following example:

...many of my best learning experiences came from being directed to the right place to find information rather than just being told what to do. It allows us to gain a basic knowledge and use more experienced nurses to clarify our understanding. It promotes adult learning... mobile technology helps us to bridge gaps in our knowledge (FGI 4).

Ongoing use of mobile technology for learning, was confirmed by another participant who stated: “In University we are encouraged to use mobile technology every day - in fact it’s not just encouraged, but essential. It’s how we learn (FGI 5)”. Another participant confirmed the frequent use for ongoing learning: “We were often encouraged to utilise our mobiles to search for information (FGI 1)”. This implies that when the participant was a student, they were encouraged and frequently used this resource for information searching and to bridge gaps in knowledge. This was further evidenced by another participant: “...can use it to increase their knowledge on medications even at home – not just in the clinical environment (FGI 6)”.

It would seem curious however, that this familiar method of learning was not encouraged to the point of care when transitioning into clinical areas as a new graduate. Some clinical areas and specialities positively embraced mobile technology at the point of care: “I have seen mobile technology used and embraced in point of care situations is with St Johns ambulance emergency transfers and in oncology with chemotherapy administration databases to make transfer of care between outpatient and inpatient settings easier (FGI 5)”. In some areas, however, challenges existed where some clinical areas had not kept up with point of care technology. A final comment by a participant questioned as to why bedside nursing care has not evolved similarly, in relation to other advances in technology in the clinical areas:

However when the rest of our world is turning digital, and even hospital services like HR and ROSTAR and CIMS forms all require digital form submissions as its easier to file, store and retrieve data, its curious why our bedside nursing care hasn’t evolved similarly (FGI 5).

#### **Subtheme: Resources accessed with mobile technology.**

The second subtheme relating to mobile technology use at the point of care, was highlighted by responses commenting on useful medication resources such as apps. One participant found benefits of point of care mobile technology use within their particular clinical area, by stating: “I find mobile technology very important in my workplace (FGI 2)”. To explore what extent and what ways mobile technology was important in participant’s role, it was clarified further in the focus group interview at the time. The response suggested point of care benefits for medication administration and evidence data bases:

As a new graduate I also find mobile pharmacology apps very important as it gives me the opportunity to look up medications quickly on the go... having access to a large database of information quickly is really important especially if you are still trying to learn the ins and outs of time management and are a bit time poor (FGI 2).

As a practical tool, one participant stated: "I often use mobile technology to research medications.... it helps me get info fast (FGI 3)". Another participant confirmed its use for medication administration by stating that: "As a new graduate I also find mobile pharmacology apps very important as it gives me the opportunity to look up medications quickly on the go (FGI 4)". Accessing mobile technology when administering medications may also increase safety. One participant states: "I think every time I can do a medication round safely because I can quickly look up medications is a positive (FGI 4)". These participant responses can be linked to using mobile technology as a resource for time efficiency.

### **Time efficiency-preferred over ward PCs.**

The personal use of mobile technology provided participants with time saving benefits. A similar theme was also noted in the text-based responses from the quantitative phase of the study. This preference for personal use of mobile technology, was based on the familiarity with the resource learnt in the University settings. Sharing resources with their colleagues may have also saved time at the point of care.

An example of a preference of mobile technology over existing ward technology was evidenced in the following example: "Looking up medication interactions on the MIMS app instead of searching through the book or waiting for the computer to be free - it's a lot faster and the information is easier to sort through on mobile devices (FGI 5)". A similar response was echoed by another participant: "Sometimes access to computers is limited so being able to use my mobile to search for things such as medications has saved me a lot of time (FGI 1)". A lack of access to ward PCs at ward level was seen as a common issue, with another participant stating that mobile technology was: "Very useful as the lack of computer availability is always a problem (FGI 2)".



As a time saving device, participants commented that: “It's right there with me. If I'm in the medication room and someone is using the medication station I can look up information whilst waiting (FGI 1)”. Another example was it: “helps me get info fast (FGI 3)”. In addition to time saving benefits, mobile technology was perceived as easy to use by a number of participants with the following example: “I find it useful because my mobile is small, I can put it my pocket. It's easily accessed. I can wipe it down (FGI 1).”

One participant expressed challenges relating to transitioning from student to graduate when learning time management. This was evidenced as: “having access to a large database of information quickly is really important especially if you are still trying to learn the ins and outs of time management and are a bit time poor (FGI 4)”. Furthermore, the same participant stated: “...having the ability to simply search a policy or medication without having to search through books or files has saved me a lot of time (FGI 4)”. In terms of professional development, mobile technology affords flexibility. This concept was evidenced with one participant stating:

It would make it easier to access in off work time as well for professional development. It's frustrating wanting to know more about a certain procedure and not being able to have enough time to research it thoroughly or being too tired at the end of a shift, or wasting paper (FGI 5).

An improvement to productivity and time saving could be achieved if mobile technology was allowed to be used as stated by one participant: “I feel having mobile technology available in the area that I am working in would make for a more productive work environment (FGI 5)”. This frustration of a waste of time was highlighted: “Oftentimes we are queued up waiting for the computer to do research or other projects during downtime - it's ineffective to have stationary technology in a critical care area (FGI 5)”.

### **Influenced by other nurses.**

A major theme that was highlighted across both quantitative and qualitative phases was the influence of others. A common trend influencing the participant's use of mobile technology was, the role of the person present at the time. This aspect linked

to the second research question: what extent and in what ways do nurse graduates currently use mobile technology? This question was probed in more detail within the interview questions. Two distinct subthemes emerged which included the use of mobile technology covertly due to the negative perceptions of other staff, and the inconsistencies noted in senior nurses directions in using mobile technology. For example, one participant stated: “The lack of acceptance being the biggest roadblock (FGI 3).” This level of acceptance seems to vary between staff and the team. For example, some senior nurses, educators or managers may have supported mobile technology use, where others did not. For example: “I have met some CNS’s [Clinical Nurse Specialist’s] who allow us to use our personal devices for on-hand referencing, but a majority tend to indicate a distrust in the appropriate use of mobile technology, especially personal devices, in the clinical setting (FGI 5)”.

An unexpected finding related to participants’ decisions to use mobile technology, was based on both positive and negative examples from others. For example, one participant stated that as a junior nurse, they took cues from senior nurses. When witnessing unprofessional use, the same participant assumed responsibility for their own professional use:

If senior nurses encourage and use mobile technology in the clinical setting, as a junior nurse I generally take cues from them. However, there have been some instances where I have witnessed inappropriate use (in my opinion) and tend to take responsibility for my own use in an appropriate manner (FGI 5).

The influence of other nurses on the participants’ use of mobile technology was reflected in a number of responses. Some participants indicated that older nurses distrust technology:

I think despite having a policy or guideline that would encourage its use, a lot of the old-school nurses who are in senior positions still distrust the technology and its potential benefits. I also think that there might be a reticence to use mobile technology by these nurses as they have been trained a certain way and making changes to accommodate mobile technology in the clinical setting is another burden, something else for them to learn and integrate into their busy schedules...(FGI 5).

Based on potential negative perceptions related to the influence of senior nurses, one participant provided a comment which evidenced her frustrations: “Having nurses that are so against all mobile technology – I can't share wonderful things to aid them in reducing work load. ‘Work Smarter NOT Harder!!’ (FGI 6)”. This disappointment cemented that senior nurses posed a barrier to mobile technology: “the barriers - primarily being senior nurse’s attitudes to mobile technology. I think people are scared of the unknown and the what if’s that mobile technology brings into the healthcare setting (FGI 5)”. Despite this barrier, participants’ tended to make covert use of mobile technology.

**Subtheme: Used covertly due to negative perceptions.**

The participants’ often raised the negative perception of others as a motivation for using mobile technology covertly. A typical comment highlighted this notion:

Other people’s perception of mobile technology use affects my use. If I'm on my phone then people will assume that I'm on Facebook rather than doing something work related. It can give the perception that you aren't interested or are being lazy (FGI 4).

When asked what covert use might look like, one participant provided an example which reflected the preferred use of mobile technology. The junior nurse’s actions were changed based on who was around at the time:

Looking up medication interactions on the MIMS app instead of searching through the book or waiting for the computer to be free - it’s a lot faster and the information is easier to sort through on mobile devices. I have seen junior nurses do research like this in the treatment room while senior nurses are not there. If the senior nurses are there they wait and use the book/computer when they are free (FGI 5).

One participant highlighted that although mobile technology is used covertly, they are trying to positively change perceptions within their team. This interesting example included:

I've been trying to introduce a few of the older nurses to using the technology available and for the most part they have been quite receptive.

In this way I'm trying to alter the perception of technology use to make it more accepted (FGI 4).

**Subtheme: Inconsistencies in use from senior nurses.**

Whilst participants acknowledged that senior nurses influenced their decision to use mobile technology, they found frequent inconsistencies in directions. This was reflected in the following example:

As a graduate nurse I was on a ward for six months where I was surrounded mostly by veteran nurses who solely relied on textbooks and hands on learning to increase their knowledge and skills set. They were against all mobile technology – with even one saying that it could put the patient in danger (FGI 6).

The same participant commented that she had been directed to an older learning resource that the senior nurse used. This method of finding a resource was unfamiliar to the participant who commented that:

[I was checking] a medication on my online MIMS at the patient bedside prior to myself administering it as I was unsure of the dosage that was prescribed. Nurse said that I should not trust my online version but use the wards MIMS that was down the end of the other corridor. Both versions are exactly the same but the nurse in question questions the validity due to it being mobile technology and not something that they have always relied on in the past (FGI 6).

The above statement implied the participant had a portable, newer, and more up to date version of the MIMS resource, which could have been used at the point of care. The direction from the senior nurse meant that the participant had to go to the other end of the ward, which wasted time.

A concern was noted that related to the social aspects of working in a team. One participant stated that ‘nurses eat their young’ and mentioned they would not want to misdirect a colleague in using mobile technology, even though they themselves were an advocate of its use:

The “nurse eating their young” stereotype is real. It doesn’t matter if you’re a supervisor or CE [clinical educator], you’re still a member of the team and social issues definitely come into play....[when encouraging

mobile technology with another new graduate]... I wouldn't want the new grad to follow advice from me that another nurse would pull them up on (FGI 5).

Participants' displayed a pattern in the responses that demonstrated their adaptability in the use of mobile technology. Again, it was the presence of supportive or non-supportive senior nurses that were influential: "...some staff would not mind if you used mobile technology but others would assume you were using it for non-work related thing... most likely though usually who is working on the floor (FGI 1)". To clarify this aspect, the researcher sought more information on potential differences between peers and senior nurses influence: "Mostly peers, and then depending on what supervisors are around... it is clear that depending on who we work around, and where we are, is influencing our use of mobile technology (FGI 1)". This view is confirmed when educators may encourage use away from patients, but some of the participants peers may not support the use: "it is frowned upon by some nurses... The nurse educators told me not to let patients see me on my mobile (FGI 3)".

The inconsistencies in directing use of mobile technology were further demonstrated by one participant, who highlighted the differences and inconsistencies within the same team on the ward:

The nurses around me influence my technology use. I'm lucky in the fact that my clinical educator encourages us to always look up policies and use these to guide our practice. But other nurses particularly some of the older ones don't necessarily believe in the use of mobile technology and almost assume that if they tell you something then you won't look into it any further (FGI 4).

The inconsistencies that existed between senior staff and peers, was most pronounced between younger staff and senior staff. This may have been related to the methods used in the training school of senior nurses, where it has only been in recent years that mobile technology for undergraduate education has been introduced. One participant noted that senior staff were not using mobile technology. This may be related to how senior staff learnt themselves:

My supervisors haven't really influenced my use of mobile technology, apart from my CE [clinical educator] a lot of the other nurses I work with are very experienced and I haven't really noticed them actually using mobile technology apart from note writing (FGI 4).

A number of suggestions were provided by the participants, to improve mobile technology use in the clinical areas. This included a need to be supported by an overall hospital response. This may include changing perceptions of the older or senior nurses in the use of mobile technology for new nurse graduates for example.

### **Support from hospital.**

Lack of consistent support from the hospital was identified as an influencing factor in the use of mobile technology. One participant identified that the use of mobile technology use could be included with other annual mandatory competencies that nurses are required to undertake: "...perhaps at orientation the mobile technology policy could be a requirement to be read, just has hand hygiene, manual handling are all competencies that are required. Clear understanding of whether or not you can use mobile technology (FGI 1)". This was an interesting comment, as the participant knew that a policy and guideline existed at only one hospital site in Perth metropolitan area, but she had not been able to gain access. This highlighted an overall pattern that information on this issue of mobile technology use should be available for all staff: "I think there would have to be lots of education sessions throughout the hospital so everyone was aware that the use of mobile technology was encouraged and accepted (FGI 2)". This example of increasing awareness of policy and guidelines implies that the overall culture within the clinical area may need to change.

A change in hospital culture and staff acceptance was further highlighted as one of the most important issue discussed in the interviews. A number of participants simply stated: "Staff education and acceptance" (FGI 3). For one participant, when they were asked a question regarding a negative example of mobile technology use, noted support was needed from the hospital: "Negative example is just being referred back to the hospital resources instead... They are always harder to access as there are not enough computers available when needed (FGI 3)".

There were some positive examples of the emerging trend in staff to the use of mobile technology. For example, one participant commented that: “The workforce is getting younger. The benefits are beginning to outweigh the negatives. As younger staff are attaining more senior positions, the tide is turning on the use of mobile technology (FGI 5). As younger staff enter the workforce and guide change: “I think support for mobile technology is gaining momentum though so that’s a positive (FGI 5)”. However a need for ongoing: “...support from hospital executive and senior staff (FGI 5)” may be required. In regards to transitioning from the University to the clinical settings using mobile technology and gaining staff acceptance: “[University] I feel it was a great start for my use of mobile technology. I just feel there needs to be a change of thinking at the coal face (FGI 3)”.

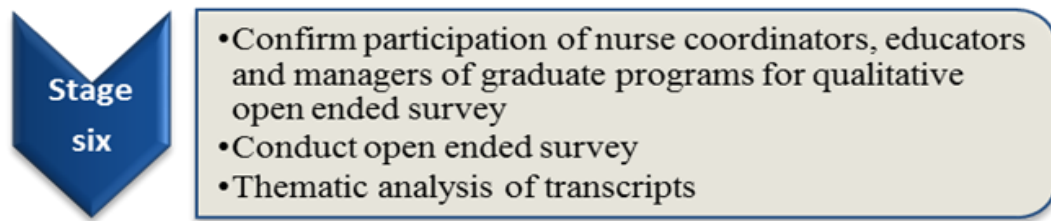
One participant, offered a potential solution to the lack of hospital support:

Overall I think if each nurse on shift had an allocated tablet that gave them access to their patient’s documentation, it would make nursing care a lot easier - real-time note-taking, access to medication fluid or falls charts, maybe a timetable app with alerts? and of course access to hospital policies, and search tools (FGI 5).

One final comment suggested that there may be issues with staff unprofessional behaviour in regards to mobile technology use, but as the majority used them professionally, then they should be supported:

The problem with mobile technology in the clinical setting is that there will always be someone who wants to show 'cat videos' but it's such a useful tool that the majority of people who would use it appropriately should be allowed and encouraged to (FGI 2).

Stage five of this qualitative phase of the study, identified the perceptions of graduates in regards to factors that may have influenced the clinical use of mobile technology. The following stage is concerned with describing the nurse leader’s perceptions of graduate’s use of mobile technology.



*Figure 68.* Stage six of the qualitative phase

### **Stage six**

The aim of stage six was to investigate nurse leaders' perspectives of mobile technology in clinical settings, as it was clear such people influence its use. These nurse leaders included nurse coordinators, educators and managers of graduate programs. This final stage incorporated the administration of an open-ended survey and its subsequent analysis providing links to the findings from stage four and five. This stage incorporated recruitment of the participants; data collection; and thematic analysis of the transcripts. It was important to identify the perspective of nurse leaders as they may have sometimes viewed issues differently from front line nurses (Casey & Krueger, 2009).

In order to gauge the roles and responsibilities of the nurse leaders, the Job Descriptions were voluntarily provided. These descriptions indicated that nurse leaders responsibilities may have included: coordination of the graduate program; ongoing development and monitoring of graduates progress; an orientation role; sourcing resources for professional development; supervision; liaison roles; support; facilitation and planning of learning; recruitment and marketing; and ongoing performance management. Based on these descriptions the final research question asked: 'What are the perceptions of nurse coordinators, educators and managers of graduate programs, regarding mobile technology use in the clinical setting?'

### **Recruitment**

To maintain consistency throughout the phases of the study, the sample selection of participants for the open-ended survey were purposefully sought from the hospitals identified in Phase 1 of the study. An invitation was forwarded via email to the respective potential participants (see Appendix 16). Graduate program nurse



coordinators were initially contacted via the telephone, followed by a formal email to remind them of the study. The researcher also encouraged forwarding the invitation to other staff within their team who directly supervised, educated, or managed registered nurse graduates. An email contained the survey hyperlink information about the study, in the form of the Participant Information Form for each specific hospital site, and the contact details of the researcher (see Appendix 17). Consent was implied through completion of the survey, as advised in the initial email and at the start of the survey. A total of twenty four online open ended surveys were distributed, with seventeen being completed in full.

### **Data collection**

To maintain consistency within the study, the focus group interview questions used with the graduate participants, was adapted for the online open-ended survey with the nurse leaders (see Appendix 18). It was further reviewed and refined based on the graduate participant's responses.

In order to become familiar with the survey responses, all data was transferred into a Microsoft Word® table and read and re-read a number of times. During this process, it was noted the data required cleaning, two responses were inaccurate. These two participants misread the instructions on the survey that referred to the definition of mobile technology as any portable devices, such as smartphones, tablets and iPads. These participants referred to mobile technology as the current fixed ward PCs. Subsequently these participants were removed from the analysis of the data.

Patterns and trends were identified from the transcripts until a saturation point was achieved (Polit & Beck, 2014; Schneider, Whitehead, Elliot, Lobiondo-Wood & Haber, 2012). Although a saturation point was achieved early, it was noted that inconsistencies occurred between participants with particular questions. Thus, the researcher analysed all data, to gain additional understanding of these inconsistencies. The emerging themes and subtheme were collated to form the concept maps as explained in the examples earlier in this chapter.

To enhance credibility of this phase, and following the data analysis, a final question at the end of the interview asked participants if they would consent to being contacted via email to review the findings (see Figures 69 & 70). Thirteen participants consented, but only four participants, responded. These participants supported the findings and provided positive feedback on the presentation and layout of the themes and subthemes.

### **Themes and subthemes from open ended survey**

Ten broad themes emerged from the analysis of the data. These themes were then defined and named into a final concept map (See Figure 69). A separate figure diagram illustrates the final themes and subthemes (see Figure 70). Participants provided their perceptions on graduate's use of mobile technology, and included their personal use in the clinical setting.

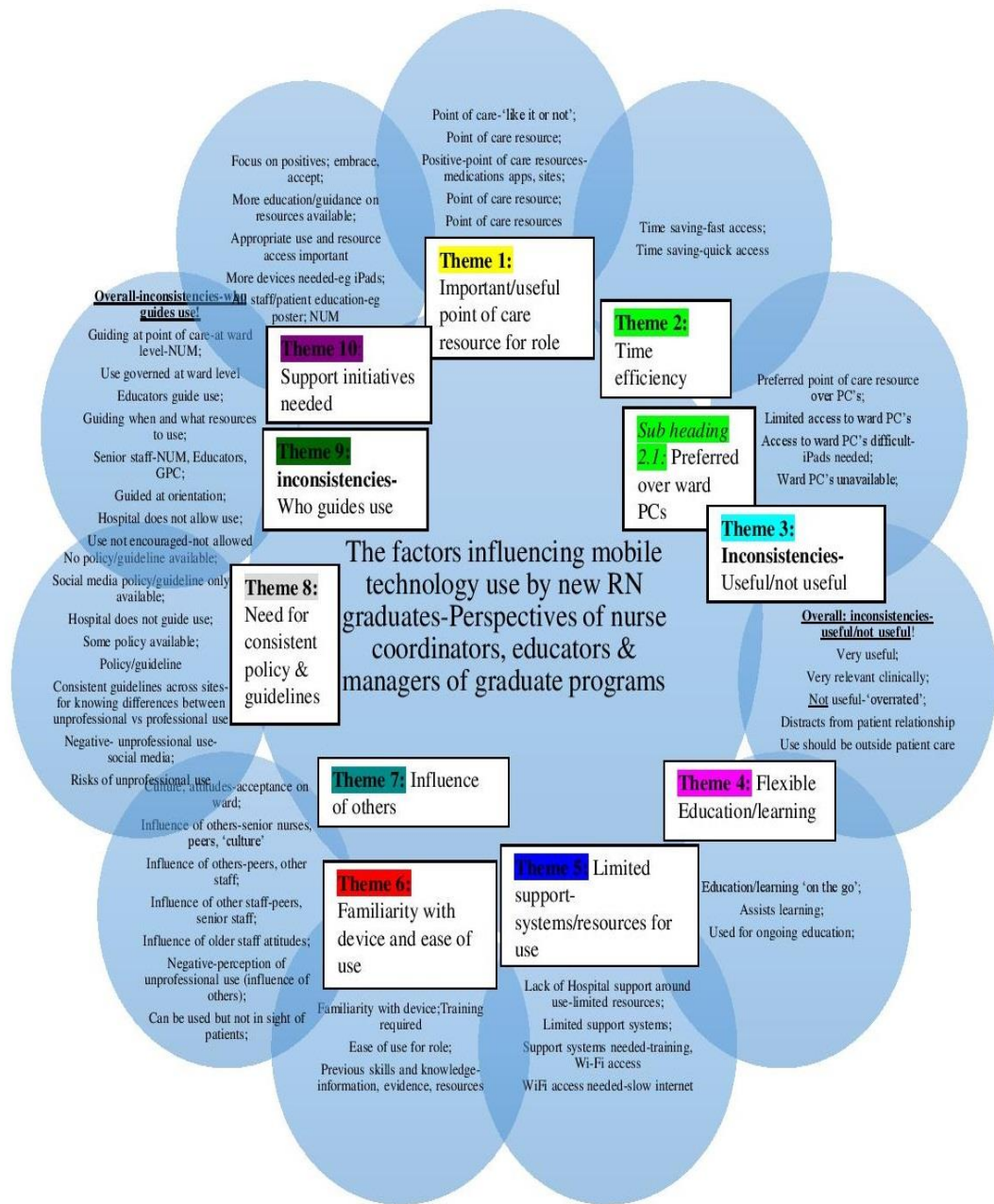


Figure 69. Stage six final concept map sample with potential themes combined into themes/subthemes

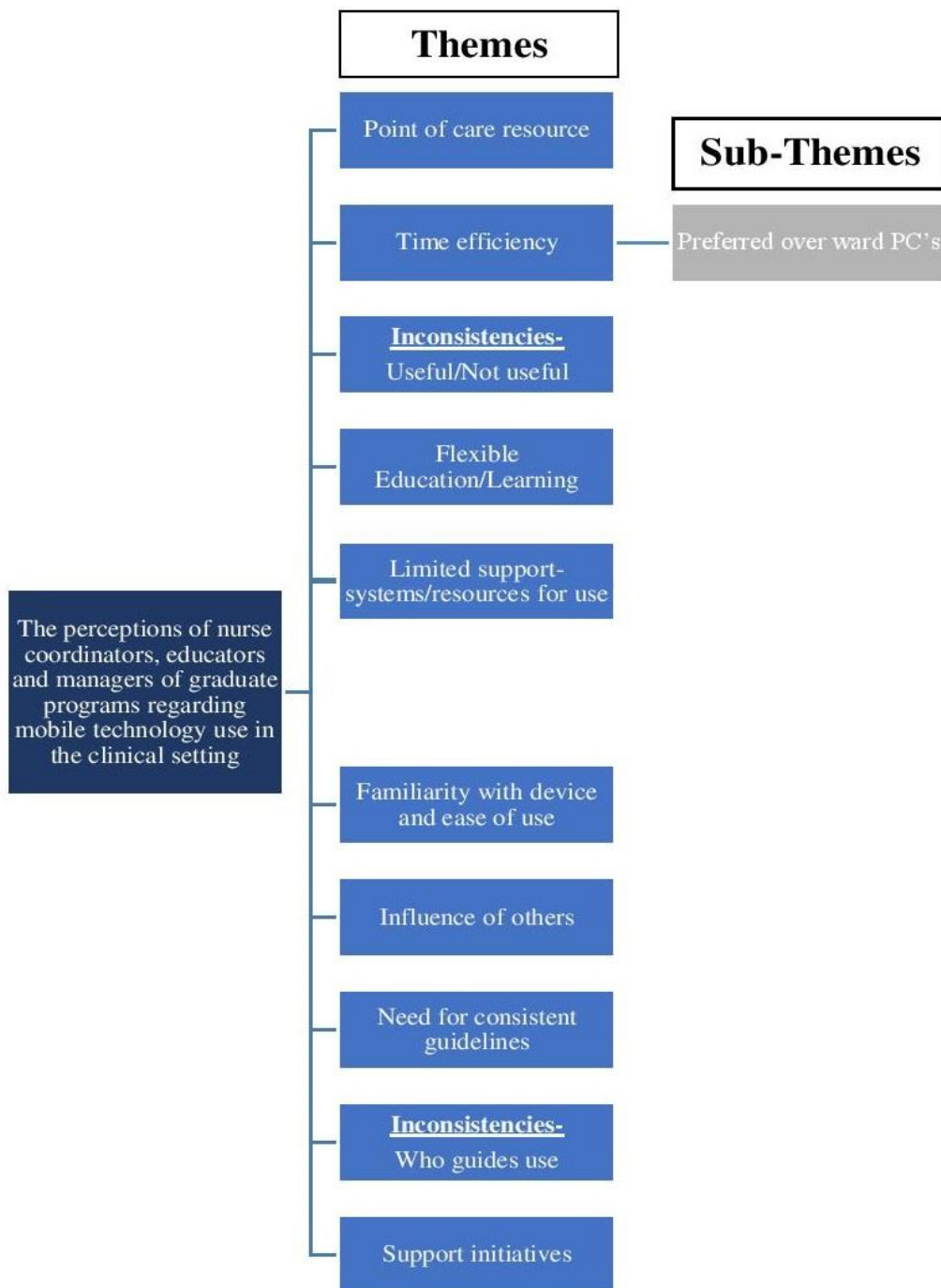


Figure 70. Final themes and subthemes from the qualitative open ended survey to nurse coordinators, educators and managers of graduate programs

**Point of care resource.**

Once again there was similarity between graduates and nurse leaders concerning the use of mobile technology as a point of care resource. The findings from the survey administered to the nurse leaders provided further evidence in addressing the second

research question, regarding the extent and ways in which graduates currently use mobile technology in the clinical settings.

The majority of the responses from the participants reflected the usefulness of mobile technology at the point of care for new graduates and for themselves. For example, one participant stated: “I believe it is extremely important to support the graduates with on the spot information that is relevant and correct (OES 14)”. Another confirmed this view, when they stated: “Mobile technology could certainly assist the graduate nurse with their ability to access and interpret information at the point of delivery in a timely and meaningful way (OES 3)”. In regards to the information accessed and improving safety, one participant suggested that an iPad (property of the hospital) would be better over the graduates’ own device:

It would be of benefit if the new RNs could have easy access to an iPad when they are doing their early medication rounds to quickly and safely look up unfamiliar medications instead of guessing or leaving the medications until they found a book to look them up. Other technology would be a hindrance distracting them from the focus which should be the patient (OES 22).

When graduate commenced a new clinical rotation, there is often new medications to learn, particularly on speciality wards. One participant mentioned that: “When moving to a new setting, graduates are eager to learn about new medications and mobile technology makes this so much easier for them (OES 7)”. A similar comment was made in regards to differences in specialities, and relevance of use of mobile technology at the point of care: “The use of mobile technology is very relevant particularly as we cover a variety of specialties in the Post Anaesthetic Unit - it provides a fast method to access information (OES 12)”.

A similar response at the point of care during medication administration, concerned: “Using Mobile Technology and AMH [Australian Medicines Handbook] to ensure correct drug etc when doing medication competency and rounds (OES 13)”. This resource can be accessed in University settings, and online through some hospital libraries. One participant stated:

Positive example = Graduate nurses accessing mobile phones at the bedside in order to look up uncommon medications (I think the hospital

should give every nurse free access to an approved app like MIMS or AMH to ensure they only access good quality information), it is far quicker and they are more likely to double check if they have the resources right at the point of care (OES 20).

When discussing the relevance of mobile technology use by graduates at the point of care, one participant stated how essential the resource was to access the internet and resources: “In fact it is sometimes essential that graduate nurses use the internet access on their mobile devices because they cannot access useful websites/apps via the hospital generic login (they don't have the access privilege)(OES 20)”. Another trend was noted that a number of participants also used personal mobile technology, as they had difficulties accessing through current systems. For example:

I use my mobile phone for internet access at work because the internet at work is slow and hard to access if using a shared computer with a generic log in. Sometimes useful resources are not on the intranet and I need to access them either at the bedside or away from my office, so I would use mobile technology then also (OES 20).

In relation to the point of care resources, one participant confirmed: “Mobile technology is relevant for graduates, as it provides opportunities for them to access information regarding their patient's medications, tests, diagnosis etc (OES 16)”. In addition, specific examples of point of care resources used and encouraged were provided by one participant: “palliative care resources, ABG [Arterial Blood Gas] interpretation, AIRVO demonstration app [Respiratory device] (OES 14)”. One clinical area also encouraged its use within the graduate program structure:

It's very relevant. I see that graduates use mobile technology to access different types of apps such as drug calculation and use it as resource to find out information about a procedure or a medication they are unsure of. They also use it to access their graduate work books and required hospital education (OES 18).

Perceived time saving benefits of using personal mobile technology devices at the point of care, was identified and was preferred over ward based PCs.

### **Time efficiency.**

When asked 'what' influences new graduates clinical use of mobile technology, one participant stated: "a desire to get current info in timely manner (OES 23)". Another similar response was: "The advancing of technology, the cutting of time, technology enable to make looking something up quicker (OES 21)". Similarly: "The speed of the internet and the calculators on smartphones cuts the time it takes to administer medications and check what medications are for and correct doses (OES 7)".

The responses highlighted in that graduates were under time pressure, and that mobile technology assisted in access to education and resources at the point of care. For example: "It supports the ability to have access to education & MIMS online to graduates that are under time pressures (OES 21)".

Some of the hospital sites utilise portable tablet mobile technology for ongoing graduate education and resources. Participants noted these resources were very useful at the point of care with graduates: "Very useful, as it enables us to provide 'in the moment education' at any given time. Using iPads, for example to review a rhythm strip, is fantastic (OES 16)". Having less time and resources, participants found portable mobile technology useful for flexibility of educational sessions within the clinical area. This was supported by participants saying: "Very useful especially seeing time for education has been significantly reduced we use iPads and laptops to deliver education on the go, even 5min presentations throughout the nursing staffs shift (OES 21)". A further example of a benefit to the graduate's time management at the point of care was: "Mobile technology such as iPads so technology is with the Grad it complements their ability to maintain time management (OES 21)".

In contrast to the perceived time saving benefits, some participants found that a barrier to the clinical use of mobile technology by graduates, was a: "Lack of time and opportunity. They need to gain confidence interacting with patients and problem solving using critical thinking skills e.g. do I have a deteriorating patient? Should I call a MER [Medical Emergency Response]? (OES 22)". In addition, another participant stated mobile technology use could be perceived as actually wasting time. For one participant, the most important thing that related to the use of mobile technology in clinical settings was: "Not overusing it and getting distracted and

wasting time. You do not need an instant answer to every query. Some things you can make a note of and look up later. Be selective and prioritise (OES 19)”. This example highlighted patterns of inconsistencies and discrepancies between participants in some of their responses. It highlighted the difference noted in the graduate’s responses, who commented that they valued instant access to information and resources to improve care and save time.

### **Subtheme-Preferred over ward PCs.**

A related subtheme was identified under the theme of time efficiency. Participants indicated that graduates would prefer the use of their mobile technology over the existing ward PCs. One participant noted that graduates used personal mobile technology frequently for medication administration resources, as challenges existed when trying to access existing ward PCs: “New RN graduates access MIMS online continuously and it is much easier and quicker for them to use mobile technology to do this. Wards generally only have one book and the computers are always hogged by medical teams (OES 3)”. A similar response was confirmed by another participant, when noting their own experiences when trying to access ward PCs:

Mobile phones would be great in the wards because you can look up medications for example in an area such as the medication room when there is not a patient around. I remember working in the ward and it was hard to find a computer to look up information I needed to know urgently (OES 1).

In response to a question in the survey, concerning ‘what’ influences mobile technology use within the clinical setting, it was noted that participants found it was easier to use personal mobile technology at the point of care. For example: “getting access to computers; being able to access information at the bedside (OES 3)”. For the same question, another participant stated challenges existed in simply accessing the internet from existing ward PCs: “No access to the internet on generic log in ward/ shared computers - The wealth of resources online that they may want to access at the bedside (especially for looking up medications) (OES 20)”. Another example, in answer to the question, one participant found that mobile technology use in clinical areas is: “Incredibly relevant, most people have their mobile phones



readily accessible at all time and I can see the potential of this readily accessible mobile technology in providing education at the bedside (OES 20)".

Some participants preferred the graduate to only use the existing ward PC: "If they are wanting to look up a procedure or medical term. They should have internet access to look this up on the computer (OES 1)". One participant offered a solution to this challenge:

A positive example could be the use of a tablet that can access the nursing practice guidelines at the bedside instead of having the graduate access the intranet on a ward computer and then printing it off to bring it to the bedside - save time, money and trees! (OES 3).

### **Inconsistencies-useful/not useful.**

Throughout the analysis of the data from the nurse leaders, a pattern of inconsistencies emerged. These included whether nurse leaders perceived mobile technology use for graduates as useful or not useful; whether they supported its use; and whose role it was to provide direction for graduates in its use. These inconsistencies may have led graduates to covertly use of mobile technology. In addition, a lack of clear guidelines or policies across the sites may have added to confusion and discrepancies in the graduate's use of mobile technology. This situation may have created a gap between theory and practice, if nursing graduates familiar with the use mobile devices to access resources in University settings, are not able to use them at the point of care.

Some participants highlighted the benefits of personal graduate's use of mobile technology at the point of care. A common response to the question that asked: How 'useful' is mobile technology for your role in the clinical setting, when supervising/managing/educating new RN graduates? was: "Mobile technology for education is imperative, whether it is mobiles, or tablets (OES 16)". As an educational tool, it is: "very useful, can demonstrate things to the staff (OES 14)". One participant used mobile technology in a similar manner to graduates when accessing evidence based resources: "I find the use of mobile technology very useful and have frequently used it myself when trying to recall/refer to evidence based research and to point students to useful... (OES 12)".

Mobile technology was considered useful in the specific role as a coordinator for administrative and management benefits: “For my role as coordinator, I find the tablets useful for accessing information in meetings, having the ability to record / minute conversations or meetings and having an electronic diary to coordinate a busy schedule (OES 3)”.

A surprising and unexpected finding was noted from one participant, who encouraged use of the computer on wheels (COW’s), and still advocated use of personal mobile technology in the clinical area: “I set up the three computers on wheels for initial med rounds, access to policy and procedures etc and feel staff should be able to use smart phones for work related apps etc (OES13)”.

In contrast, other participants stated mobile technology was not useful: “Not very useful... I use out hospital intranet mainly and access via a work station on the ward (OES 19). A similar response was:

[Not useful]. Mostly I have time to take the graduate nurse to my office to look up policy on how to perform a task, e.g. take out a drain. Often if I am teaching a new skill e.g. needling an infusaport I have the equipment in my office for simulated practise (OES 22).

Another participant stated mobile technology was: “not as relevant as we tend to teach using standard PP [PowerPoint®] and PC’s (OES 2)”. The response seems to suggest incongruence between what the graduates indicated in their survey and focus group. Evidence from the graduates, suggested they used their personal mobile technology covertly, depending on who was present at the time. It was noted from their responses, they only used the resource in front of supportive staff or supervisors. A nurse leader who appeared unsupportive of mobile technology use stated:

Again the need for such devices on the floor when working/teaching our new graduates on the floor is I feel overrated. There is an over reliance on the need for instantaneous information which limits the skill set of developing a critical mind able to problem solve and think outside the box (OES 15).

Furthermore, when participants were asked what influences graduates to use mobile technology, one participant stated: “Habit, over reliance on technology (OES 15)”, with another’s response to the question- What is the most important thing that relates to the use of mobile technology in clinical settings for new RN graduates: “Not overusing it and getting distracted and wasting time... You do not need an instant answer to every query (OES 19)”. These examples highlight the challenges faced by graduates when inconsistencies were noted with nurse leaders. Based on the participant responses, clear inconsistencies were noted where some participants found mobile technology useful and supported its use, whilst others did not.

### **Flexible education/learning.**

One clear theme emerged, that most participants supported the use of mobile technology as an educational tool for the flexibility it offers in learning: “Another great use is to record the guest speakers presentation so it can be delivered in busy clinical areas when the staff get a free amount of time they can catch the presentation on the iPad (OES 21)”. This example was based on one hospital site using specific iPads supplied by the organisation for supporting education.

Flexibility of learning was a common theme from the nurse leader’s responses: “Very useful, as it enables us to provide 'in the moment education' at any given time (OES 16). Mobile technology provided flexibility and time saving benefits: “good for accessing 5 minute education sessions – PPs [PowerPoint’s] (OES 2)”. Flexibility of learning with mobile technology potentially becoming the way of the future: “Education on the run is the way the future is heading and without mobile technology it would be very hard to deliver evidence based education to the caregivers in the clinical setting (OES 17)”. Ongoing benefits of mobile technology use was noted for education and ease of use:

It’s very useful. It is a much quicker way to get information to the graduates, it’s relevant to the way they are used to learning. I find that I can access and use a wider range of education resources. It’s great for this quick on the spot education needs, you can quickly wipe up a power point or access a program that has already been written. It saves time (OES 18).

It was noted from the participant responses, that although some innovative hospital sites used portable iPads for delivering education with the graduates, a number of issues regarding support systems and resources were concerning.

**Limited support-systems/resources for use.**

Even when mobile technology initiatives such as clinically supplied iPads were used with graduates, challenges were noted. These limitations were associated with limited support systems: “The iPad internet connectivity is poor, when completing an audit sometimes you have to restart due to the internet cutting out (OES 20). Although benefits were noted, more devices were required: “We also only have one iPad for shared use of the whole ward (OES 20)”. One participant stated that even with access to portable mobile technology for use with the graduates, there are ongoing challenges with the devices within the clinical setting:

We do have access to tablets which can enable us to complete office tasks on the go but these are bulky, expensive and cumbersome at the bedside. We also run the risk of theft as these must be secured if left unattended (OES 3).

A common pattern emerged from nurse leader participants, that although most hospitals had access to the internet, it was considered very slow and some online resources were inaccessible. Again, these challenges lead graduates to use their personal mobile technology. A potential solution suggested by a participant was for Wi-Fi internet access to be provided by the hospital: “having free Wi-Fi (OES 2 & OES 3)”. A potential problem, however, was: “the cost of acquiring such devices through a limited procurement contract with limited financial resources (OES 3)”.

One participant referred to a risk of interference with other electrical equipment if mobile technology was used but was unsure if this would be an issue within the clinical area: “interference with other technology?? (OES23)”. This response provides further evidence of the inconsistencies associated with the lack of clear guidelines or policies regarding safe use of mobile technology.

### **Familiarity with device and ease of use.**

When nurse leaders were asked what factors influenced use of mobile technology, it was suggested prior knowledge and ease of use was a factor. Ease of use could be linked to University education, where appropriate online resources and evidenced based information was learnt. In response to the question, one participant stated: “I guess their affinity with their device. Their knowledge of appropriate online resources and their ability to distinguish between creditable and non-creditable sources of on line information (OES 19)”and they’re: “ability to navigate around sites (OES 23)”.

In addition to being familiar with mobile technology, another participant suggested it was part of the culture from school, to University, and now the clinical setting:

It’s a culture, it’s what they have been using throughout high school and University. It is technology that they understand and can work through quickly. It pretty much is the first port of call when they need to communicate or access information (OES18).

The nurse leaders perceived that graduates found mobile technology easy to use: “ease of use - very familiar with the equipment (OES 11)”. As mobile technology was easy to use, this was a factor that influenced their use: “Their own determination is pretty much the only thing enabling the use of mobile technology, I would say mobile technology is not being used to its full potential in our workplace (OES 20)”.

### **Influence of others.**

The perception of role modelling was also considered a factor that influences graduates use, where: “We all do. If we are sending emails, setting up programs on line, putting required education materials online, policy and procedures online and giving them no other alternative to access information or communicate then we are the biggest influence (OES 18)”. Role modelling with mobile technology also appeared to extend to social media use in graduates where:

As an SDN I encourage the use of mobile technology and have an agreement with the Grads not to abuse same. I remind them it is a not a

good idea to friend me on Facebook as I will see if they are using social media on a late shift :) (OES 13).

Role modelling may have influenced the graduate when the educator or supervisor was seen using the device: “I use my mobile phone for work on a daily basis, it is proving to be the most efficient way of contacting other wards, line managers and the WASON [Western Australian School of Nursing] building where all the education is centred (OES 7).

In addition, peers may influence graduates use. One participant perceived that: “RN graduates would likely influence each other as well, if someone finds something useful they share with their colleagues (OES 20)”. In addition, “everyone is doing it (OES 23)” along with “peers (OES23)” influencing its use.

One participant stated that although younger graduates are familiar with mobile technology and accessing resources, they may experience challenges:

The millennial generation also plays a role, technology is what they know and what they live by. I'm sure they would struggle if they had to research topics or complete education by hand and only looking up books in a library (OES 18).

A similar response on the impact of culture was: “Society in general. Being told or sold the idea they cannot function without the devices (OES 15)”. It was noted that not only peers influenced their use, but: “The culture of the clinical unit or hospital (OES 19)”. Referring to hospital culture, it was noticed that technical strides lagged behind: “Attitudes within hospital cultures have not kept pace with technical developments in this area for nursing staff. Doctors and other health care professionals use them regularly (OES 19)”.

When asked the question in the survey: ‘What are the 'enablers' for new graduates to use mobile technology in the clinical setting? one participant said: “feeling empowered to use device while in clinical area (OES 2)”. This suggests support and encouragement from other staff was a factor that influenced its use. Another participant stated a similar response: “Feeling empowered to use their mobile device when appropriate without getting told off by staff (OES 2)” and:

“seeing other staff using mobiles to access information (OES 2)”. The influence of peers was highlighted by another participant: “How receptive staff are. I firmly believe that the new generation of nurses will benefit greatly with positive encouragement to use mobile technology (OES13)”.

In contrast to empowering staff to use mobile technology, it could be discouraged by others: “I have found the perception of engaging with mobile technology among nurses to be a barrier too, they often assume if you are on your phone then you aren't being productive (OES 20)”. A potential negative use of mobile technology was identified by one participant as : “...be seen by patients, visitors, other staff as being inappropriate - should be attending to patient care rather than 'playing' on phone (OES 23)”.

The influence of others in the use of mobile technology included Nurse Unit Managers (NUM). Discrepancies were noted in who guided its use for graduates and provides further evidence on the need for clear policy and guidelines. One participant stated:

My nurse unit manager and I allow nurses to carry their mobile phones on the ward but they aren't allowed to use them in the corridor, we only ask that they be discreet when they use their phones and duck off to a private area, or explain to the patient why they are using their phone if doing so at the bedside (OES 20).

Although in the above response, the NUM and the participant allowed the use of mobile technology in their area, others may not have been as flexible. This situation could have created potential inequity between staff, and lead to covert use by graduates. Where on one ward they could use their device, but in another ward they could not. This pattern is identified in the following example where a fear of misuse was noted:

Some NUM's are against staff carrying their mobile phones when out on the wards due to the fear of misuse. If they see other staff using their mobile phones for the calculator or MIMS online then they appear to be more comfortable in their use (OES 7).

The example relates to mistrust of the personal use of mobile technology, as its use could be seen as engaging in unprofessional behaviour, until the staff member 'proves' they are using it appropriately.

When asked 'who' influences graduates use of mobile technology, it was governed not only at ward level by the NUM's, but also from the graduate program staff. For example, the: 'SDN [Staff Development Nurse]; myself and the ward CNS [Clinical Nurse Specialist] / CNM [Clinical Nurse Manager] / NUM have governance of this (as we would their clinical and professional practice) (OES 3)''.

A guideline existed for the safe use of social media, but few policies or guidelines existed for the use of mobile technology in clinical areas. This theme was highlighted when participants identified a need for a consistent approach to guidelines or policy.

#### **Need for consistent policies & guidelines.**

The result of no clear guidelines or policies to guide mobile technology use, can lead to inconsistencies and discrepancies in clinical areas. When participants were asked - what is the most important thing that relates to the use of mobile technology in clinical settings for graduates: "Guidelines and consistency across sites (OES 13)" seemed to be highlighted.

Further evidence of the discrepancies between the sites and clinical areas was identified by the participants when asked 'How does the hospital guides/direct the use of mobile technology in the clinical setting for graduates?': "No guide in place at this stage (OES 21)"; but another had: "hospital has guidelines for mobile use (OES 2)". Despite a lack of clear guidelines or policies, one participant promoted its use within their educational role: "I don't think there are clear guidelines apart from social media; As SDN I promote the use of mobile technology (OES13)". Another participant stated that it is: "not provided to new graduate nurses (OES22)".

With no clear guideline or policies available, ongoing confusion about whether to use or not use mobile technology, may occur for the graduate and others. Some hospitals and other health industry organisations actively promote apps and other online resources for staff and general public use. It would appear, however, that no



guidelines existed for their appropriate use in clinical areas. An example online resources accessed from mobile technology was provided by one participant who stated: “there are now some online apps used by the hospital and publicised for general use (OES 14)”.

Some clinical areas were more specific in guiding mobile technology use, but it was not clear if there was a policy or guideline. For example, one participant stated that although it was not allowed, they could see potential benefits within the area: “Mobile phones not allowed in operating theatres. If mobile phones were allowed in theatres it will be easier access to information on surgical procedures (OES 1)”.

### **Inconsistencies-Who guides use.**

When participants were asked ‘who’ influences graduates use of mobile technology in the clinical setting, participants responses were varied and demonstrated significant inconsistencies. Such inconsistencies could have been related to the lack of clear guidelines/policies, or the personal preference of nurse leaders. Either way, graduates could be confused, leading to the covert use of personal mobile technology.

It was noted in the responses, however, that some of the sites were quite specific in guiding use of mobile technology as soon as the graduate commenced employment with the hospital. For example:

During orientation we inform the graduates of the relevant policies and operational directives (it is also in their handbook). We then ensure the ward has this conversation with them regarding the ward use of personal devices and those provided by the ward (OES 3).

At a different site, another participant informs graduates at orientation that its use is not allowed as a point of care resource:

All graduates are informed at orientation that mobile phones are not to be used for day to day activities on the ward, i.e. Checking Facebook and other such social media sites, making phone calls/text messages that can wait until break time and sending of emails etc (OES 7).

Clearly, this participant did not see the use of mobile technology as a point of care resource. Although some sites advised graduates during orientation about mobile technology, it also appeared to be based on some nurse manager's preferences in guiding its use: "Clinical Educators, Nurse Managers, and Clinical Nurses- it depends on the nurse manager's preferences for his or her department (OES 21)". This statement demonstrates that mobile technology appears to be governed at the ward level: "the staff member is not advised to use their personal devices in the clinical area. This is governed at the ward level (OES 3)". Further evidence of the discrepancies at the ward level, was that the same nurse leader would change directions in the use of mobile technology at different times. This example highlights that mobile technology use may depend on who is around at the time on the ward. For example: "Most graduates will access their personal devices during scheduled breaks or in situations endorsed by their ward based supervisors (OES 3)". In contrast however, another participant remained neutral to the use of mobile technology: "I would only respond if I thought there was a problem or issue. I don't proactively promote or disparage the use of mobile technology (OES 20).

When participants were asked how does the hospital guide/direct the use of mobile technology in the clinical setting for new RN graduates, one participant stated: "It doesn't. Currently Nurses are not allowed to carry personal mobile devices when on the floor (OES 19)". A similar response identified that the hospital does not guide or direct its use and that it may be directed by different staff: "...apart from being directed to educational apps and websites by other educators I don't think the hospital on the whole guides/ directs the use of mobile technology (OES 20)". For the same question at another site, a participant stated that although they promote online access, they do not want the graduates to have the devices on them:

This is really hard to police because we need to treat them like adults and hope they are following the rules, we are too busy to walk around checking to see if they have left their phones in their bags. It's a catch 22, we tell them to access things online but we don't want them to have devices on them (OES 18).

To further highlight inconsistencies in who guides mobile technology use, participants were asked "What is your role in regards to guiding/directing use of

mobile technology clinically?: “I highlight accessible resources that may benefit them (OES 14)”. Where another participant, in contrast stated: “No direct role (OES 2)”. It was identified by some participants that they preferred that graduates access mobile technology for education, but outside the clinical area: “It is a great tool for education, however, outside the clinical area where patients need to be the number one focus (OES 15)”. It may be that this participant either did not agree, or had little idea about the benefit of mobile technology at the point of care.

Participant’s noted perceived benefits and challenges to the clinical use of mobile technology. Relating to these benefits and challenges, was a lack of hospital support that influenced graduates and nurse leader’s clarity in the clinical use of mobile technology.

### **Support initiatives.**

Most participants supported for graduate’s use of mobile technology. Motivation to embrace the resource because of the potential benefits was a common pattern. For example: “I am a big supporter of mobile technology and the good that it can do. I think that if we focus on the good and use positive reinforcement we can embrace this technology and encourage correct usage (OES 7)”. An interesting response was noted from an older nurse: “I think it is wonderful. I am in my 60’s, nursed for over 40 years. We need the most up to date research, IT and devices (OES 13)”. A suggestion for more portable devices was made by some participants such as: “I believe we should have secure access to iPad that would be available in each section for the new grads to use (OES 22)”.

Graduates may face challenges in accessing consistent information at the point of care as policy/guideline accessed online may differ from hospital policies/guidelines. From a University setting, however, nursing students are encouraged to analyse, evaluate and critique evidence and information online. One participant referred to a negative of mobile technology use in clinical settings, surprisingly as: “using google to look up policies (OES 13)”. Another participant stated: “The biggest negative I have is that we are presuming that each RN graduate has the ability to access and understand technology... we are guessing that they are

understanding the information they are reading (OES 18)". This example suggests the participant may not have kept up-to-date with educational goals for graduates in University settings.

Some participants felt positive about providing support in terms of mobile technology to nurses, but not surprisingly they had a more macro perspective:

I would embrace any form of device that can improve the delivery of quality and efficient health care without compromising the integrity of the system, the individual and most importantly the patient. The ongoing challenge is finding something that is cost efficient that can accommodate the needs of a large workforce operating within a limited IT system (limited capabilities and resources) (OES 3).

Encouragingly, the same participant felt that graduates practiced using mobile technology appropriately: "Separating personal from professional use is the biggest hurdle for some. Our graduates generally are aware of the risks associated with using personal devices and practice within our parameters (OES 3)". It was noted, however, no policies/guidelines exist at the participant's site for the use of mobile technology.

Some participants suggested practical support in the form of the: "Graduate being provided with access to a free list of approved mobile apps to use on their mobile phones, so that the hospital can be assured they have provided nurses with quality resources (OES20)". One participant stated a need for: "consistent sites and common apps (OES 11)". Another example of support was: "clinical education support (part of a learning program) (OES 11)."

Mobile technology use was seen by some participants as a *'fait accompli'* for the future:

I really feel that whether we like it or not, graduate nurses will be engaging with mobile technology in order to provide care - we as educators need to respond to this and set our graduate nurses up for success (OES 20).

In addition, a similar response was noted: "Mobile technology is unstoppable - it is the future, it is better to understand it (and its limitations) and to actively engage with it in order to get the best outcomes for our patients (OES 20)". Another participant

felt that: “I think that we need to accept that there is no going back, technology is only going to become a bigger reality on the floor so we need to find a balance (OES 18)”.

As a future resource for care, mobile technology use was seen as important tool. It was also noted that current systems needed updating. For example: “When we have a paperless system there will be a lot more mobile devices that will be available (OES22)”. Another participant clarified this view: “If we are heading into the technology age then having better and more resources for the RNs to use and the educators to access as well (OES 18)”. A need for progress was noted as: “I would rate our hospital internet and mobile technology as very behind the times (OES 20)”.

An overall hospital approach in regards to the need for support initiatives was a pattern in the nurse leader’s responses: “To inform all staff that the use of mobile technology can be used for good, such as medication checking, calculators, translating apps. Education for the NUM's regarding mobile devices (OES 7)”. A further recommendation from one participant was: “Maybe posters designed to inform visitors and patients that these devices are being used for appropriate professional purposes (OES19).” This suggestion was seen as keeping people cognisant of mobile technology.

Another overall response for clarity in mobile technology use was related to attitudes of staff. An overall support initiative may involve addressing the culture and attitudes of older staff in clinical areas for example. Participants suggested that the ‘enablers’ to mobile technology use included: “The attitude of the hospital management/ directors; Hospital Policy; The attitude of the NM towards technology in the workplace; the attitude of colleagues (OES 19)”. “Old attitudes (OES 13)” highlighted by one participant, was seen as a barrier to its use.

In order to reduce the potential discrepancies and inconsistencies, one participant suggested that there should be more collaboration between industry and the universities. The participant felt that graduates needed to be mindful that healthcare providers were behind in the technological world and that this issue may be associated with financial constraints. Moreover, she felt they also had to be aware

of the risks associated with mobile technology, although the participant did not elaborate further:

There could be more collaboration between industry, the ANF and the universities to make students more aware of the risks associated with use of mobile technology (particularly personal devices) in the clinical setting. Health settings will always fall behind the rapidly increasing (and expensive) IT world and whilst desirable to have access to the advances in technology, the reality is we will always be steps behind (for a variety of reasons) and as such, graduates need to expect that and function within those constraints (OES 3).

This final stage of the qualitative phase of the study provided the perceptions of nurse coordinators, educators and managers of graduate programs, regarding the clinical use of mobile technology. Whilst there were similarities between the graduates' perspective and the nurse leaders there were also unique themes that related to the role that these people played in directing graduates.

### **Conclusion to the chapter**

The qualitative phase of the study, involved three key stages to assist in answering the research questions. Stage four involved thematic analysis of the text-based responses from the quantitative phase of the study. The themes provided data for the development of the questions for the focus group interviews and provided a link between the quantitative and qualitative phases of the study. Stage five, following data collection from the focus group interviews thematic analysis, uncovered a number of themes and subthemes to assist in answering the first and second research questions. Stage six involved posing questions to nurse leaders regarding graduates clinical use of mobile technology. It was deemed necessary to investigate the perceptions of these nurses since they were often the people who directed graduates on the wards. Responses from the nurse leaders assisted in answering the third research question.

Findings from this qualitative phase of the study indicated similarities in themes between graduates and nurse leaders. There were also inconsistencies and discrepancies in the use mobile technology. A major theme identified by both sets of participants was that mobile technology was useful and relevant at the point of care.

They also noted that mobile technology was easy to use and saved time. Most participants also added that mobile technology use was preferred over ward PCs. Graduates were consistent over the issue of their covert use of personal mobile technology as issue that may have been related to the lack of support from the hospital in terms of policy and guidelines and/or from nurse leaders who generally followed their own rules. Thus, these problems created inconsistencies and mixed messages to graduates in the clinical use of mobile technology.

Throughout the qualitative phase of the study, it was important to ensure the trustworthiness of the findings. This is discussed within the following section.

### **Rigour and Trustworthiness**

As the study utilised multiple sources of data, both rigour and trustworthiness of the findings was essential. In qualitative research the term trustworthiness is used to describe the strategies used to ensure findings can be trusted (Streubert & Carpenter, 2011). The operational terms that describe this process are credibility, dependability, confirmability and transferability (Lincoln & Guba, 1985; Shenton, 2004; Streubert & Carpenter, 2011). These terms are discussed in the following narrative to how they were applied in this phase of the study.

Credibility involved activities that increased the probability that credible findings were produced. Prolonged engagement with the participants was considered evidence of this concept (Streubert & Carpenter, 2011). Since the collection of data in the study was predominantly online, this concept was difficult to achieve. The following steps, however, were undertaken to demonstrate credibility and achieve neutrality: personal and professional values when collecting and analysing data were discussed with the researcher's supervisor; the supervisor checked journal entries and processes used in analysing the data; and participants were provided with a copy of the transcripts and findings on request. Credibility of this phase was demonstrated through the following example. At the end of the qualitative online text-based focus group interviews and open-ended survey to graduate program supervisors, managers and educators, the following statement was included:

*'As mentioned previously, please select 'yes' below if you are happy for me to contact you via email following the data analysis to review the results for credibility of this phase. This would simply involve an email with a summary of the results for you to provide brief comment and feedback. Thank you again for being part of this important research so far.'*

Dependability refers to the extent to which the findings of the study are dependable, which is comparable to validity and reliability demonstrated in the quantitative phase of the study. The explanatory, sequential, mixed method design when collecting the data, was considered an appropriate method to achieve dependability. In accordance with this recommendation, the researcher followed a routine of analysing data by comparing across the different responses. This process was particularly relevant in moving between phase one and two of the study and between the different data sources. This process was undertaken by juxtaposing the data to determine the consistency of findings (Struebert & Carpenter, 2011).

Confirmability is the process of leaving an audit trail. In order for the evidence and thought processes to be open to scrutiny, the researcher systematically recorded and managed all data (Patton, 2015; Struebert & Carpenter, 2011). This process was especially important in addressing any potential bias of the researcher during the qualitative phase.

Transferability refers to the possibility that the findings of the study have relevance to others. Nurses across many practice settings may find the study has relevance (Struebert & Carpenter, 2011). This concept will be addressed in the recommendations and limitations of the study in the following chapter.



## **Chapter Six**

### **Discussion, conclusion and recommendations**

#### **Introduction**

This chapter includes a synthesis of the findings in relation to the research questions. Comparisons are made to other studies explored in the literature in order to interpret the outcomes of the study. The chapter will include the limitations of the study, together with recommendations. It will conclude by providing implications and recommendations from the present study for linkage into clinical, education and research considerations. The aim of the chapter is to reconstruct a holistic picture of the study.

#### **Study purpose**

This study set out to investigate the factors influencing nurse graduates use of mobile technology in Perth, Western Australia. The assumption was that there were few standard policies in healthcare institutions to guide graduates use of mobile technology. Significantly, there appeared to be a potential gap between learning with mobile technology in undergraduate nursing programs and their use in the clinical setting. Three research questions were posed:

1. What factors influence nurse graduates use of mobile technology in the clinical setting?
2. To what extent and in what ways do nurse graduates currently use mobile technology in the clinical setting?
3. What are the perceptions of nurse coordinators, educators and managers of graduate programs regarding mobile technology use in the clinical setting?

In order to answer these questions and to provide a better understanding of the research problem, a mixed method study design with six sequential stages was used. This design combined quantitative with qualitative data (Creswell & Plano Clark, 2011; Creswell, 2015). Data collection for the quantitative phase used an

online survey, whilst focus groups used an online text-based questionnaire. The questionnaire was developed using the findings from the survey. This approach uncovered limitations of one approach that was corrected or balanced by the other (Creswell & Plano Clark, 2011).

A number of themes were uncovered from the results and findings of the study, which explained factors influencing graduates clinical use of mobile technology. The synopsis of themes are presented in the following headings: usefulness at the point of care; covert use; bridging the gap from University; a personal mobile technology preference over ward PC's; policies and guidelines; the influence of others; & support initiatives.

#### **Usefulness at the point of care.**

A major factor that influenced the graduates to use mobile technology was its usefulness at the point of care. Most importantly, graduates felt their safety and quality of care was improved. A reason for the perceived improvement in safety, may be linked to being able to access unfamiliar medications. These results match those observed in earlier studies with undergraduate nurses (Farrell & Rose, 2008; George, Davidson, Serapiglia, Barla, & Thotakura, 2010; Hudson & Buell, 2011; Koeniger-Donohue, 2008; Patillo, Brewer & Smith, 2007; Secco, Jamieson, Profit, Bailey, Brennick, Whitty-Rodgers, 2010; Wu & Lai, 2009).

The Technology Acceptance model (TAM2) posits that both social influence processes and cognitive instrumental processes influence technology acceptance (Venkatesh & Davis, 2000). Whilst there was no single factor that significantly influenced graduates to use mobile technology in the clinical setting, both social and cognitive variables were influential. Graduates valued ease of use and its usefulness, which led to their intention to use (Davis, Bagozzi & Warshaw, 1989). Ease of use was probably related to graduates familiarity with mobile technology having learnt the benefits they offered during their undergraduate program. In a study, using student nurses as participants, a similar finding suggested that there was a general perception that technology was useful and easy to use (Williamson & Muckle, 2017). The job relevance and usefulness of using mobile technology at the point of care

corroborates an earlier study which found that mobile technology use in healthcare enhanced patient safety; improved care quality; and increased efficiencies (Scott, 2017; Strudwick, 2015).

Graduates were in the process of gaining more confidence with their time management, which they believed increased when using personal mobile technology at the point of care. As an example, one student was told to access a point of care resource that was at another end of the ward, when they had a more up to date resource on their own mobile technology device at the bedside. Similar findings concerning time management have been reported in a previous study using undergraduate nursing students (George, Davidson, Serapiglia, Barla & Thotakura, 2010). From a nursing students' perspective, they found more time was actually spent with patients, by looking up information to improve quality of care, which enhanced patient safety (Grabowsky, 2015).

The majority of graduates felt that clinical use of mobile technology improved their learning and felt the transition of theory to practice was improved. Although other studies have used undergraduate students as participants, they have concluded similar results (Farrell & Rose, 2008; George, Davidson, Serapiglia & Barla, 2010; Koeniger-Donohue, 2008; Patillo, Brewer & Smith, 2007; Wu & Lai, 2009; Secco, Jamieson, Profit, Bailey, Brennick, Whitty-Rodgers, 2010; & Hudson & Buell, 2011).

Whilst nurse leaders agreed with the graduates that clinical use of mobile technology for learning offered benefits for education, some were more concerned that graduates would spend less time with the patient. By contrast, graduates reported spending more time with patients, as they could use the resource at the point of care. This finding compares favourably with a study of student nurses found more time was actually spent with patients, by looking up information to improve quality of care with enhanced safety (Grabowsky, 2015; Koeniger-Donohue, 2008; Johansson et al., 2013). They also felt that using their mobile technology at the point of care improved their self-confidence. This benefit linked to previous literature with undergraduate nursing students (Goldsworthy, Lawrence & Goodman, 2006; Johansson, Peterson & Nilsson, 2013; & Wu and Lai, 2009).

This study demonstrated interesting differences in the gender of graduates in the clinical use of mobile technology. More males than females felt their organisational skills, performance, and learning were improved with the use of mobile technology. They perceived a high quality of output, indicating mobile technology was important for their job. These findings link to previous research, which has revealed that gender plays a significant role in determining the intention to accept technology (Goswami & Dutta, 2016).

Moreover, a significant finding was noted where more males than females indicated that clinical mobile technology use, did not require a lot of their mental effort. This finding links to previous research into technology acceptance, where women used technology when there was less effort required (Venkatesh & Morris, 2000). In addition, previous research links to social influence effect, where females were more sensitive to the suggestions of their peers. Within the context of this study it was evident that nurse leaders influenced the clinical use of mobile technology and created apprehension for some graduates. This finding was similar to TAM2 studies, which suggested that influence of peers was stronger when forming an Intention To Use (ITU) the technology (Venkatesh, Morris, Davis, & Davis, 2003). The same study also revealed that females were more anxious than men when it comes to using technology. This resulted in a reduction in their perceived self-effectiveness leading to increased perceptions of the effort required to use the technology (Venkatesh et al, 2003).

Personal use of mobile technology at the point of care, may assist in meeting standard four of the National Safety and Quality Health Service (NSQHS) standards for healthcare settings and may assist in reducing medication errors for nurse graduates and students. The ACSQHC stated that systems should be developed considering local circumstances, with consideration of individual roles and resources using information technology, equipment, staff, education and training (ACSQHC, 2012). Further research into this area would assist in confirming the perceived improvement in safety for medication administration for graduates, when using their personal mobile technology at the point of care.

### **Covert use.**

A common theme that emerged from the study was the covert use of mobile technology. Harking back to their student days, graduates remarked that despite the University dictating they were not permitted to use their mobile phones when on clinical practice, they used them covertly. The majority of graduates valued using mobile technology and indicated they used the resource for their learning whether they were encouraged to or not by the University. The finding suggests the benefits of use outweighed the risks of being reprimanded by some senior staff who may not have been supportive. Despite potential restrictions during clinical practice rotations as students, graduates found clinical use of mobile technology improved their transition of theory to practice. Previous research also identified that nursing students covertly use mobile technology, and that it was the culture of the unit or ward that was an influencing factor (Doyle et al. 2014; Strandell-Laine, Stolt, Leino-Kilpi, Saarikoski, 2015; Pimmer, Brysiewicz, Linxen, Walters, Chipps, & Gröhbiel, 2014). Furthermore, previous research conducted from in-depth interviews with nurses across thirteen hospitals in the Philippines found that even when policy restricted clinical use of mobile technology, nurses perceived the benefits outweighed the risks of being 'caught out' by nurse leaders. The study found that mobile technology use was instrumental for the nurse's role, and although its use was prohibited by most hospitals, nurses justified their covert use for clinical purposes and for the benefit of their patients (Bautista & Lin, 2016).

The covert use of mobile technology depended on 'who' was around at the time, and whether senior nurses were supportive. Senior nurses and managers also influenced their use (Bautista & Lin, 2016). Graduates in this study also indicated they were also having to prove to their nurse managers and peers they were professionally using their personal mobile technology.

Additionally, the use of clinical mobile technology and support for its use varied between the hospital sites. Differences were noted between graduates clinical use of mobile technology based on the location of their graduate program. When it was used for accessing information, apps were more valued at some hospitals than others. In addition, some hospitals, encouraged of clinical use of mobile technology for learning and education.

### **Bridging the gap from University.**

As students, the majority of graduates used mobile technology on a daily basis for learning within their undergraduate degree. As such, the graduates found it provided a bridge from University to clinical settings. During this transition phase, graduates often accessed their University notes and resources online through the 'cloud'. This finding was consistent with studies concerning student nurses use of mobile technology. Similar to graduates, students found online mobile technology more useful than text-based resources, and were more likely to access evidence based resources (Kuiper, 2008; Williams and Dittmer, 2009). It could be argued, that graduates confidence increased in the application of theory to practice, since they often shared resources and encouraged professional use with other nurses and multidisciplinary colleagues.

Graduates valued mobile technology for enhancing their learning in both the academic and clinical environments. They suggested that mobile technology for learning had higher value in some universities compared to others. Previous research has been conducted into integrating technologies into nursing curricula, with many nursing bodies and associations encouraging its use (CASN, 2012; National League for Nursing, 2008; Sigma Theta Tau International Honor Society of Nursing (STTI), 2006; & The International Council of Nurses (ICN), 1997). Currently, competencies in informatics and mobile technology are required to prepare students for evidenced based practice and safe nursing care prior to professional practice (CASN, 2012; Hebda & Calderone, 2010).

### **Personal mobile technology preference over ward PC's.**

As previously mentioned, mobile technology within this study encompassed any portable mobile devices that can connect to the Internet. These may include any items such as smartphones, tablets, laptops and iPads. In the clinical setting access to the Internet is gained by using the ward PC. Information regarding patient care, hospital policies, guidelines and protocols are also stored on the ward PCs. Both the graduates and nurse leaders found accessing ward PCs a challenge especially in public hospitals such as SCGH, RPH and FSH. This limited access may have been associated with competition from other health professionals (Guillot & Pryor, 2007).

Such challenges, however, were less in the newer FSH, which had computers on wheels (COW'S). Fiona Stanley Hospital had been touted as WA's first paperless fully digital hospital, with some healthcare clinicians preferring to enter their clinical data on the COW devices instead of the ward PC (McDonald, 2015). Although potentially having access to more PC's and COW's at this site, graduates still valued access to their personal mobile technology for clinical use.

The graduates noted that when they were students, they had limited access to ward PCs as they had not been given a login password. This meant that vital Internet resources, test results and other ward policies and guidelines were unavailable. This factor may have led to the covert use of their personal mobile technology and continued once the student graduated.

#### **Policies and guidelines.**

One hospital had a policy for clinical use of mobile technology, but generally, graduates were unsure if policies or guidelines existed. They felt 'stuck in the middle' without clarity. Nearly half the graduates indicated they felt unsure whether nurse managers or senior management supported them in using mobile technology and that nurse leaders often vacillated between being supportive and unsupportive. This stance may have been associated with the lack of a policies (Beauregard, Arnaert, & Ponzoni, 2017).

In relation to hospital support, most graduates felt unsure if their hospital library supported the use of mobile technology. Generally, however, University libraries attempt to match subscriptions to point of care to the hospital library subscriptions for healthcare staff use. This provides a useful assistance in bridging the transition from healthcare student to graduate. A possible explanation for graduates being unsure about library resources could be related to the lack of adequate orientation to the library, or a lack of clarity in the use available resources. An important finding, relating to the low levels of perceived support from the hospital, was that most graduates would have valued clear guidelines or policies that directed the clinical use of mobile technology.

Graduates indicated they felt unsure if they could use mobile technology for patient education. The opportunities for such use could be realised with clear policies or guidelines concerning their use in the clinical area. Elsewhere, other studies have revealed that mobile technology plays a very important role in patient education and self-management of disease (Mosa, Yoo & Sheets, 2012; Schnock, Ravindran, Fladger, Leone, Williams, Dwyer, Vu, Thornton & Gazarian, 2017).

Most graduates used mobile technology frequently at the point of care and were keen to engage further with patients and their family using this resource. It is argued in the literature, the use of mobile technology resources in healthcare settings, has enabled new opportunities for developing patient-centred approaches to care. In addition, mobile technology resources such as eHealth education and for health promotion would empower the patient to manage their health and would strengthen the nurse-patient relationship (Mather & Cummings, 2015).

Nurse leaders were uncertain about who they felt should guide clinical use of mobile technology. This indecisiveness could be related to the lack of clear guidelines/policies, or the personal preference of the senior nurse leaders. Previous studies have indicated that most policies and guidelines for the personal use of mobile technology in clinical settings were based on professional expert recommendations, rather than research findings (Moyer, 2013).

### **The influence of others.**

Most graduates regularly observed other health professionals and patients using mobile technology in the clinical area. The majority of graduates, however, were concerned that other staff and patients may think they would be using it for unprofessional reasons. This finding supported the suggestion that staff and patients could perceive that the device was being used for personal or social reasons (Mann, Medves, & Vandenkerkhof, 2015).

The term 'Image' as a TAM2 variable within social influences, was defined as 'the degree to which use of an innovation is perceived to enhance one's . . . status in one's social system' Moore and Benbasat (1991, p. 195). Within this study, some graduates believed that it was acceptable to use mobile technology at a patient's



bedside since they observed doctors using their mobile phones. Similarly, they indicated that younger staff shared mobile technology resources for clinical applications, and that this use reflected the future of healthcare. It would seem that younger staff influenced the perception of cultural change concerning the acceptance of mobile technology for use in clinical settings. Thus, it is conceivable that as a consequence, younger staff enhance a graduate's social status. This supposition would align with the TAM2 framework.

In contrast, within the context of this study, professional image displayed by graduates using mobile technology at the point of care, was concerning to both graduates and nurse leaders. Graduates were apprehensive that patients and other staff may think they were using their mobile technology unprofessionally. Some nurse leaders also pointed to their perception that graduates clinical use of mobile technology at the point of care was unprofessional remarking that graduates should be focussed on patient care. Such a perception seems inconsistent, since it has been demonstrated that graduates use their mobile technology to effect better patient care.

Graduates clinical use of mobile technology was directed by a variety of people, which may include peers, nurse leaders, and other multidisciplinary team members. Inconsistencies in guidance and direction, however, lead to discrepancies in levels of support and to covert use of mobile technology. Nurse leaders provided examples of their own clinical use of mobile technology, which impacted how they delivered clinical education to graduates.

Some nurse leaders did not support clinical use of mobile technology, where others were very supportive. Graduates observed younger nurses and multidisciplinary team members using mobile technology more frequently than older staff within the clinical area. This observation may be related to older nurses not using such technology during their student nurse days and had not had the opportunity to up-skill. This finding concurred with a similar, recent finding which suggested that nurses aged 50 years were less likely to use a smartphone in acute care settings and did not agree with the benefits of smartphones (Flynn, Polivka, & Behr, 2017).

Graduates thought that a cultural change was occurring within clinical settings in the use of mobile technology. This was associated with younger staff being familiar with mobile technology. They encouraged each other and shared mobile technology resources for the betterment of patient care. This cultural change has been previously identified as being integral to the modernization of the workplace (Farrell, 2016). Some nurse leaders in this study, in a private hospitals, used iPads for teaching graduates, however, an overall preference for personal mobile technology at the point of care was noted.

### **Support initiatives.**

A major theme from both graduates and nurse leaders was the necessity for hospital support initiatives related to clinical use of mobile technology. Inconsistencies and discrepancies were noted in this study, which created barriers for professional clinical use by both graduates and nurse leaders. Discrepancies between nurse leaders related to 'who' is responsible for guiding the clinical use of mobile technology, particularly when there were no specific guidelines or policies for its use. Both graduates and nurse leaders identified the need for a clear policy or guideline for the clinical use of mobile technology. Such a requirement was also recognised by a recent study that focused on the perceptions and experiences of nurse managers in British Columbia relating to Bring Your Own Device (BYOD). The study suggested that a specific policy including boundaries and expectations was required to address how personal mobile technology should be used in clinical settings (Martinez, Borycki, & Courtney, 2017).

Within this study, inconsistencies were noted in the nurse leader's responses in how they supported clinical mobile technology use. Most graduates, however, found mobile technology useful in the clinical setting at the point of care. Recent literature also highlights a difference in perceived benefits, where a study of nurse leaders in the U.S. into the clinical use of personal mobile technology with staff suggested more concerns than benefits. The study, however, suggested caution for the implications of the findings, suggesting clinical nurses at the point of care who were not included in the study may find significant benefits (Brandt, Katsma, Crayton, & Pingenot, 2016).

Graduate responses in the qualitative phase, indicated an overall hospital response was required to assist in shifting the culture on the wards in regards to clinical use of mobile technology. An example was provided by a graduate which interestingly, matched the innovations in Canada whereby posters and staff in-services support the professional use of mobile technology in the clinical settings (Registered Nurses Association of Ontario [RNAO], 2017). Similarly, in comparison to other studies, when nurses felt their organisation had high levels of facilitating conditions of both physical and technical infrastructures supporting the use of the technology, high levels of technology acceptance was noted (Aggelidis & Chatzoglou, 2009; Asua, Orruno, Reviriego, & Gagnon, 2012). The authors of a study involving both nurses and medical staff, noted these facilitating conditions included: support and technical help when the technology was implemented, available equipment, and importantly end-user involvement in the decision making process (Asua, Orruno, Reviriego, & Gagnon, 2012).

The influence of others on graduates' clinical use of mobile technology was a significant finding within the study. This influence extended to the extent and in what ways it was used. Support from hospital authorities was highlighted with graduates providing tangible examples of how they preferred the support to occur and when transitioning from students to graduates. An important and recent study found that educators enhance the benefits of mobile technology use in academic and clinical settings as experienced by the students. This can be through improved delivery methods, practice methods, and strategies to keep students engaged and prepared. It is argued that these initiatives would ensure that nursing students are even more prepared for the transition into the clinical workforce (Williamson & Muckle, 2017). Strategies to enhance the clinical use of mobile technology, included having preceptors and nursing staff who were competent in using the resource (Hudson & Buell, 2011).

## **Conclusion**

The blending of findings provides support for the premise that clinical use of personal mobile technology, assists in bridging the gap in learning from University to clinical settings for nurse graduates. Findings also suggest that significant

inconsistencies and discrepancies exist in clinical settings for graduates. Some of these inconsistencies and discrepancies include the lack of clear policies or guidelines, differences in levels of support and direction from nurse leaders and senior staff, and an overall lack of support and guidance from the hospital sites within the study.

The covert use of mobile technology was associated with the inconsistencies of nurse leader's directions. Their influence was an overriding concern of the graduates as they experienced mixed messages. Based on these mixed messages, they often had to hide and covertly use their mobile technology. Other healthcare professionals also communicated these mixed messages as they were often observed using their smart phones in at the point of care. As such, these people unwittingly acted as role models.

Added to these issues, was the concern that patients would think the graduate was behaving unprofessionally if they used their mobile technology at the point of care. Interestingly, it is noted that in today's social climate, many patients use their mobile technology to investigate their condition and self-diagnose. Additionally within this study, graduates noted high use of the patients own mobile technology in their bed spaces. A major concern of the graduates, however, indicated a fear that other staff and patients would think the graduate was unprofessional by using their own personal mobile technology.

Whilst younger staff were supportive, older staff tended to mistrust the personal use of mobile technology. This finding may have been associated with nurse leader unfamiliarity with the benefits of using mobile technology at the point of care, or alternatively, it might be that they had not learnt how to use the technology as part of their own training.

The most obvious finding to emerge from this study was that nurse graduates found personal mobile technology use in clinical settings relevant and useful for their roles. It was the relevancy and usefulness related to patient care that graduates justified their covert use of mobile technology. Perceived benefits of using mobile technology from the graduates' perspective included: improved self-confidence; time efficiency; improvement in safety and quality of care; and an improvement in

organisational skills. These factors may have influenced a graduates' intention to use mobile technology. The findings of the study enhance understanding of the TAM2 social and cognitive variables that influence graduates use of mobile technology use in clinical settings. In general, this research extends nurses' knowledge and the methods that graduates use their mobile technology in the clinical settings. It also suggests that both social and cognitive factors are influential in its use. The present study confirms previous findings in the literature and contributes new and valuable additional evidence that has implications for healthcare organisations and universities that offer undergraduate nursing programs.

### **Limitations of the study**

The present study explored graduates' clinical use of mobile technology. Thus, given the setting and design of the study generalisability of the findings are subject to some limitations. These may include:

- Within the quantitative survey, the Cronbach's alpha score was low for one of the section headings: 'mobile technology use by nurses, other health professionals and patients'. Cronbach's alpha for the questions within this subheading were low at  $\alpha=0.517$ . The researcher considered removing this subheading from the analysis due to the low internal consistency score. It was noted however, that trends in question responses were also confirmed in the qualitative findings. For example, questions regarding policy and guidelines within this section were related to themes and subthemes in the qualitative stages. As section one only utilised frequency and percentages, this subheading was left in the study for the benefits noted in the qualitative phase. If this study is replicated, it will need further review of these subheading questions to gain an improvement in the internal consistency.
- Although the study contained a relatively small sample size, most of the results were significant. The significance observed indicated meaningful effect sizes. With a small sample size, however, caution must be applied, as the findings might not be transferable. In addition, as the study was presented in Western Australia, the findings may not relate other healthcare service sectors, or other universities nationally or internationally. As similar findings were noted in this study to literature

from around the world, however, the significance of the results may be applicable to other settings.

- The literature uncovered a number of other challenges to the clinical use of mobile technology such as issues of infection control, and risks relating to social media in healthcare settings. These issues were not found, but might be important to pursue in the future especially when developing guidelines and policies for the clinical use of mobile technology.
- This study did not involve older senior nurse peers in the design. Further research may benefit from this group's perspectives, since it uncovered older nurses particularly nurse leaders influence graduates.
- As participants were employed in Perth metropolitan hospitals perspectives of graduates in outer city hospitals and in country/rural areas were not sought. Thus, findings may not be as transferrable to these settings. Further research could focus on the perspectives of country and rural areas.
- During the data collection phase for the quantitative survey with graduates at one of the hospital sites, it was noted graduates commenced the online survey, but their time was cut short accidentally due to time constraints. This meant that graduates had completed only half of the survey, with most not completing section two (TAM2). An average time frame calculated from the survey website would assist in future planning.
- Nurse leader's perspectives were only collected in the qualitative phase of the study. Future research may benefit from quantitative surveys and would add more significance to qualitative findings.
- The TAM2 did not include voluntariness as a social influence in the present study. Voluntariness has been defined as the extent to which potential adopters of the technology or system perceive the adoption decision to be non-mandatory (Hartwick and Barki 1994). Voluntariness was used by the original authors of TAM2 as a moderating variable to distinguish between mandatory and voluntary usage of technology (Venkatesh & Davis, 2000). As clinical mobile technology use by graduates was a voluntary decision to adopt or reject, a comparison to mandatory usage was not applicable.
- Similarly, the TAM2 variable of experience was not included within the present study as a measured variable in the TAM2. The original authors of TAM2

found in their study, that as individuals gained direct experience with a system or technology over time, they relied less on social information in forming perceived usefulness and intention (Venkatesh & Davis, 2000). These results, however, were mainly applied to mandatory technology. As previous research (Davis et al. 1989) was found to have a less significant role on social influences such as voluntariness and experience in voluntary contexts, a decision was made to exempt these variables. Fisher's exact tests were applied to the demographic of time frames within the graduate program, which revealed mixed results.

### **Implications and recommendations of findings**

The findings of this study have a number of important implications for future practice and research. Thus, recommendations from study link into clinical, education and research considerations. The following recommendations include:

#### **Clinical.**

- A need for policies and/or guidelines that support clinical use of mobile technology. This would aid all staff in guiding the professional use of such technology. This initiative may reduce the current covert nature of its use by graduates. For example, policies or guidelines may need to be formulated at a broader Health Department level for public hospitals, to reduce inconsistencies and discrepancies noted within the study between the hospital sites.
- The involvement and engagement all relevant parties would be important when developing the policies and or guidelines, to gain a balanced perspective. Such people could include for example, end users such as the graduates, nurse leaders, IT staff, and academic staff from universities.
- Should policies or guidelines become available, then it would be the hospitals' responsibility to inform all staff. As demonstrated successfully from the literature in Canada for example, posters informing patients and visitors of the safe and professional use of mobile technology by staff may be useful. As a cultural shift is already occurring for education and clinical use of mobile technology with younger nurses and within the multidisciplinary team, their influence on older staff could be an important issue to consider. As suggested in the findings, ward in-service sessions demonstrating positive and professional use

in clinical settings, may assist in changing culture for older staff who may not be as familiar with mobile technology as a point of care resource.

- Hospital library departments may need to liaise with nurse leaders for clarity in what resources and mobile subscriptions are available for nurses at the point of care.
- A review of ward PC access for nursing staff may need to occur, due to the many challenges highlighted with access noted within the study. In addition, when the graduates were students, they faced issues with accessing ward PCs. A review of student access permission to essential ward PC based systems such as blood results, policies and guidelines may need to be conducted for students to access.
- When policies and guidelines are available, graduates may benefit from additional support for mobile technology use as a link from University to the clinical settings. An orientation that includes examples of professional, versus unprofessional use may be useful. Involving the hospital library staff to promote subscribed point of care resources available for all staff access, may reduce inconsistencies within the multidisciplinary team as to who can use these resources and to what extent in the clinical area. This initiative may assist in further bridging the gap between learning at University with point of care resources and what is available within clinical settings.
- Public hospitals should consider trials of portable devices such as iPads for use at the point of care. Building on the innovation from the private hospital sites, nurse leaders found these useful for flexible learning with graduates. Hospital support and training would be required, however, as challenges such as poor Internet access still exists at some sites. More research may be required, however, as graduates may prefer their own familiar device that conveniently fits into their pocket for use at the point of care.

### **Education.**

- Academics and hospital clinical educators/nurse leaders should work together to support transitions and bridge potential gaps in learning. This initiative is also based on motivations from nursing organisations and the need in industry for e-resources on mobile technology for patients and significant others. In addition, an



aim would also be to reduce the 'covert use' noted within the study, so students and graduates can feel empowered to use mobile technology professionally and appropriately when transitioning from University to clinical settings.

#### **University settings.**

- The encouragement of ongoing links with nurse academics and nurse leaders in clinical settings for clarity in encouraging appropriate, and agreed point of care resources. This would also encourage innovation and sharing of ideas and resources.
- A review of clinical practice rotation guidelines for student nurses in relation to the clinical use of mobile technology should be undertaken. It should be noted that graduates face challenges relation to use of personal smart phones being used by others in the clinical setting and passwords to PCs were not forthcoming when students are on their clinical rotation. Increased flexibility for students may be required by universities in the use of mobile technology on clinical practice rotations, as resources gained from University and from other nurses provided many perceived benefits noted at the point of care.

#### **Research.**

- An important issue for future research would be the association of personal, clinical use of mobile technology and the perception of improving medication safety. Further research is recommended should be conducted to investigate the link between using mobile technology at the point of care and the prevention of medication errors.
- Replication of this study on graduates in the rural areas of WA could benefit the progression of nursing knowledge and better patient care.
- Replication of this study with other health professionals could also benefit others in the multidisciplinary health care team.
- The perspectives of patients and significant others when staff are using clinical mobile technology would be valuable, as significant benefits highlighted by the graduates in this study may also be elicited by these groups.
- Future research in the use of mobile technology in nursing may benefit from the use of the TAM3 model, which combines TAM2 and the model of the determinants of perceived ease of use (Venkatesh & Bala, 2008).

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## List of Appendices

## Appendix 1: Sample Letter to Directors of Nursing & Midwifery (DON&M) at the hospital sites



19 Mouat St (PO Box 1225) Fremantle WA 6959  
+61 8 9433 0555 | [enquiries@nd.edu.au](mailto:enquiries@nd.edu.au)

Director of Nursing & Midwifery  
Hospital

Mr Benjamin Hay  
+61 8 9433 0262  
0433260047  
[Benjamin.hay@nd.edu.au](mailto:Benjamin.hay@nd.edu.au)

30<sup>th</sup> October 2015

Dear,

I am currently undertaking research for a Doctor of Philosophy (PhD) whilst being employed as a senior lecturer at the University of Notre Dame Australia on the Fremantle campus. The purpose of my study is to investigate **'The use of mobile technology by recently graduated registered nurses in Western Australia: A mixed method study.'** The aim is to identify and explore potential barriers to the use of mobile technology in the clinical areas of designated hospitals.

As an integral part of the research proposal, I hope to be able to obtain current information on policies or guidelines for nursing staff on the use of mobile technology within your organisation. Prior to my ethics applications for the study, I would be very grateful for a letter from your office providing provisional approval/support for access to these documents.

I have included my abstract from the proposed study. I would be happy to include more details as required for further information.

Thank you for your consideration of the above, and I look forward to your reply,  
Sincerely,

Benjamin Hay  
Senior Lecturer  
SONM, UNDA, Fremantle Campus

Broome Campus 88 Guy St (PO Box 2287) Broome WA 6725  
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[nd.edu.au](http://nd.edu.au)

## Appendix 2: Invite to expert reviewers



Dear Colleague,

I am currently enrolled as a PhD candidate at the University of Notre Dame Australia, School of Nursing and Midwifery. You are invited to take part in my research project, which is titled: *The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study.*

The research project investigates factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia. Previous studies have identified that student and graduate nurses are eager to use mobile technology in healthcare. Additionally, these studies have highlighted the potential benefits of such technology for nursing students and nurses. Currently there are few standardised policies issued by healthcare institutions to guide the use of mobile technology. There appears to be a potential gap between learning with mobile technology in the University setting and the clinical setting. The results of this study may lead to policies and guidelines being reviewed/developed by local healthcare agencies and may lead to review of current mobile technology integration into an undergraduate degree.

This proposed study seeks to answer the following questions:

1. What factors influence nurse graduates use of mobile technology in the clinical setting?
2. To what extent and in what ways do nurse graduates currently use mobile technology in the clinical setting? And;
3. What are the perceptions of nurse managers, nurse educators, coordinators of graduate programs of mobile technology in the clinical setting?

The research design will involve reviewing existing policy and guidelines regarding mobile technology use in the hospitals included in the study (SCGH; FSH; RPH and SJOGH-Murdoch and Subiaco). An online emailed survey to graduate registered nurses; a follow up text-based focus group to graduates; and an open ended survey with nurse managers and graduate program coordinators will all assist to answer the research questions.

I am inviting you to participate in the development of the online survey for this project. I require experienced nurses to help by reviewing the online survey questions to be posed to the graduate nurses. This will involve reading through the proposed questions, checking the clarity of the questions, internal consistency and validity and making any comments necessary to help refine the questions. Your completion of the survey will be considered as consent.

The project has been approved by the University of Notre Dame Australia Human Research Ethics Committee (015163F). Your privacy and the confidentiality of any information you provide is guaranteed. I hope you will be able to contribute to the study and look forward to receiving your feedback. Thanks for your involvement.

Kind regards

**Benjamin Hay**

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## Appendix 3: Expert reviewer instructions and survey

Factors influencing nurse graduates use of mobile technology in clinical settings in Perth, Western Australia.

Dear Colleague,

I invite you to contribute to the development of a survey that is part of my studies for a Doctor of Philosophy at the University of Notre Dame. The survey will be forwarded to registered nurses in the clinical settings who have recently graduated. I would be very grateful for your feedback on the survey tool. The research is titled: "The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study". The project has been approved by the University of Notre Dame's Human Research Ethics Committee. Your consent will be implied from the completion of the survey. If you require any further information, you are welcome to contact me as per my email or phone.

The guiding research questions for the study are as below:

Research questions.

- What factors influence nurse graduates use of mobile technology in the clinical setting?
- To what extent and in what ways do nurse graduates currently use mobile technology in the clinical setting?
- What are the perceptions of nurse managers, nurse educators, coordinators of graduate programs and nurse executives of mobile technology in the clinical setting?

The following online survey is based on the below literature topics and the guiding research questions:

Literature review topics:

- nursing students and graduates use of mobile technology;
- mobile technology in learning and teaching;
- mobile technology use by health professionals;
- policies and guidelines associated with mobile technology in the clinical setting; and
- factors influencing the use of mobile technology in healthcare (exploring the Technology Acceptance Model 2 [TAM2 model]).

Prior to test/retesting the survey tool with third year nursing students, your review of the questions for clarity, internal consistency and validity is important. Any comments will be valuable in refining the questions before the test/retesting of the survey tool occurs. Thank you for your feedback on the survey tool and I look forward to your response.

Your feedback is important in the following ways:

- (Clarity) Identifying for each question if it is clear or unclear (click either box)
- (Content Validity) Identifying if the content of each question relates or does not relate to the overall topic/heading?(click either box); and
- (Internal consistency) Identify if each question is measuring the overall topic and headings eg. 'Does this question belong in the survey?' and "Do these questions all generally belong in the survey tool?' These questions will be asked at the end of the survey.

## Demographics

Note to reviewer: All participants (Graduates) details will be kept anonymous and confidential. Participants will not be contacted via email unless they consent to a second phase of the research outlined at the end of the final version of the survey.

This section of the survey will collect basic demographic information on the new Graduate. If you feel there should be any changes in this section, feel free to add comments at the end of the survey in the text box provided. Please only enter your name and email address below as a reviewer. Questions 3-9 do not need to be answered by the reviewer.

1.

Name:

2. Email address:

3. Current Graduate program location (select one option below)

- Sir Charles Gairdner Hospital (SCGH)
- Fiona Stanley Hospital (FSH)
- Royal Perth Hospital (RPH)
- St. John of God Murdoch Hospital
- St. John of God Subiaco Hospital

4. Length of time within current graduate program (select one option below)

5. Age group range (select one option below)

- 20-25 years
- 26-30 years
- 31-40 years
- 41-45 years
- 46-50 years
- 51-55 years
- 56 & over

6. What is your gender?

- Female
- Male

7. Which University did you complete your undergraduate registered nursing degree (select an option below)

- The University of Notre Dame Australia
- Curtin University
- Edith Cowan University
- Murdoch University
- The University of Western Australia

Other (please specify)

8. Do you own a mobile technology device (like a smartphone/iPad/Tablet)?

- Yes
- No

9. Please select what mobile technology devices you own (select all that apply):

- Smartphone
- Tablet (ipad or similar)
- Laptop
- Smartwatch

**Please select the response which best describes how you feel about each question as it relates to nursing.**

**The term 'mobile technology' refers to any portable mobile devices that can connect to the internet. These may include any items such as smartphones, tablets, laptops and iPads.**

**Note for reviewer: Please review each question and select if the question is clear or unclear and indicate if it relates or does not relate to the overall topic/heading. Please make comments in the text box for any questions that you indicate are unclear and/or does not relate to the overall topic. Thank you**

10. Nursing graduates use of mobile technology *in the clinical area*

	The question is <b>clear</b>	The question is <b>unclear</b>	The content of the question <b>relates</b> to the overall topic/heading	The content of the question <b>does not relate</b> to the overall topic/content
10.1 I value accessing relevant clinical information on mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.2 I use mobile technology to find information for clinical application/s.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.3 When using mobile technology clinically, my self-confidence is improved.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.4 In the clinical area, I use a number of applications (apps) on mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.5 I use a number of eBooks clinically on mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.6 I use search engines like Google to access clinical information on mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.7 Using mobile technology clinically enables me to save time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.8 Using mobile technology clinically enables me to be more efficient.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.9 Using mobile technology clinically improves the safety and quality of my care.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.10 Using mobile technology clinically improves my organisational skills.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please make any comments below for the specific question/s you indicate that you feel might be unclear or does not relate to the overall topic/content: Eg. 10.1...

11. Mobile technology in learning and teaching relating to *the clinical setting*

	The question is <b>clear</b>	The question is <b>unclear</b>	The content of the question <b>relates</b> to the overall topic/heading	The content of the question <b>does not relate</b> to the overall topic/heading
11.1 Using mobile technology clinically improves my learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.2 Using mobile technology clinically improves the transition from theory to practice.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.3 The education and learning department of the hospital supports staff using mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.4 I am encouraged to use mobile technology for educational opportunities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.5 I would use mobile technology for ongoing learning in the clinical area if permitted.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please make any comments below for the specific question/s you indicate that you feel might be unclear or does not relate to the overall topic/content: eg. 11.1...

12. Mobile technology in learning and teaching relating to the University setting.

	The question is <b>clear</b>	The question <b>unclear</b>	The content of the question <b>relates</b> to the overall topic/heading	The content of the question <b>does not relate</b> to the overall topic/content
12.1 I used mobile technology on a daily basis for learning during my undergraduate RN degree.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.2 My university encouraged mobile technology for learning within my nursing studies.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.3 I valued using mobile technology for learning during my undergraduate RN degree.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.4 I used mobile technology for learning during my clinical practice rotations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.5 The transition from theory to practice was improved when using mobile technology during clinical practice rotations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please make any comments below for the specific question/s you indicate that you feel might be unclear or does not relate to the overall topic/content: eg. 12.1...

13. Mobile technology use by nurses and other health professionals

	The question is <b>clear</b>	The question is <b>unclear</b>	The content of the question <b>relates</b> to the overall topic/heading	The content of the question <b>does not relate</b> to the overall topic/heading
13.1 I regularly observe health professionals using mobile technology in the clinical area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.2 It is difficult to access PC/computers in my department/ward.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.3 I would prefer to access information on mobile technology than the ward PC/computer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.4 Patients may think I am using mobile technology for unprofessional reasons.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.5 Other staff may think I am using my mobile technology for unprofessional reasons.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.6 I regularly observe patients using their own mobile technology in their bed-spaces.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.7 Patients and significant others in my care ask for relevant resources relating to their health to access on their mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.8 I currently use mobile technology as an aid in educating the patient and significant others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.9 If permitted, I would use mobile technology as an aid in educating the patient and significant others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please make any comments below for the specific question/s you indicate that you feel might be unclear or does not relate to the overall topic/content: eg. 13.1...



14. Policies and guidelines associated with mobile technology in the clinical setting

	The question is <b>clear</b>	The question is <b>unclear</b>	The content of the question <b>relates</b> to the overall topic/heading	The content of the question <b>does not relate</b> to the overall topic/heading
14.1 Nurse managers/supervisors of my <b>department/ward</b> supports nurses using mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.2 Nurse managers/supervisors of the <b>hospital</b> supports nurses using mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.3 Departments such as the hospital library, supports <b>all</b> staff using mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.4 Departments such as the hospital library, supports <b>nursing</b> staff using mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.5 I am aware of a hospital guideline or policy that guides the use of mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.6 I would value accessing hospital policies and area specific guidelines for nursing care from mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.7 I would value a hospital policy or guideline that would guide the use of mobile technology for clinical application.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please make any comments below for the specific question/s you indicate that you feel might be unclear or does not relate to the overall topic/content: eg. 14.1...

Factors influencing nurse graduates use of mobile technology in clinical settings in Perth, Western Australia.

Please select the response which best describes how you feel about each question as it relates to nursing in the clinical area.

The term 'mobile technology' refers to any portable mobile devices that can connect to the internet. These may include items such as smartphones, tablets, laptops and iPads.

15. Factors influencing the use of mobile technology in healthcare (TAM 2 Model)

	The question is <b>clear</b>	The question is <b>unclear</b>	The content of the question <b>relates</b> to the overall topic/heading	The content of the question <b>does not relate</b> to the overall topic/heading
15.1 Assuming I have access to mobile technology, I intend to use it.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.2 Given that I have access to mobile technology, I predict that I would use it.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.3 Using mobile technology improves my performance in my job.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.4 Using mobile technology in my job increases my productivity.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.5 Using mobile technology enhances my effectiveness in my job.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.6 I find mobile technology to be useful in my job.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.7 My interaction with mobile technology is clear and understandable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.8 Interacting with mobile technology does not require a lot of my mental effort.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.9 I find mobile technology to be easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.10 I find it easy to get mobile technology to do what I want it to do.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.11 People (nurse managers/ supervisors) who influence my behaviour think that I should use mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.12 People (nurse managers/ supervisors) who are important to me think that I should use mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	The question is <b>clear</b>	The question is <b>unclear</b>	The content of the question <b>relates</b> to the overall topic/heading	The content of the question <b>does not relate</b> to the overall topic/heading
15.13 People in my organization who use mobile technology have more prestige than those who do not.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.14 People in my organization who use mobile technology have a high profile.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.15 Having mobile technology is a status symbol in my organization.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.16 In my job, usage of mobile technology is important.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.17 In my job, usage of mobile technology is relevant.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.18 The quality of the output I get from my mobile technology is high in the clinical area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.19 I have no problem with the quality of my mobile technology's output in the clinical area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.20 I have no difficulty telling others about the results of using mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.21 I believe I could communicate to others the consequences of using mobile technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.22 The results of using mobile technology are apparent to me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.23 I would have difficulty explaining why using mobile technology may or may not be beneficial.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please make any comments below for the specific question/s you indicate that you feel might be unclear or does not relate to the overall topic/content:

**This final section relates to the internal consistency of the survey. Please answer the final questions below based on the survey**

16. Do all of the questions belong in the survey? If not please indicate below.

- Yes
- No
- Comments

17. Are all the questions grammatically correct?

- Yes
- No
- Comments

18. Are the questions free from jargon?

- Yes
- No
- Comments

19. Can any of the questions be open to alternative interpretation?

- Yes
- No
- Comments

20. Do you have any other comments, questions, or concerns?

The end of the survey feedback!

**Thank you so much for your valuable time and expertise in completing the feedback. I really appreciate it!**

## Appendix 4: Expert reviewer results

### Results of Section One:

Table 36

*Nursing Graduate's Use of Mobile Technology in the Clinical Setting: Expert Panel Review*

Question (N=6)	Clear	Unclear	*Content relates to overall topic/hea ding	*Content does not relate to overall topic/hea ding
10.1 I value accessing relevant clinical information on mobile technology	6	0	5	0
10.2 I use mobile technology to find information for clinical application/s	6	0	5	0
10.3 When using mobile technology clinically, my self-confidence is improved	5	1	4	1
10.4 In the clinical area, I use a number of applications (apps) on mobile technology	6	0	5	0
10.5 I use a number of eBooks clinically on mobile technology	5	1	5	0
10.6 I use search engines like Google to access clinical information on mobile technology	5	1	5	0
10.7 Using mobile technology clinically enables me to save time	6	0	5	0
10.8 Using mobile technology clinically enables me to be more efficient	6	0	5	0
10.9 Using mobile technology clinically improves the safety and quality of my care	6	0	5	0
10.10 Using mobile technology clinically improves my organisational skills	6	0	5	0
<b>*Note only 5 reviewers for this question</b>				

Reviewer 1 for **Question 10.3 ‘When using mobile technology clinically, my self-confidence is improved’** felt (as indicated in the textbox for additional comments): ‘not sure what self-confidence relates to? Is this personal/self-esteem or clinical attribute you are trying to elicit?’ As the topic content is: ‘*Nursing graduates use of mobile technology in the clinical area*’, the question was slightly reworded for the test-retest to: ‘When using mobile technology clinically, my self-confidence *clinically* is improved’.

Table 37

*Mobile Technology in Learning and Teaching Relating to the Clinical Setting:  
Expert Panel Review*

<b>Question (N=6)</b>	<b>Clear</b>	<b>Unclear</b>	<b>Content relates to overall topic/heading</b>	<b>Content does not relate to overall topic/heading</b>
11.1 Using mobile technology clinically improves my learning	6	0	6	0
11.2 Using mobile technology clinically improves the transition from theory to practice	5	1	6	0
11.3 The education and learning department of the hospital supports staff using mobile technology	6	0	6	0
11.4 I am encouraged to use mobile technology for educational opportunities.	6	0	6	0
11.5 I would use mobile technology for ongoing learning in the clinical area if permitted	6	0	6	0

Table 38

*Mobile Technology in Learning and Teaching Relating to the University Setting:  
Expert Panel Review*

Question (N=6)	Clear	Unclear	Content relates to overall topic/heading	Content does not relate to overall topic/heading
12.1 I used mobile technology on a daily basis for learning during my undergraduate RN degree	6	0	6	0
12.2 My University encouraged mobile technology for learning within my nursing studies	6	0	6	0
12.3 I valued using mobile technology for learning during my undergraduate RN degree	6	0	*5	*0
12.4 I used mobile technology for learning during my clinical practice rotations	6	0	5	1
12.5 The transition from theory to practice was improved when using mobile technology during clinical practice rotations	5	1	5	1
<b>*Note only 5 reviewers for this question</b>				



Table 39

*Mobile Technology Use by Nurses and Other Health Professionals: Expert Panel Review*

<b>Question (N=6)</b>	<b>Clear</b>	<b>Unclear</b>	<b>Content relates to overall topic/heading</b>	<b>Content does not relate to overall topic/heading</b>
13.1 I regularly observe health professionals using mobile technology	6	0	6	0
13.2 It is difficult to access PC/computers in my department/ward	6	0	5	1
13.3 I would prefer to access information on mobile technology than the ward PC/computer	5	1	6	0
13.4 Patients may think I am using mobile technology for unprofessional reasons	6	0	6	0
13.5 Other staff may think I am using my mobile technology for unprofessional reasons	6	0	6	0
13.6 I regularly observe patients using their own mobile technology in their bedspaces	6	0	5	1
13.7 Patients and significant others in my care ask me for relevant resources relating to their health to access on their mobile technology	5	1	5	1
13.8 I currently use mobile technology as an aid in educating the patient and significant others	6	0	6	0
13.9 If permitted, I would use mobile technology as an aid in educating the patient and significant others	6	0	6	0

Table 40

*Policies and Guidelines Associated with Mobile Technology in the Clinical Setting:  
Expert Panel Review*

<b>Question (N=6)</b>	<b>Clear</b>	<b>Unclear</b>	<b>Content relates to overall topic/heading</b>	<b>Content does not relate to overall topic/heading</b>
14.1 Nurse managers/supervisors of my department/ward supports nurses using mobile technology	6	0	5	1
14.2 Nurse managers/supervisors of the hospital supports nurses using mobile technology	5	1	5	1
14.3 Departments such as the hospital library, supports all staff using mobile technology	6	0	5	1
14.4 Departments such as the hospital library, supports all nursing staff using mobile technology	6	0	5	1
14.5 I am aware of a hospital guideline or policy that guides the use of mobile technology	6	0	6	0
14.6 I would value accessing hospital policies and area specific guidelines for nursing care from mobile technology	6	0	6	0
14.7 I would value a hospital policy or guideline that would guide the use of mobile technology for clinical application	5	1	6	0

**Results of Section Two:**

Table 41

*Factors Influencing the Use of Mobile Technology in Healthcare (TAM2): Expert Panel Review*

<b>Question (N=6)</b>	<b>Clear</b>	<b>Unclear</b>	<b>*Content relates to overall topic/heading</b>	<b>*Content does not relate to overall topic/heading</b>
15.1 Assuming I have access to mobile technology, I intend to use it	5	1	6	0
15.2 Given that I have access to mobile technology, I predict that I would use it	5	1	6	0
15.3 Using mobile technology improves my performance in my job	6	0	6	0
15.4 Using mobile technology in my job increases my productivity	6	0	6	0
15.5 Using mobile technology enhances my effectiveness in my job	6	0	6	0
15.6 I find mobile technology to be useful in my job	6	0	6	0
15.7 My interaction with mobile technology is clear and understandable	4	2	5	1
15.8 Interacting with mobile technology does not require a lot of my mental effort	5	1	6	0
15.9 I find mobile technology to be easy to use	6	0	6	0
15.10 I find it easy to get mobile technology to do what I want it to do	6	0	6	0
15.11 People (nurse managers/supervisors) who influence my behavior think that I should use mobile technology	5	1	*5	*0
15.12 People (nurse managers/supervisors) who are important to me think that I should use mobile technology	5	1	6	0

15.13 People in my organisation who use mobile technology have more prestige than those who do not	5	1	6	0
15.14 People in my organisation who use mobile technology have a high profile	5	1	6	0
15.15 Having mobile technology is a status symbol in my organisation	6	0	6	0
15.16 In my job, usage of mobile technology is important	6	0	6	0
15.17 In my job, usage of mobile technology is relevant	6	0	6	0
15.18 The quality of the output I get from my mobile technology is high in the clinical area	3	3	5	1
15.19 I have no problem with the quality of my mobile technology's output in the clinical area	3	3	5	1
15.20 I have no difficulty telling others about the results of using mobile technology	5	1	6	0
15.21 I believe I could communicate to others the consequences of using mobile technology	3	3	6	0
15.22 The results of using mobile technology are apparent to me	6	0	6	0
15.23 I would have difficulty explaining why using mobile technology may or not be beneficial	6	0	6	0

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**\*Note only 5 reviewers for this question**

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For question **15.7 My interaction with mobile technology is clear and understandable** the expert panel 4 (66.67%) indicated the question is clear where 2 (33.33%) indicated the question was unclear.

For Questions **15.18 The quality of the output I get from my mobile technology is high in the clinical area**; and **15.19 I have no problem with the quality of my mobile technology's output in the clinical area**, the expert panel indicated that 3 (50%) felt the question was clear with the other half indicating it was unclear.

Comments included: Reviewer 2: ...'not sure what this means: The quality of data which I access via my mobile device is high quality?' Reviewer 3: '...Not sure what

you mean by output?’. Reviewer 4: ‘..I think this could read better’. Note however that for these questions, 5 (83.33%) reviewers still felt these questions related to the overall topic/heading.

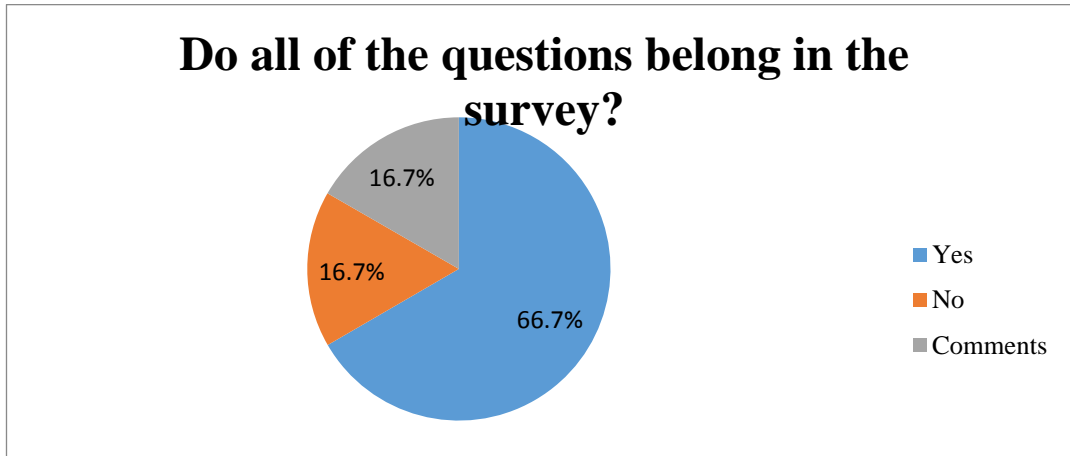


Figure 71. Expert review indicating if all questions belong in the survey.

Reviewer 1: ‘See my comments on previous pages - where I have not been sure of the meaning of the question, I could not say whether they were relevant questions or not.’

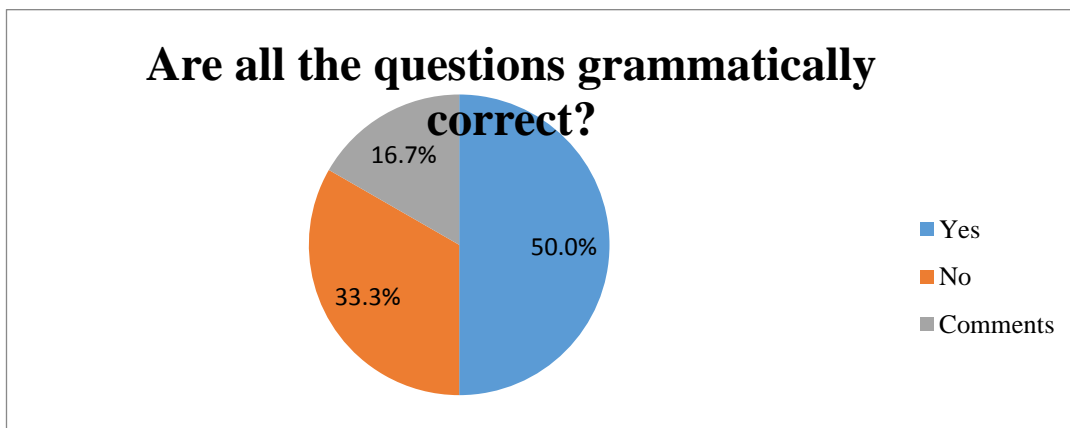
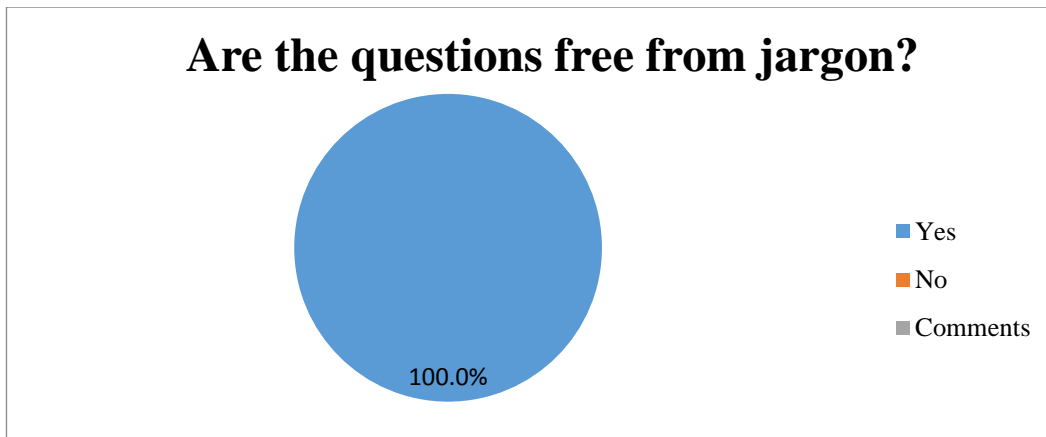


Figure 72. Expert review indicating if all questions are grammatically correct.

Reviewer 1 indicated in a comment box: ‘I think some could read differently to help interpretation issues’.



*Figure 73.* Expert review indicating if all questions are free from jargon.

## Appendix 5: Test-retest information sheet



### **INFORMATION SHEET**

**Title of study:** *The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study*

Dear Participant

You are invited to participate in the research project described below.

***The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study.***

#### ***What is the project about?***

The research project investigates factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia. Previous studies have identified that student and graduate nurses are keen to use mobile technology in healthcare. Additionally, these studies have highlighted the potential benefits of such technology for nursing students and nurses. The benefits have included: increased self-confidence; enhanced learning with integration from theory to practice; improved efficiency; time saving; organisation improvements in information sharing; and most importantly, improved safety and quality of care.

Anecdotal evidence suggests that graduates have experienced challenges in using mobile technology for learning in the clinical setting. Given the potential benefits of such technology it is pertinent to investigate the factors influencing its use in WA hospitals.

#### ***Who is undertaking the project?***

This project is being conducted by Benjamin Hay and will form the basis for the degree of Doctor of Philosophy at The University of Notre Dame Australia, under the supervision of Dr Carol Piercey.

#### ***What will I be asked to do?***

If you consent to take part in this study, it is important that you understand the purpose of the study and the tasks you will be asked to complete. Please make sure that you ask any questions you may have, and that all your questions have been answered to your satisfaction before you agree to participate. Your consent will be implied from the completion of the survey.

**For current semester five (final year) students:**

You are invited to participate in the research project in the following way:

1. **Completing the online survey**—via the emailed hyperlink (estimated <10mins completion). This phase of the research involves a **test/retest** of the survey tool as you are current semester five (final year) students and are nearing graduation. I would be very grateful if you could complete the surveys within the dates allocated. The 'Test 1' survey will be required to be completed within a set date. Within two weeks, I will send the 'Test 2' survey via email for you to complete once more within a set date. This two stage, same survey process enables statistical testing of the survey tool and will provide important insights and trends from your valued responses.

***Are there any risks associated with participating in this project?***

There is no foreseeable risk in you participating in this research project. Although the researcher may be a lecturer or tutor during this time, you are under no pressure to complete this survey and the choice not to participate will not prejudice assessments/grades, now or in the future.

***What are the benefits of the research project?***

This study is significant in that currently there are few standardised policies issued by healthcare institutions to guide the use of mobile technology. There appears to be a potential gap between learning with mobile technology in the University setting and the clinical setting. The results of this study may lead to policies and guidelines being reviewed/developed by local healthcare agencies and may lead to review of current mobile technology integration into an undergraduate degree.

***What if I change my mind?***

Participation in this study is completely voluntary and should you agree to participate you cannot be identified in the online survey.

***Will anyone else know the results of the project?***

Information gathered about you will be held in strict confidence. This confidence will only be broken if required by law.

If you agree to participate in this study, any information collected will **not** be disclosed to anyone else. Information that might identify you will **not** be used in either the analysis, or any potential publications. Once the study is completed, the data collected from you will be de-identified and stored securely in the School of Nursing and Midwifery at The University of Notre Dame Australia for at least a period of five years. The data may be used in future research but you will not be able to be identified. The results of the study will be published as a journal article/thesis/book chapter.

***Will I be able to find out the results of the project?***

Once we have analysed the information from this study we will email a summary of our findings. You can expect to receive this feedback in two years' time.



***Who do I contact if I have questions about the project?***

If you have any questions about this project please feel free to contact either myself [Benjamin.hay@nd.edu.au](mailto:Benjamin.hay@nd.edu.au) or my supervisor, Dr Carol Piercey, [carol.piercey1@nd.edu.au](mailto:carol.piercey1@nd.edu.au) My supervisor and I are happy to discuss with you any concerns you may have about this study.

***What if I have a concern or complaint?***

The study has been approved by the Human Research Ethics Committee at The University of Notre Dame Australia (approval number 015163F). If you have a concern or complaint regarding the ethical conduct of this research project and would like to speak to an independent person, please contact Notre Dame's Ethics Officer at (+61 8) 9433 0943 or [research@nd.edu.au](mailto:research@nd.edu.au). Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

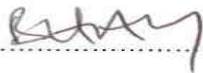
***How do I sign up to participate?***

If you are happy to participate, please click on the following link to the survey as directed in the email.

Thank you for your time. This sheet is for you to keep.

Yours sincerely,

Benjamin Hay



.....

## Appendix 6: Test-retest PowerPoint promotion

**SEMESTER 5 STUDENTS**

A FORMAL INVITATION TO PARTICIPATE IN RESEARCH: BENJAMIN HAY

*What is it about?*

- The research project investigates factors influencing nurse graduates use of mobile technology in clinical settings in Perth, Western Australia.

*How can you contribute?*

- The research forms part of progression towards a PhD qualification and the survey tool used in the study requires test/retesting. As you are nearing graduation and are final year students, you are perfectly placed to test the online survey tool. You can assist in two ways by completing two surveys within a two week timeframe.
- I would be very grateful if you can complete **TEST1** and then within the two week timeframe, **TEST2** when notified. **Both will be emailed to you with a hyperlink to the 10-12min survey along with an information sheet.** The surveys TEST1 and TEST2 are the same but this two stage, same survey process enables statistical testing of the survey tool and will provide important insights and trends from your valued responses.
- Please note, as the test/retest requires comparison between TEST1 and TEST2 based on your responses, it is important that if you attempt TEST1, you would need to complete TEST2 when it is available in the next week.

Thank you in advance for your valuable time in completing the surveys!

Please contact me if you have any questions: [Benjamin.hay@nd.edu.au](mailto:Benjamin.hay@nd.edu.au)

**Disclaimer:** Although the researcher may be a lecturer or tutor during this time, you are under no pressure to complete this survey and the choice not to participate will not prejudice assessments/grades, now or in the future.

## Appendix 7: Kappa Scores

Table 42

*Kappa Scores and Percentage Agreement: Nursing Graduates Use of Mobile Technology in the Clinical Setting*

<i>Subheading: Nursing graduates use of mobile technology in the clinical setting</i>	<b>Kappa result 3 scale likert</b>	<b>% agreement</b>
8.1 I value accessing relevant clinical information on mobile technology.	23/23	100%
8.2 I use mobile technology to find information for clinical application/s.	.313	21/23 91%
8.3 When using mobile technology clinically, my self-confidence clinically is improved.	-.117	18/23 78.3%
8.4 In the clinical area, I use a number of applications (apps) on mobile technology.	.332	14/23 60.9%
8.5 I use eBooks on my mobile technology device to access clinical information.	.462	16/23 69.6%
8.6 I use search engines like Google on my mobile technology device to access clinical information.	1.000	23/23 100%
8.7 Using mobile technology clinically enables me to save time.	.646	21/23 91%
8.8 Using mobile technology clinically enables me to be more efficient.	-.045	21/23 91%
8.9 Using mobile technology clinically improves the safety and quality of my care.	.558	21/23 91%
8.10 Using mobile technology clinically improves my organisational skills.	.558	19/23 82%

Note: Fleiss's evaluation criteria for improved visual representation: poor < 0.40, fair = 0.40–0.599, Good = 0.60–0.749, excellent ≥ 0.75 (Fleiss, 1981).

Table 43

*Kappa Scores and Percentage Agreement: Mobile Technology in Learning and Teaching Relating to the Clinical Setting*

<b>Subheading: Q9 Mobile technology in learning and teaching relating to the clinical setting</b>	Kappa result 3 scale likert	% agreement
9.1 Using mobile technology clinically improves my learning.	23/23	100
9.2 Using mobile technology clinically improves the transition from theory to practice.	23/23	100
9.3 The education and learning department of the hospital supports staff using mobile technology.	.515	16/23 69%
9.4 I am encouraged to use mobile technology for educational opportunities.	.425	15/23 65%
9.5 I would use mobile technology for ongoing learning in the clinical area if permitted.	23/23	100

Note: Fleiss's evaluation criteria for improved visual representation: poor < 0.40, fair = 0.40–0.599, Good = 0.60–0.749, excellent 0.75 (Fleiss, 1981).

Table 44

*Kappa Scores and Percentage Agreement: Mobile Technology in Learning and Teaching Relating to the University Setting and Clinical Practice Rotations*

<b>Subheading: Q10 Mobile technology in learning and teaching relating to the University setting and clinical practice rotations</b>	Kappa result 3 scale likert	% agreement
10.1 I used mobile technology on a daily basis for learning during my undergraduate nursing degree.	23/23	100
10.2 My University encouraged mobile technology for learning within my undergraduate nursing degree.	.733	22/23 95%
10.3 I valued using mobile technology for learning during my undergraduate nursing degree.	23/23	100
10.4 I used mobile technology for learning during my clinical practice rotations.	.632	19/23 82%
10.5 The application of theory to practice was improved when using mobile technology during clinical practice rotations.	.481	17/23 73%

Note: Fleiss's evaluation criteria for improved visual representation: poor < 0.40, fair = 0.40–0.599, Good = 0.60–0.749, excellent 0.75 (Fleiss, 1981).

Table 45

*Kappa Scores and Percentage Agreement: Mobile Technology Use by Nurses, Other Health Professionals and Patients*

<b>Subheading: Q11 Mobile technology use by nurses, other health professionals and patients</b>	Kappa result 3 scale likert	% agreement
11.1 I regularly observe health professionals using mobile technology in the clinical area.	.709	19/23 82%
11.2 In my experience, it is difficult to access PC/computers in my department/ward.	.759	21/23 91%
11.3 I would prefer to access information on mobile technology rather than the ward PC/computer.	.23/23	100
11.4 Patients may think I am using mobile technology for unprofessional reasons.	.349	20/23 87%
11.5 Other staff may think I am using my mobile technology for unprofessional reasons.	.652	22/23 96%
11.6 I regularly observe patients using their own mobile technology in their bed-spaces.	.313	22/23 96%
11.7 Patients and significant others in my care ask me how to access relevant resources relating to their health by using their mobile technology.	.538	17/23 74%
11.8 I currently use mobile technology as an aid in educating the patient and significant others.	.506	16/23 70%
11.9 If permitted, I would use mobile technology as an aid in educating the patient and significant others.	-.045?	22/23 96%

Note: Fleiss's evaluation criteria for improved visual representation: poor < 0.40, fair = 0.40–0.599, Good = 0.60–0.749, excellent = 0.75 (Fleiss, 1981).

Table 46

*Kappa Scores and Percentage Agreement: Policies and Guidelines Associated with Mobile Technology in the Clinical Setting*

<b>Subheading: Q12 Policies and guidelines associated with mobile technology in the clinical setting</b>	Kappa result 3 scale likert	% agreement
12.1 Nurse managers/supervisors of my department/ward support nurses using mobile technology.	.447	15/23 65%
12.2 Senior nurse managers/supervisors of the hospital support nurses using mobile technology	.437	15/23 65%
12.3 Departments such as the hospital library, support all staff using mobile technology.	.309	16/23 70%
12.4 Departments such as the hospital library, support nursing staff using mobile technology.	.300	16/23 70%
12.5 I am aware of a hospital guideline or policy that guides the use of mobile technology.	.410	15/23 65%
12.6 I would value being able to use mobile technology to access hospital policies and area specific guidelines for nursing care.	23/23	100
12.7 I would value a hospital policy or guideline that would guide health professionals in the use of mobile technology in the clinical area.	23/23	100

Note: Fleiss's evaluation criteria for improved visual representation: poor < 0.40, fair = 0.40–0.599, Good = 0.60–0.749, excellent = 0.75 (Fleiss, 1981).

Table 47

*Kappa Scores and Percentage Agreement: Factors Influencing the Use of Mobile Technology in Healthcare (TAM2)*

<b>Subheading: Q13 Factors influencing the use of mobile technology in healthcare (TAM2)</b>	Kappa result 3 scale likert	% agreement
13.1 Assuming I have access to mobile technology, I intend to use it.	23/23	100
13.2 Given that I have access to mobile technology, I predict that I would use it.	.646	22/23 96%
13.3 Using mobile technology improves my performance in my job.	.839	22/23 96%
13.4 Using mobile technology in my job increases my productivity.	.143	17/23 74%
13.5 Using mobile technology enhances my effectiveness in my job.	.629	21/23 91%
13.6 I find mobile technology to be useful in my job.	-.117?	18/23 78%
13.7 My interaction with mobile technology is clear and understandable.	.646	22/23 96%
13.8 Interacting with mobile technology does not require a lot of my mental effort.	.011?	15/23 65%
13.9 I find mobile technology to be easy to use.	.489	22/23 96%
13.10 I find it easy to get mobile technology to do what I want it to do.	.313	22/23 96%
13.11 People (nurse managers/supervisors) who influence my behaviour think that I should use mobile technology.	.452	15/23 65%
13.12 People (nurse managers/supervisors) who are important to me think that I should use mobile technology.	.341	13/23 57%
13.13 People in my organization who use mobile technology have more prestige than those who do not.	.268	13/23 57%
13.14 People in my organization who use mobile technology have a high profile.	.315	13/23 57%
13.15 Having mobile technology is a status symbol in my organization.	.320	13/23 57%
13.16 In my job, usage of mobile technology is important.	.265	16/23 70%
13.17 In my job, usage of mobile technology is relevant.	.569	21/23 91%
13.18 The quality of the output I get from my mobile technology is high in the clinical area.	.420	17/23 74%
13.19 I have no problem with the quality of my mobile technology's output in the clinical area.	.455	19/23 83%
13.20 I have no difficulty telling others about the results of using mobile technology.	.355	20/23 87%

13.21 I believe I could communicate to others the consequences of using mobile technology.	.349	20/23 87%
13.22 The results of using mobile technology are apparent to me.	.646	22/23 96%
13.23 I would have difficulty explaining why using mobile technology may or may not be beneficial.	.447	18/23 78%

Note: Fleiss's evaluation criteria for improved visual representation: poor  $< 0.40$ , fair =  $0.40-0.599$ , Good =  $0.60-0.749$ , excellent  $\geq 0.75$  (Fleiss, 1981).



## Appendix 8: Sample PICF (SCGH)

Page 1 of 4

### Participant Information Sheet/Consent Form

Sir Charles Gairdner Hospital-SCGH  
*Graduate Participation Information Sheet/Consent Form*

<b>Title</b>	The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study.
<b>Protocol Number</b>	2016-037
<b>Project Sponsor</b>	The University of Notre Dame Australia
<b>Coordinating Principal Investigator/ Principal Investigator</b>	Benjamin Hay
<b>Associate Investigator(s)</b>	Dr Carol Piercey (Research Supervisor)
<b>Location</b>	SCGH

#### Part 1 What does my participation involve?

##### 1 Introduction

You are invited to take part in this research project, which is called: *The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study.*

You have been invited because evidence suggests that graduates have experienced challenges in using mobile technology for learning in the clinical setting. Given the potential benefits of such technology, it is important to investigate what influences its use in WA hospitals. Your contact details were obtained from the Graduate Program Coordinator.

This Participant Information Sheet/Consent Form tells you about the research project. It explains the processes involved with taking part. Knowing what is involved will help you decide if you want to take part in the research.

Please read this information carefully. Ask questions about anything that you don't understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a colleague, relative, friend or local health worker.

Participation in this research is voluntary. If you don't wish to take part, you don't have to.

If you decide you want to take part in the research project, you will be asked to sign the consent section. By signing it you are telling us that you:

- Understand what you have read
- Consent to take part in the research project
- Consent to be involved in the research described
- Consent to the use of your personal and health information as described.

You will be given a copy of this Participant Information and Consent Form to keep.

##### 2 What is the purpose of this research?

The research project investigates what influences nurse graduates use of mobile technology in clinical settings in Perth Western Australia. Previous studies have identified that student and graduate nurses are eager to use mobile technology in healthcare. These studies have shown

the potential benefits of such technology for nursing students and nurses. The benefits have included: increased self-confidence; enhanced learning with integration from theory to practice; improved efficiency; time saving; organisation improvements in information sharing; and most importantly, improved safety and quality of care.

At the moment there few standardised policies within healthcare to guide the use of mobile technology. There appears to be a gap between learning with mobile technology in the university setting and the clinical setting. The results of this study may lead to policies and guidelines being reviewed/developed by local healthcare agencies and may lead to review of current mobile technology integration into an undergraduate degree. The results of this research will be used by the researcher Benjamin Hay to obtain a Doctor of Philosophy degree through the University of Notre Dame Australia.

### **3 What does participation in this research involve?**

You are invited to participate in the research project in two ways:

**1. Completion of an online survey**—via the emailed hyperlink (estimated 10mins completion) <https://www.surveymonkey.com/r/MV237NT>; and an optional

**2. Follow up text based-only focus group.** The text based focus group will be undertaken using Skype. The focus groups will be conducted with no video or audio being recorded with only the transcripts of the text responses stored by the researcher.

These stages within the research will assist to answer the above research questions.

### **4 Other relevant information about the research project**

This proposed study seeks to answer the following questions:

1. What influences nurse graduates use of mobile technology in the clinical setting?
2. To what extent and in what ways do nurse graduates currently use mobile technology in the clinical setting? and;
3. What are the perceptions of nurse managers, nurse educators, coordinators of graduate programs and nurse executives of mobile technology in the clinical setting?

The research involves reviewing existing policy and guidelines regarding mobile technology use in the hospitals included in the study (SCGH; FSH; RPH and SJOGH-Murdoch and Subiaco). An online emailed survey to graduate registered nurses; a follow up text-based focus group to graduates; and a catered face to face focus group with nurse managers, nurse executives and graduate program coordinators will all assist to answer the research questions.

### **5 Do I have to take part in this research project?**

Participation in any research project is voluntary. If you do not wish to take part, you do not have to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. Your decision whether to take part or not to take part, or to take part and then withdraw, your relationship with professional staff or your relationship within your graduate program at the Hospital.

If you do decide to take part, you will be given this Participant Information to sign and you will be given a copy to keep.

### **6 What are the possible benefits of taking part?**

We cannot guarantee or promise that you will receive any benefits from this research. However, the results of this study may lead to policies and guidelines being reviewed/developed by local healthcare agencies and Hospitals and may lead to review of current mobile technology integration into an undergraduate degree.

**7 What are the possible risks and disadvantages of taking part?**

There is no foreseeable risk in you participating in this research project.

**10 What happens when the research project ends?**

Once we have analysed the information from this study we can email a summary of our findings on request. You can expect to receive this feedback in two years' time. If you have any questions about this project please feel free to contact either myself [Benjamin.hay@nd.edu.au](mailto:Benjamin.hay@nd.edu.au) or my supervisor, Dr Carol Piercey, [carol.piercey1@nd.edu.au](mailto:carol.piercey1@nd.edu.au) My supervisor and I are happy to discuss with you any concerns you may have about this study.

**Part 2 How is the research project being conducted?**

**11 What will happen to information about me?**

By completing the online survey, you consent to the research team collecting and using personal information about you for the research project. Any information obtained in connection with this research project that can identify you will remain confidential. Any information collected will **not** be disclosed to anyone else. Information that might identify you will **not** be used in either the analysis, or any potential publications. Once the study is completed, the data collected from you will be de-identified and stored securely in the School of Nursing and Midwifery at The University of Notre Dame Australia for at least a period of five years. The data may be used in future research but you will not be able to be identified (if applies). The results of the study will be published as a journal article/thesis/book chapter.

Your information will only be used for the purpose of this research project and it will only be disclosed with your permission, except as required by law.

The personal information that the research team collect and use is your survey responses to the questions; your email contact details if you consent to Stage 2 for participation in the text-based focus groups, and your text-based personal responses used for analysis of potential trends.

In accordance with relevant Australian and/or Western Australian privacy and other relevant laws, you have the right to request access to the information about you that is collected and stored by the research team. You also have the right to request that any information with which you disagree be corrected. Please inform the research team member named at the end of this document if you would like to access your information.

**12 Complaints and compensation**

If you suffer any distress as a result of this research project, you should contact the research team as soon as possible. You will be assisted with arranging appropriate treatment and support. It is recommended you refer to the SCGG HREC for any complaints or feedback.

**13 Who is organising and funding the research?**

This research project is being conducted by Benjamin Hay as part of a Doctor of Philosophy through The University of Notre Dame, Australia in conjunction with SCGH.

**14 Who has reviewed the research project?**

All research in Australia involving humans is reviewed by an independent group of people called a Human Research Ethics Committee (HREC).

The ethical aspects of this research project have been approved by the HREC of the University of Notre Dame Australia and the Sir Charles Gairdner Group HREC.

This project will be carried out according to the *National Statement on Ethical Conduct in Human Research (2007)*. This statement has been developed to protect the interests of people who agree to participate in human research studies.

**15 Further information and who to contact**

The person you may need to contact will depend on the nature of your query. If you want any further information concerning this project or if you have any problems which may be related to your involvement in the project, you can contact the researcher on 08 94330262 or any of the following people: Research supervisor: Dr Carol Piercey, [carol.piercey1@nd.edu.au](mailto:carol.piercey1@nd.edu.au)

**Research contact person**

Name	<i>Benjamin Hay</i>
Position	<i>Senior Lecturer, PhD Candidate</i>
Telephone	<i>08 94330262</i>
Email	<i>Benjamin.hay@nd.edu.au</i>

For matters relating to research at the site at which you are participating, the details of the local site complaints person are:

**Complaints contact person**

Name	<i>Notre Dame's Ethics Officer</i>
Position	<i>Ethics Officer, Research Office</i>
Telephone	<i>08 94330943</i>
Email	<i>research@nd.edu.au</i>

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about being a research participant in general, then you may contact:

**Reviewing HREC approving this research and HREC Executive Officer details**

Reviewing HREC name	<i>Sir Charles Gairdner Group Human Research Ethics Committee</i>
Telephone	<i>93462999</i>
Email	<i>Hrec.scgh@health.wa.gov.au</i>

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## Appendix 9: Formal invitation letter to graduates



19 Mouat St (PO Box 1225) Fremantle WA 6959  
+61 8 9433 0555 | enquiries@nd.edu.au

Ms/Mr Graduate registered nurse

Sir Charles Gairdner Hospital

Mr Benjamin Hay

+61 8 9433 0262

0433260047

[Benjamin.hay@nd.edu.au](mailto:Benjamin.hay@nd.edu.au)

10 November 2016

Dear Graduate Registered Nurse,

I am currently undertaking research for a Doctor of Philosophy (PhD) whilst being employed as a senior lecturer at the University of Notre Dame Australia on the Fremantle campus. The purpose of my study is to investigate: **'The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study'**.

The aim is to identify and explore potential barriers to the use of mobile technology in the clinical areas of designated hospitals. This study is significant in that there appears to be a potential gap between learning with mobile technology in universities and its use in clinical settings.

As an integral part of the research proposal, I hope you will be able to contribute to the topic by being a participant in the research. Your perspectives on the topic is extremely valuable. In order to participate, an email will be forwarded from your Graduate Coordinator with a hyperlinked online survey and this will include a further invitation to contribute to a *text-based only* focus group. Your involvement is voluntary and would not impact your enrolment in your graduate program. The hyperlinked survey:

<https://www.surveymonkey.com/r/MV237NT>

Further information such as the information sheet and study details can be found from the email; by contacting myself or your graduate coordinator. I would be happy to include more details as required for further information.

Thank you for your consideration of the above, and I look forward to your valued involvement in the study,

Sincerely,

Benjamin Hay  
Senior Lecturer  
SONM, UNDA, Fremantle Campus

Broome Campus 88 Guy St (PO Box 2287) Broome WA 6725  
Sydney Campus 140 Broadway (PO Box 944) NSW 2007

Fremantle Broome Sydney

ABN 69 330 643 210 | CRICOS Provider Code: 01032F

[nd.edu.au](http://nd.edu.au)

## Appendix 10: Promotional PowerPoints to graduates



## HOW DO I GET INVOLVED?

YOUR PARTICIPATION IS VOLUNTARY

### Graduate RN's:

- Complete the hyperlinked survey sent via email
- Consent in the survey to participate in the *text-based only* focus group at a later date

### NM/SDN's/Graduate Coordinators:

- Face-to-face focus group

## QUESTIONS?

- Thanks for your involvement!
- For more information-please contact [Benjamin.hay@nd.edu.au](mailto:Benjamin.hay@nd.edu.au) or your graduate coordinator

## Appendix 11: Sample email invitation to graduates

Dear registered nursing graduate,

I am currently undertaking research for a Doctor of Philosophy (PhD) whilst being employed as a senior lecturer at the University of Notre Dame Australia on the Fremantle campus. The purpose of my study is to investigate: **‘The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study’**.

### *What is it about?*

The research project investigates factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia. Previous studies have identified that student and graduate nurses are keen to use mobile technology in healthcare. Additionally, these studies have highlighted the potential benefits of such technology for nursing students and nurses.

Anecdotal evidence suggests that graduates have experienced challenges in using mobile technology for learning in the clinical setting. Given the potential benefits of such technology it is pertinent to investigate the factors influencing its use in WA hospitals.

This study is significant in that there appears to be a potential gap between learning with mobile technology in universities and its use in clinical settings.

### *How can you contribute?*

You are able to contribute to this research in two ways:

1. I would be very grateful if you could complete the online survey as part of the research topic. Your opinion is extremely valuable and I look forward to your responses.
2. At the completion of the survey, you will be invited to take part in the next phase of the research at a later date. This consists of a *text-based only* focus group using an online program like Skype™ from your own mobile device at a time that suits you. This second phase is purely voluntary (select Yes/No at the end of the survey), but will be important to obtain further information based on the survey results.

It has been estimated the survey will take about 10-12 mins of your time and completion of the survey would have implied your consent. You will find an information sheet attached to this email along with the hyperlink to the survey: <https://www.surveymonkey.com/r/MV237NT>

I thank you in advance for being part of this research, and I look forward to your valued responses. Please feel free to contact myself or your graduate coordinator for any further information you may require as per the information sheet or as per below.

Kind regards,

**Benjamin Hay**

Senior Lecturer, Unit Coordinator

2nd Year Student-Academic Liaison

School of Nursing and Midwifery, office ND43/303

The University of Notre Dame Australia

19 Mouat St (PO Box 1225) Fremantle 6959

Phone: + 61 8 9433 0262 Fax: + 61 8 9433 0227

Email: [benjamin.hay@nd.edu.au](mailto:benjamin.hay@nd.edu.au) Web: [www.nd.edu.au](http://www.nd.edu.au)



## Appendix 12: Graduates survey with focus group invite

**Registered Nurse Graduate Survey:** The factors influencing nurse graduates use of mobile technology in clinical settings in Perth, Western Australia.

Registered nurse Graduate Survey

Dear registered nursing graduate,

I invite you to contribute to the research that is part of my studies for a Doctor of Philosophy at the University of Notre Dame. This survey has been forwarded to you from your graduate nursing coordinator as a new registered nurse within a graduate nursing program.

The research is titled: "The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study".

How can you involved in the research?

1. I would be very grateful if you could complete this online survey as part of the research topic. Your opinion is extremely valuable and I look forward to your responses.
2. At the completion of the survey, you will be invited to take part in the next phase of the research at a later date. This consists of a *text-based only* focus group using an online program like Skype from your own mobile device at a time that suits you. This second phase is purely voluntary (select Yes/No at the end of the survey) but will be important to obtain further information based on the survey results.

The project has been approved by the Hospital's Research and Governance Committees, along with the University of Notre Dame's Human Research Ethics Committee. Your consent will be implied from the completion of the survey. You are under no pressure to complete this survey and the choice not to participate will not prejudice any future employment opportunities. Please see the information sheet for more information and you are welcome to contact me as per my email or phone for any further clarification on the above.

Thank you for being involved in this important research and I look forward to your responses.

### Demographics

**This section of the survey will collect basic demographic information that will be kept confidential and used only for statistical analysis of the data. You will only be contacted if you consent at the end of the survey for the *text-based only* focus group.**

**Please note: It is important that you answer each question in the survey and ensure your details are accurate.**

\* 1.

Name:

\* 2. Email address:

\* 3. Age group range (select one option below)

- under 20 years
- 20-25 years
- 26-30 years
- 31-40 years
- 41-45 years
- 46-50 years
- 51-55 years
- 56 & over

\* 4. What is your gender?

- Female
- Male
- Other

\* 5. I confirm that I am completing a graduate nursing program and am employed as a registered nurse (RN).

Please note: only registered nurses (RN's) undertaking a graduate program should continue to complete this survey. If you are not an RN and are not undertaking a graduate nurse program, please click no below.

- Yes
- No

\* 6. Please select at which University you attended to obtain your registered nursing qualification:

- The University of Notre Dame Australia
- Murdoch University
- Curtin University
- Edith Cowan University
- The University of Western Australia
- Other (please specify)

\* 7. Please select which Hospital you are currently undertaking your graduate nurse program:

- Sir Charles Gairdner Hospital (SCGH)
- Fiona Stanley Hospital (FSH)
- Royal Perth Hospital (RPH)
- St. John of God Hospital (Murdoch)
- St. John of God Hospital (Subiaco)

\* 8. Please indicate below the specific time frame you have spent in your graduate program:

- 1-3 months
- 4-6 months
- 7-10 months
- 11 months or longer

\* 9. Do you own a mobile technology device (like a smartphone/iPad/Tablet/laptop)?

- Yes
- No

\* 10. Please select what mobile technology devices you own (select all that apply):

- Smartphone/mobile
- Tablet (ipad or similar)
- Laptop
- Smartwatch
- Other (please specify)

**Registered Nurse Graduate Survey:** The factors influencing nurse graduates use of mobile technology in clinical settings in Perth, Western Australia.

**Please select the response which best describes how you feel about each question as it relates to nursing.**

**The term 'mobile technology' refers to any portable mobile devices that can connect to the internet. These may include any items such as smartphones, tablets, laptops and iPads.**

**Please remember to select an answer for each question.**

\* 11. Nursing graduates use of mobile technology *in the clinical setting.*

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
11.1 I value accessing relevant clinical information on mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11.2 I use mobile technology to find information for clinical application/s.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11.3 When using mobile technology clinically, my self-confidence clinically is improved.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11.4 In the clinical area, I use a number of applications (apps) on mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11.5 I use eBooks on my mobile technology device to access clinical information.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11.6 I use search engines like Google on my mobile technology device to access clinical information.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11.7 Using mobile technology clinically enables me to save time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11.8 Using mobile technology clinically enables me to be more efficient.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11.9 Using mobile technology clinically improves the safety and quality of my care.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11.10 Using mobile technology clinically improves my organisational skills.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please make any additional comments below for any of the specific question/s Eg. 11.1...

\* 12. Mobile technology in learning and teaching relating to *the clinical setting*

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
12.1 Using mobile technology clinically improves my learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12.2 Using mobile technology clinically improves the transition from theory to practice.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12.3 The education and learning department of the hospital supports staff using mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12.4 I am encouraged to use mobile technology for educational opportunities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12.5 I would use mobile technology for ongoing learning in the clinical area if permitted.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please make any additional comments below for the specific question/s eg. 12.1...

**Registered Nurse Graduate Survey: The factors influencing nurse graduates use of mobile technology in clinical settings in Perth, Western Australia.**

**\* 13. Mobile technology in learning and teaching relating to the University setting and clinical practice rotations.**

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
13.1 I used mobile technology on a daily basis for learning during my undergraduate nursing degree.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13.2 My university encouraged mobile technology for learning within my undergraduate nursing degree.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13.3 I valued using mobile technology for learning during my undergraduate nursing degree.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13.4 I used mobile technology for learning during my clinical practice rotations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13.5 The application of theory to practice was improved when using mobile technology during clinical practice rotations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please make any additional comments below for the specific question/s eg. 13.1...

\* 14. Mobile technology use by nurses, other health professionals and patients

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
14.1 I regularly observe health professionals using mobile technology in the clinical area.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.2 In my experience, it is difficult to access PC/computers in my department/ward.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.3 I would prefer to access information on mobile technology rather than the ward PC/computer.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.4 Patients may think I am using mobile technology for unprofessional reasons.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.5 Other staff may think I am using my mobile technology for unprofessional reasons.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.6 I regularly observe patients using their own mobile technology in their bed-spaces.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.7 Patients and significant others in my care ask me how to access relevant resources relating to their health by using their mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.8 I currently use mobile technology as an aid in educating the patient and significant others.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.9 If permitted, I would use mobile technology as an aid in educating the patient and significant others.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please make any additional comments below for the specific question/s eg. 14.1...



\* 15. Policies and guidelines associated with mobile technology in the clinical setting

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
15.1 Nurse managers/supervisors of my <b>department/ward</b> support nurses using mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15.2 Senior nurse managers/supervisors of <b>the hospital</b> support nurses using mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15.3 Departments such as the hospital library, support <b>all</b> staff using mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15.4 Departments such as the hospital library, support <b>nursing</b> staff using mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15.5 I am aware of a hospital guideline or policy that guides the use of mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15.6 I would value being able to use mobile technology to access hospital policies and area specific guidelines for nursing care.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15.7 I would value a hospital policy or guideline that would guide health professionals in the use of mobile technology in the clinical area.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please make any additional comments below for the specific question/s eg. 15.1...

**Registered Nurse Graduate Survey: The factors influencing nurse graduates use of mobile technology in clinical settings in Perth, Western Australia.**

**Please select the response which best describes how you feel about each question as it relates to nursing in clinical areas.**

**The term 'mobile technology' refers to any portable mobile devices that can connect to the internet. These may include items such as smartphones, tablets, laptops and iPads.**

**Please remember to select an answer for each question.**

\* 16. Factors influencing the use of mobile technology in healthcare

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
16.1 Assuming I have access to mobile technology, I intend to use it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.2 Given that I have access to mobile technology, I predict that I would use it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.3 Using mobile technology improves my performance in my job.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.4 Using mobile technology in my job increases my productivity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.5 Using mobile technology enhances my effectiveness in my job.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.6 I find mobile technology to be useful in my job.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.7 My interaction with mobile technology is clear and understandable.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.8 Interacting with mobile technology does not require a lot of my mental effort.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.9 I find mobile technology to be easy to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.10 I find it easy to get mobile technology to do what I want it to do.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.11 People (nurse managers/supervisors) who influence my behaviour think that I should use mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.12 People (nurse managers/supervisors) who are important to me think that I should use mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
16.13 People in my organization who use mobile technology have more prestige than those who do not.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.14 People in my organization who use mobile technology have a high profile.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.15 Having mobile technology is a status symbol in my organization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.16 In my job, usage of mobile technology is important.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.17 In my job, usage of mobile technology is relevant.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.18 The quality of the output I get from my mobile technology is high in the clinical area.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.19 I have no problem with the quality of my mobile technology's output in the clinical area.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.20 I have no difficulty telling others about the results of using mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.21 I believe I could communicate to others the consequences of using mobile technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.22 The results of using mobile technology are apparent to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.23 I would have difficulty explaining why using mobile technology may or may not be beneficial.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Please make any additional comments below for the specific question/s: eg. 16.1...					

**General comments**

17. Do you have any other comments?

18. **Text-based only** focus group invitation:

As mentioned previously, if you would like to be part of a text-based only focus group for further involvement in the research topic, please select 'yes' below. Thank you again for being part of this important research so far.

- Yes, I would like to be part of the *text-based only* phase of the research, and I understand there is no video or face-to-face involvement required. I am happy to be contacted via my contact details from the start of the survey at a later date by the researcher if required.
- No thank you

**Registered Nurse Graduate Survey:** The factors influencing nurse graduates use of mobile technology in clinical settings in Perth, Western Australia.

The end of the survey!

**Thank you so much for your valuable time in completing the feedback. I really appreciate it!**

**Thank you again for being part of this research!**

**If you have any further questions about the research, please see the details in the information sheet supplied or contact me via my email: [benjamin.hay@nd.edu.au](mailto:benjamin.hay@nd.edu.au).**

**If you have any questions or concerns relating to mobile technology for your specific clinical area, please see your Graduate Program Coordinator or Staff Development Nurse.**

## **Appendix 13: Focus group interviews open ended survey**

### **Here are a few tips leading into the open ended survey:**

- The questions are from the results of the online survey
- ***Our topic is:** The factors influencing mobile technology use with registered nurse graduates in clinical settings.*
- The results will be used for the PhD thesis chapters; potential journal article publications; and for industry recommendations
- You were selected because you completed the online survey and your feedback and opinions are extremely important to the study

#### ***Open ended survey guidelines:***

- There are no right or wrong answers, only differing points of view;
- I will be recording the transcript/results for analysis at a later date;
- My phone is 94330262 or mobile 0433260047 if you have any issues or if you would like to contact me for any other issues.
- Please add comments under each question in the section under each question. You are welcome to write as much or as little as you like for each question.
- Thank you so much for contributing to this important research!

#### **Open ended survey questions:**

- How 'relevant' is mobile technology to your role in the clinical setting?
- How 'useful' is mobile technology to your role in the clinical setting?
- 'What' influences your use of mobile technology in the clinical setting?
- 'Who' influences your use of mobile technology in the clinical setting?
- What are the barriers in using mobile technology in the clinical setting?
- What are the enablers in using mobile technology in the clinical setting?

- How do you feel your University influenced your **current** use of mobile technology in the clinical settings?
- What is the role of your supervisors in the use of mobile technology in the clinical setting?
- If you were a supervisor, how would you direct the use of mobile technology with new graduates?
- Can you think back to a positive example of using mobile technology in the clinical setting?
- Can you think back to a negative example of using mobile technology in the clinical setting?
- What could be improved when using mobile technology in the clinical setting?

**Final questions:**

- What do you feel was the most important thing from the previous questions that relates to the topic of mobile technology use in the clinical setting?
- Have we missed anything? Is there anything anyone else would like to add?

Thank you again for your time as it is greatly appreciated!

**Appendix 14: Transcripts for quantitative text based results**

Transcripts for quantitative text based results	Categories
<p><b>Nursing graduates use of mobile technology in the clinical setting.</b></p>	
<p>3 I find the use of mobile technology assists me with medication rounds. For example, a patient of mine had a low bp and I was unsure whether the drug I was giving would make it drop further. I looked it up and discussed the side effects of the drug, we decided to withhold it. 12/17/2016 5:54 AM</p>	<p>Assists with med administration</p>
<p>5 Filing and note systems should be moved over to iPad devices that are portable 12/7/2016 3:45 PM</p>	<p>Ipads would be preferred for role</p>
<p>6 I use my smart phone to access mims and other apps however most nurses do not know its available. 12/7/2016 3:23 PM</p>	<p>Medication apps used</p>
<p>7 It allows me to have access to the most up to date information that can help assist in giving education to patients as well as increasing my knowledge. I don't use mobile technology for NPS due to RPH policy though. 12/1/2016 2:17 PM</p>	<p>Point of care resource for education for self and patients</p>
<p>10 I once used my mobile phone to assist with Google translate for a patient speaking Portuguese, when a translator or family was not available. 11/30/2016 3:10 PM</p>	<p>Google translate app useful</p>
<p>12 Using my phone to look up medications is super easy and fast in the morning med round. It would be nice if there was a device we could use without breaching policy. 11/12/2016 10:47 AM</p>	<p>Looking up medications but worried about breaching policy</p>
<p>1 I am unaware of the rules regarding using mobile technology in my workplace. So rarely use it in the clinical settings. 12/19/2016 9:05 PM</p>	<p>Unaware of rules so rarely used</p>



<p>2 It sometimes feels like you are being judged by other nurses for using your phone at work even if it is for clinical reasons 12/17/2016 11:38 AM</p> <p>4 I currently only use mobile technology during my breaks as it is not generally acceptable practice whilst out on the ward 12/7/2016 4:34 PM</p> <p>8 I don't carry my phone while I'm on the floor, i think it looks unprofessional so i only use it on breaks. 12/1/2016 2:16 PM</p> <p>9 At times computers are unavailable - therefore online MIMs and clinical data bases are unable to be accessed. Word of mouth from other nurses is then obtained. 11/30/2016 5:06 PM</p> <p>11 In the clinical setting I don't have my mobile device on me. However, I will often look up information on the hospital computer (policies etc) 11/14/2016 8:58 AM</p>	<p>Other nurse influence- 'judged'</p> <p>Not accepted for use on ward, but used during breaks</p> <p>Perceived as unprofessional-used only on breaks</p> <p>PC not available-word of mouth from other nurses obtained instead</p> <p>Don't have mobile on me-info accessed on PC</p>
<p><b>Mobile technology in learning and teaching relating to the clinical setting</b></p> <p>1 I'm unsure as to the hospitals exact policy. We are told to only use our phones in the clinical area in case of receiving an emergency call. I usually duck off to the medication room or nurses station if I need to use my phone. As a student it was forbidden to have your phone on the floor at all. Many JMO's also use their phone at the bedside if unsure of medications/dosages/diagnosis etc which makes me feel like it isn't a problem to do so 12/16/2016 9:27 AM</p>	<p>Unsure of policy-used covertly;</p> <p>Other staff use so must be ok</p>

<p>2 As policy notes mobile phones aren't to be used we aren't able to access mobile information unfortunately 12/7/2016 2:59 PM</p> <p>3 Some of the senior nursing staff discourage about using technology re: confidentiality issues. Also some believe that using textbooks is the right way and are not open to new technology. 12/1/2016 2:17 PM</p> <p>8 12.3: I am aware of medical staff using mobile technology for dictation apps (EMDAT) but no nursing specific apps of similar clinical use. 12.4: I get the feeling it is viewed as unprofessional to use mobile apps in clinical environment 11/11/2016 1:57 PM</p> <p>4 Easy access in a timely manner 11/30/2016 5:06 PM</p> <p>5 I find that I am a visual learner, therefore when I do not understand the process of a procedure I like to research and find videos and diagrams. This is rather than having a senior staff member explain it to me, I find this harder to understand. In such a case I turn to trusty google and for back up I'll check a evidence based book or go into my eBook's 11/30/2016 10:36 AM</p> <p>6 Again, I don't have my mobile phone on me in the clinical setting, but I can see how it would be beneficial if used appropriately. 11/14/2016 8:58 AM</p> <p>7 Encourage staff to use ward computers but they're always in use or there's not enough time during work hours to use them 11/12/2016 10:47 AM</p>	<p>Cannot use due to policy</p> <p>Older staff not supportive and not open to technology</p> <p>Other staff use-medical staff but not nursing</p> <p>Other staff perceptions-unprofessional use</p> <p>Easy access</p> <p>Prefer mobile technology for learning style;</p> <p>Used to access POC resources (ebooks, google) over older staff explanations</p> <p>Don't have phone on me but could beneficial</p> <p>Staff encouraged to access ward PC but none available or time to access</p>

<p><b>Mobile technology in learning and teaching relating to the University setting and clinical practice rotations</b></p> <p>2 We were told never to have our phones when on prac as a student as it looked unprofessional. 12/17/2016 11:41 AM</p> <p>3 I would use my phone on my break to lookup anything I wasn't sure of due to the University threats if we were to use our phone on the clinical floor. I even had a facilitator tell me I couldn't use my phone on my 30min break as the uni rules were not to have it on you at all. Needless to say I didn't sit with her on my break again 12/16/2016 9:34 AM</p> <p>5 13.4 FORBIDDEN 11/30/2016 3:13 PM</p> <p>7 The use of mobile phones on prac was always strictly prohibited. 11/11/2016 10:49 PM</p> <p>1 I feel the use of mobile technology in clinical settings is sometimes not needed or can be inconvenient as computers are always available at work and we cant always access files on a private phone. 12/19/2016 9:09 PM</p> <p>4 Many evidence based apps are available to access health care information and medication safety. 11/30/2016 5:10 PM</p> <p>6 If I didn't know a medication and couldn't log onto a computer ( as I didn't have a HE) I would use my mims app online. I'd find out about the medication and then educate my patient with my preceptor. 11/30/2016 10:46 AM</p> <p>8 I used the noteability app to take notes on my iPad during uni. I still have all my uni notes available to me through the iCloud and information is easily</p>	<p>Unable to use on CP-looked unprofessional</p> <p>Only used on break due to Uni threats</p> <p>Use was forbidden/prohibited as a student on CP</p> <p>Not needed sometimes as PC available and files cant be accessed on mobile technology</p> <p>Health care apps, medication safety information available</p> <p>No CP no log in available for ward PC-medication apps used for educating patient with preceptor</p> <p>iCloud App used at Uni to store notes-also accessed for role</p>
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<p>accessible through the noteability app on my phone via device sharing. 11/11/2016 2:01 PM</p>	
<p><b>Mobile technology use by nurses, other health professionals and patients</b></p> <p>1 The work stations on wheels help with accessing information and have a less 'unprofessional' aspect than looking at your mobile phone.12/17/2016 6:00 AM</p> <p>3 14.1 regarding medical staff not nursing staff and other allied health staff 12/7/2016 3:37 PM</p> <p>7 A few senior nurses have made negative comments about the use of my phone to look things up, however others have commented that it's a good idea. 11/12/2016 10:58 AM</p> <p>5 14.4-14-5: Patients and other staff are likely to think that I am using mobile technology for unprofessional reasons because it is a hospital policy (? as we were told in our orientation/induction session for the graduate program) to not use mobile phones in the clinical area. I sometimes use my mobile phone in the medication/treatment (only accessible by staff) room to calculate dosage of medications when I don't have my calculator with me. 11/17/2016 11:32 PM</p> <p>2 I see many health professionals using mobile technology to look up drug names and dosages as well as health conditions. We have a good amount of computers to access in the department, however, it can take up to 5mins to log into one to be able to use it so I find mobile technology much quicker to access relevant information. If use of mobile technology in the clinical setting was permitted I would use it as an education tool for my patients 12/16/2016 9:34 AM</p>	<p>WOW/COWs-used more as less unprofessional-influence of others</p> <p>Inconsistencies between staff for use-positives/negatives</p> <p>Influence of others-patients and staff;</p> <p>Told at orientation not to use</p> <p>Used covertly-treatment room;</p> <p>Used for med calculations;</p> <p>Other MDT staff use for Point of Care-medications, conditions</p> <p>Ward PC's too long-mobile technology faster If permitted to use- would use as a patient education tool</p>

<p>4 There are so many evidence based books online and websites that have the correct information. Being educated on which sites are cited and EB would improve the overall care of patients. 11/30/2016 10:46 AM</p> <p>6 nurses should be allowed to research conditions and access mimms. Also there should be a tablet or portable device we can access on each ward 11/14/2016 2:53 PM</p>	<p>If educated on EBP sites- would improve overall care for patients</p> <p>Should allow use for conditions and medication app-mims;</p> <p>Should be a ward portable device on each ward</p>
<p><b>Policies and guidelines associated with mobile technology in the clinical setting</b></p> <p>1 Imagine having an app whereby you're able to pull up your hospitals policies and guild lines, on your phone without having to wait 15mins to get into your VMwear! 11/30/2016 10:46 AM</p> <p>2 15.6 - 15.7: I think it would be very useful if hospital policies, nursing practice guidelines and other information such as about medications (e.g. MIMs) could be accessed on mobile phone or tablets, so that it can be taken to patient bedside or the treatment room. It would also be helpful in providing patient education as it can act as a visual aid and may assist in increased understanding and compliance by patients.11/17/2016 11:32 PM</p>	<p>Time saving compared to PC</p> <p>Helpful if policies/guidelines available on phone</p> <p>Helpful if policies/guidelines available on phone-flexibility, POC</p> <p>Medication admin use</p> <p>Use in patient education-visual aid and</p> <p>May assist with increased compliance of patients</p>
<p><b>TAM2 Factors affecting the use of mobile technology in health care.</b></p> <p>1 It is often not possible to access one of the ward computers due to high demand so it is useful to be able to check out Mims on line or other apps such as Medscape, JBI etc 12/7/2016 4:48 PM</p>	<p>Ward PC not available- mobile as point of care tool</p>

<p>2 Given that the [mobile technology] it was purely for work intended purposes and not misused then I feel mobile technology is the way forward. Anything that improves patient outcome and aids the Nurse to educate their patients is important and deserves a chance. I have seen maybe Nurses use their mobiles to find out certain patients conditions and medications, yet they are somewhat having to hide due to a stigma about mobile technology. Another thing I use my phone for is medication calculations, due to the risk of infection and the med area being a clean room, we can't have calculators, therefore we use are phones. Our patients are adapting to our touch screen TV's and enjoying it, usually in the ages 10-70's. A concern is that would my elderly 80+ patients feel I was being rude if I was to pull out a phone to explain something or appreciate that I am taking an interest to find out the correct information 11/30/2016 10:54 AM</p>	<p>'The way forward' if used professionally</p> <p>Patient outcomes may be improved</p> <p>Patient education tool</p> <p>Covert use due to stigma</p> <p>Used for medication calculations</p> <p>Patients adapting to technology</p> <p>Concern about patient perception of use/misuse</p>
<p><b>A final text based question in the survey, asked if participants had any other comments:</b></p> <p>2 Mobile technology is a good tool for quick references like generic names of medications 12/1/2016 2:28 PM</p> <p>3 I work in ED and am frequently encountering unfamiliar patient conditions and medications which I will research on my phone to gain a better clinical picture of what's going on with the patient etc, all staff carry their mobile in their pockets and use them frequently in clinical practice. I've also found language translation technology extremely useful at the bedside as we encounter a number of non-English speaking patients and given the nature of The ed</p>	<p>POC tool-medications</p> <p>POC (ED)-medications; conditions</p> <p>All staff use frequently for clinical practice</p>

<p>environment it becomes extremely useful in communication between myself and the patient when doing secondary assessments and understanding patient needs, - also in communicating what I require the patient to do 12/1/2016 10:17 AM</p> <p>1 It is apparent that the majority of people that are open to the use of mobile technology in my workplace are newer nurses that have received education through their respective universities to use mobile technology in the workplace. "Older" nurses (the majority) are against it and have issues such as confidentiality and unsure of the education one can receive from mobile technology. 12/1/2016 2:29 PM</p> <p>4 I feel that there is mixed feelings about mobile tech. I work in a high IT environment, but using your phone to google something quick is frowned upon. Getting to use a computer can be hard sometime as all of the doctors take them over. If tablet access was available it would make a huge difference. 11/30/2016 2:28 PM</p>	<p>Point of care for communication tool- translator</p> <p>Majority who use are younger</p> <p>Education from uni to use clinically;</p> <p>Older nurses against use- unsure of tool for use clinically</p> <p>Mixed feelings- high IT area, but phone use frowned upon;</p> <p>PC use hard as Dr's take them over</p> <p>Tablet preferred if available</p>
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## Appendix 15: Email invitation to graduates for the focus group interviews

Dear .... (Graduate)

I hope you are well. Thank you again for participating in the PhD research late last year into the use of mobile technology in registered nurse graduates.

As part of the research, you completed the online survey and you consented to be contacted to be part of an online Skype™ text-based only focus group. **Please note:** The text-based focus group using Skype only uses the text function with no video or voice. I have also reattached the SCGH Participant Information Sheet/Consent Form (PICF) for more information on the study. Your consent will be implied by your involvement in the text-based only group on Skype™.

I have included a Personal YouTube video (2.39mins) which provides a basic summary of the study and an invitation to be part of this phase of the

research: <https://www.youtube.com/watch?v=3HP9PLdAn9g&feature=youtu.be>

**To be part of the focus group:** I will be sending another email soon with a link to an online poll for you to select your available a day/times. I am aiming to select one day/time that suits everyone if possible. I know this can be a challenge due to shift work, so I will be creating the online ‘Doodle’ poll so you can see what day/time others are selecting when you add your preferred availabilities.

**What does it involve and what is the time frame:** The text-based focus group should only be approx. 30mins or so, and I will be posing open ended questions based on your responses from the completed online survey. Within the Skype™ group, you will be able respond to these questions and others comments based on these questions. My supervisor Dr Carol Piercy will be assisting me to facilitate the discussion.

**Using Skype™:** I have created a group on Skype™ for us to chat, share and collaborate on the topic of mobile technology use by graduate registered nurses. I will send out this Skype™ link to the group in a future email once you have been able to select some dates/times for the text-based focus group. \*Don't have Skype™ yet? Download it before you join <http://www.skype.com> . If you already have a Skype™ address, please feel free to email this to me.

Thank you for your consideration of the above as your involvement is really important for the study. I encourage you to add your involvement in this study to your portfolios as evidence of your ongoing contribution to research.

For more information- please contact [benjamin.hay@nd.edu.au](mailto:benjamin.hay@nd.edu.au) or on 08 9433 0262 and I look forward to hearing back from you soon!

**Please reply back to this email** so I am aware you are willing to be involved in this part of the research, and feel free to forward your Skype™ address if you have one already.

Thank you for your support and involvement- it is greatly appreciated!

Kind regards

Benjamin Hay

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## **Appendix 16: Email invitation to nurse leaders for open-ended survey**

Dear valued Nurse coordinators, educators and managers of graduate programs,

You have been forwarded this email from the head of the graduate program as part of an important study within the Hospital. Your responses are very important and highly valued and I hope you are able to complete the survey by the 1<sup>st</sup> November 2017.

I am currently undertaking research for a Doctor of Philosophy (PhD) whilst being employed as a senior lecturer at the University of Notre Dame Australia on the Fremantle campus. The purpose of my study is to investigate within your graduate program site: **'The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study'**.

### ***What is it about?***

The research project investigates factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia. Previous studies have identified that student and graduate nurses are keen to use mobile technology in healthcare. Additionally, these studies have highlighted the potential benefits of such technology for nursing students and nurses.

Anecdotal evidence suggests that graduates have experienced challenges in using mobile technology for learning in the clinical setting. Given the potential benefits of such technology it is pertinent to investigate the factors influencing its use in WA hospitals.

This study is significant in that there appears to be a potential gap between learning with mobile technology in universities and its use in clinical settings.

### ***How can you contribute?***

You are able to contribute to this research in two ways:

1. I would be very grateful if you could complete the online open-ended survey: <https://www.surveymonkey.com/r/3BYX5GW> as part of the research topic. Your opinion is extremely valuable and I look forward to your responses. It is estimated the survey would take approximately only 10-12 mins to complete. Your consent will be implied by completion of the survey.
2. At the completion of the survey, I would be keen to send the results of the analysis to you to aid in credibility of the findings of this phase. You can indicate whether you would be happy for me to forward this to you for your feedback/comments at the end of the survey by checking a yes/no box.

You will find an information sheet attached to this email, and there is more information at the start of the survey as per the link above. I thank you in advance for being part of this research, and I look forward to your valued responses. Please feel free to contact myself or the graduate coordinator for any further information you may require as per the information sheet or as per my details below.


Kind regards


Benjamin Hay

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## Appendix 17: Sample nurse leaders PICF for open ended survey

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 Government of Western Australia  
East Metropolitan Health Service



### Participant Information Sheet/Consent Form

**Royal Perth Hospital-RPH**  
**Nurse coordinators, educators and managers of graduate programs**  
**Participation Information Sheet/Consent Form**

<b>Title</b>	The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study.
<b>Protocol Number</b>	2016-037
<b>Project Sponsor</b>	The University of Notre Dame Australia
<b>Coordinating Principal Investigator/ Principal Investigator</b>	Benjamin Hay
<b>Associate Investigator(s)</b>	Dr Carol Piercey (Research Supervisor)
<b>Location</b>	RPH

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### Part 1 What does my participation involve?

#### 1 Introduction

You are invited to take part in this research project, which is called: *The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study.*

You have been invited because evidence suggests that graduates have experienced challenges in using mobile technology for learning in the clinical setting. Given the potential benefits of such technology, it is important to investigate what influences its use in WA hospitals. Your contact details were obtained from the Graduate Program Coordinator.

This Participant Information Sheet/Consent Form tells you about the research project. It explains the processes involved with taking part. Knowing what is involved will help you decide if you want to take part in the research.

Please read this information carefully. Ask questions about anything that you don't understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a colleague, relative, friend or local health worker.

Participation in this research is voluntary. If you don't wish to take part, you don't have to.

If you decide you want to take part in the research project, you will be asked to sign the consent section. By signing it you are telling us that you:

- Understand what you have read
- Consent to take part in the research project
- Consent to be involved in the research described
- Consent to the use of your personal and health information as described.

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You will be given a copy of this Participant Information and Consent Form to keep.

## **2 What is the purpose of this research?**

The research project investigates what influences nurse graduates use of mobile technology in clinical settings in Perth Western Australia. Previous studies have identified that student and graduate nurses are eager to use mobile technology in healthcare. These studies have shown the potential benefits of such technology for nursing students and nurses. The benefits have included: increased self-confidence; enhanced learning with integration from theory to practice; improved efficiency; time saving; organisation improvements in information sharing; and most importantly, improved safety and quality of care.

At the moment there few standardised policies within healthcare to guide the use of mobile technology. There appears to be a gap between learning with mobile technology in the university setting and the clinical setting. The results of this study may lead to policies and guidelines being reviewed/developed by local healthcare agencies and may lead to review of current mobile technology integration into an undergraduate degree. The results of this research will be used by the researcher Benjamin Hay to obtain a Doctor of Philosophy degree through the University of Notre Dame Australia.

## **3 What does participation in this research involve?**

If you consent to take part in this research study, it is important that you understand the purpose of the study and the tasks you will be asked to complete. Please make sure that you ask any questions you may have, and that all your questions have been answered to your satisfaction before you agree to participate.

You are invited to participate in the research project in the follow way:

1. I would be very grateful if you could complete the online open-ended survey: <https://www.surveymonkey.com/r/3BYX5GW> as part of the research topic. Your opinion is extremely valuable and I look forward to your responses. It is estimated the survey would take approximately only 10-15 mins to complete. Your consent will be implied by completion of the survey.
2. At the completion of the survey, I would be keen to send the results of the analysis to you to aid in credibility of the findings of this phase. You can indicate whether you would be happy for me to forward this to you for your feedback/comments at the end of the survey by checking a yes/no box.

## **4 Other relevant information about the research project**

This proposed study seeks to answer the following questions:

1. What influences nurse graduates use of mobile technology in the clinical setting?
2. To what extent and in what ways do nurse graduates currently use mobile technology in the clinical setting? and;
3. What are the perceptions of nurse managers, nurse educators, & coordinators of graduate programs of mobile technology in the clinical setting?

The research design will involve reviewing existing policy and guidelines regarding mobile technology use in the hospitals included in the study (SCGH; FSH; RPH and SJOGH-Murdoch and Subiaco). An online emailed survey to graduate registered nurses; a follow up text-based focus group to graduates; and the open ended survey to you as Nurse coordinators, educators and managers of graduate programs will all assist to answer the research questions.

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**5 Do I have to take part in this research project?**

Participation in any research project is voluntary. If you do not wish to take part, you do not have to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. Your decision whether to take part or not to take part, or to take part and then withdraw, your relationship with professional staff or your relationship within your graduate program at the Hospital.

If you do decide to take part, you will be given this Participant Information copy to keep.

**6 What are the possible benefits of taking part?**

We cannot guarantee or promise that you will receive any benefits from this research. However, the results of this study may lead to policies and guidelines being reviewed/developed by local healthcare agencies and Hospitals and may lead to review of current mobile technology integration into an undergraduate degree.

**7 What are the possible risks and disadvantages of taking part?**

There is no foreseeable risk in you participating in this research project.

**10 What happens when the research project ends?**

Once we have analysed the information from this study we can email a summary of our findings on request. You can expect to receive this feedback in two years' time. If you have any questions about this project please feel free to contact either myself [Benjamin.hay@nd.edu.au](mailto:Benjamin.hay@nd.edu.au) or my supervisor, Dr Carol Piercey, [carol.piercey1@nd.edu.au](mailto:carol.piercey1@nd.edu.au) My supervisor and I are happy to discuss with you any concerns you may have about this study.

**Part 2 How is the research project being conducted?**

**11 What will happen to information about me?**

By completing the online survey, you consent to the research team collecting and using personal information about you for the research project. Any information obtained in connection with this research project that can identify you will remain confidential. Any information collected will **not** be disclosed to anyone else. Information that might identify you will **not** be used in either the analysis, or any potential publications. Once the study is completed, the data collected from you will be de-identified and stored securely in the School of Nursing and Midwifery at The University of Notre Dame Australia for at least a period of five years. The data may be used in future research but you will not be able to be identified (if applies). The results of the study will be published as a journal article/thesis/book chapter.

Your information will only be used for the purpose of this research project and it will only be disclosed with your permission, except as required by law.

The personal information that the research team collect and use is your survey responses to the questions; your email contact details if you consent to Stage 2 for participation in the text-based focus groups, and your text-based personal responses used for analysis of potential trends.

In accordance with relevant Australian and/or Western Australian privacy and other relevant laws, you have the right to request access to the information about you that is collected and stored by the research team. You also have the right to request that any information with which you disagree be corrected. Please inform the research team member named at the end of this document if you would like to access your information.

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## 12 Complaints and compensation

If you suffer any distress as a result of this research project, you should contact the research team as soon as possible. You will be assisted with arranging appropriate treatment and support. It is recommended you refer to the SCGG HREC for any complaints or feedback.

## 13 Who is organising and funding the research?

This research project is being conducted by Benjamin Hay as part of a Doctor of Philosophy through The University of Notre Dame, Australia in conjunction with RPH.

## 14 Who has reviewed the research project?

All research in Australia involving humans is reviewed by an independent group of people called a Human Research Ethics Committee (HREC).

The ethical aspects of this research project have been approved by the HREC of the University of Notre Dame Australia and the Royal Perth Hospital Group HREC.

This project will be carried out according to the *National Statement on Ethical Conduct in Human Research (2007)*. This statement has been developed to protect the interests of people who agree to participate in human research studies.

## 15 Further information and who to contact

The person you may need to contact will depend on the nature of your query. If you want any further information concerning this project or if you have any problems which may be related to your involvement in the project, you can contact the researcher on 08 94330262 or any of the following people: Research supervisor: Dr Carol Piercey, [carol.piercey1@nd.edu.au](mailto:carol.piercey1@nd.edu.au)

### Research contact person

Name	<i>Benjamin Hay</i>
Position	<i>Senior Lecturer, PhD Candidate</i>
Telephone	<i>08 94330262</i>
Email	<i>Benjamin.hay@nd.edu.au</i>

For matters relating to research at the site at which you are participating, the details of the local site complaints person are:

### Complaints contact person

Name	<i>Notre Dame's Ethics Officer</i>
Position	<i>Ethics Officer, Research Office</i>
Telephone	<i>08 94330943</i>
Email	<i>research@nd.edu.au</i>

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about being a research participant in general, then you may contact:

### Reviewing HREC approving this research and HREC Executive Officer details

Reviewing HREC name	<i>EMHS Research Governance Office</i>
Telephone	<i>9224 8791</i>
Email	<a href="mailto:EMHS.REG@health.wa.gov.au">EMHS.REG@health.wa.gov.au</a>
Reviewing HREC name	<i>Sir Charles Gairdner Group Human Research Ethics Committee</i>
Telephone	<i>93462999</i>
Email	<a href="mailto:Hrec.scqh@health.wa.gov.au">Hrec.scqh@health.wa.gov.au</a>

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## Appendix 18: Open ended survey to nurse leaders

Nurse coordinators, educators and managers of graduate programs: The factors influencing nurse graduates use of mobile technology in clinical settings in Perth, Western Australia.

### Open ended Survey

Dear Nurse coordinators, educators and managers of graduate programs,

I invite you to contribute to research that is part of my studies for a Doctor of Philosophy at the University of Notre Dame. This brief open ended survey has been forwarded to you as supervisors/managers/SDN's of RN's within a graduate nursing program within your hospital. The research is titled: "The factors influencing nurse graduates use of mobile technology in clinical settings in Perth Western Australia: A mixed method study".

How can you involved in the research?

1. I would be very grateful if you could complete this online open-ended survey as part of the research topic. Your opinion is extremely valuable and I look forward to your responses. It is estimated the survey would take approximately only 10-12 mins to complete.
2. At the completion of the survey, I would be keen to send the results of the analysis to you to aid in credibility of the findings of this phase. You can indicate whether you would be happy for me to forward this to you for your feedback/comments at the end of this survey by checking a yes/no box.

The project has been approved by the Hospital's Research and Governance Committees, along with the University of Notre Dame's Human Research Ethics Committee. Your consent will be implied from the completion of the online open ended survey. You are under no pressure to complete this survey and the choice not to participate will not prejudice any future employment opportunities. Please see the information sheet for more information and you are welcome to contact me as per my email or phone for any further clarification on the above.

Thank you for being involved in this important research and I look forward to your responses.

Benjamin Hay- benjamin.hay@nd.edu.au or Phone: (08) 9433 0262

## Demographics

**This section of the survey will collect basic demographic information that will be kept confidential and used only for analysis of the data.**

**\*You will only be contacted if you consent at the end of the survey for emailing out of the analysis of the results to aid in the credibility of this phase.**

**Please note: It is important that you answer each question in the survey.**

\* 1.

Name:

\* 2. \*Email address:

\* 3. Please select which Hospital you are currently supervising/managing/educating RN's within the graduate nurse program:

- Sir Charles Gairdner Hospital (SCGH)
- Fiona Stanley Hospital (FSH)
- Royal Perth Hospital (RPH)
- St. John of God Hospital (Murdoch)
- St. John of God Hospital (Subiaco)

Open ended survey

**Please provide brief written comments to each question within the open ended survey, which best describes how you feel when supervising/managing new RN's within a graduate program.**

**The term 'mobile technology' refers to any portable mobile devices that can connect to the internet. These may include any items such as smartphones, tablets, laptops and iPads.**

**Please remember to provide an answer for each question.**

\* 4. How 'relevant' is the use of mobile technology in the clinical setting for new RN graduates?

\* 5. How 'useful' is mobile technology for *your role* in the clinical setting, when supervising/managing/educating new RN graduates?



Open ended survey

**Please provide brief written comments to each question within the open ended survey, which best describes how you feel when supervising/managing new RN's within a graduate program.**

**The term 'mobile technology' refers to any portable mobile devices that can connect to the internet. These may include any items such as smartphones, tablets, laptops and iPads.**

**Please remember to provide an answer for each question.**

\* 6. 'What' influences new RN graduates use of mobile technology in the clinical setting?

\* 7. 'Who' influences new RN graduates use of mobile technology in the clinical setting?

\* 8. What are the 'enablers' for new RN graduates to use mobile technology in the clinical setting? Eg. Things that make its use easier.

\* 9. What are the 'barriers' for new RN graduates to use mobile technology in the clinical setting? Eg. Things that make its use more difficult.



Open ended survey

**Please provide brief written comments to each question within the open ended survey, which best describes how you feel when supervising/managing new RN's within a graduate program.**

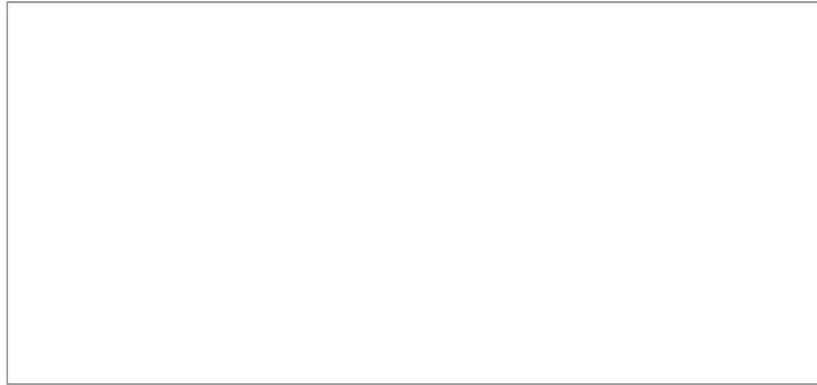
**The term 'mobile technology' refers to any portable mobile devices that can connect to the internet. These may include any items such as smartphones, tablets, laptops and iPads.**

**Please remember to provide an answer for each question.**

\* 10. How does the hospital guide/direct the use of mobile technology in the clinical setting for new RN graduates?

\* 11. What is your role as a supervisor/manager/educator in guiding/directing new RN graduates for the use of mobile technology in the clinical setting?

\* 12. Can you provide a positive and/or a negative example of mobile technology use in the clinical setting with new RN graduates?



\* 13. What could be improved regarding the use of mobile technology for new RN graduates in the clinical setting?

\* 14. What is the most important thing that relates to the use of mobile technology in clinical settings for new RN graduates?

\* 15. Do you have any final comments regarding the use of mobile technology in clinical settings for new graduates?

Open ended survey

\* 16. As mentioned previously, please select 'yes' below if you are happy for me to contact you via email following the data analysis to review the results for credibility of this phase. This would simply involve an email with a summary of the results for you to provide brief comment and feedback. Thank you again for being part of this important research so far.

- Yes, I am happy to be contacted via my contact details from the start of the survey at a later date by the researcher if required.
- No thank you

Nurse coordinators, educators and managers of graduate programs: The factors influencing nurse graduates use of mobile technology in clinical settings in Perth, Western Australia.

The end of the survey!

**Thank you so much for your valuable time in completing the feedback. I really appreciate it!**

**Thank you again for being part of this research!**

**If you have any further questions about the research, please see the details in the information sheet supplied via email or contact me via my email: [benjamin.hay@nd.edu.au](mailto:benjamin.hay@nd.edu.au).**