

Exploring Enablers and Barriers to the use of Mobile Apps for Training and Learning in  
the Australian Army

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A thesis submitted of the requirements for the degree Bachelor of Psychological Science  
(Honours)

School of Psychology,  
Faculty of Health and Medical Sciences, University of Adelaide November 2020



word count: 9036

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Abstract

Throughout time, the concept of training has been essential to the progression of civilization. With new technologies emerging rapidly organisations are changing the way they conduct training. The Australian Army is interested in optimising training outcomes through mobile technologies in order to have their people 'future ready'. Of particular interest to Army are mobile applications ('apps'), designed for smartphones and tablets. These are widely utilized for training in civilian sectors and there is evidence for their effectiveness. Despite growing reliance on technology, there are limited studies in a military context exploring uptake of mobile technologies. Previous studies in Australian and other Defence forces have suggested that personnel are reluctant to use apps for training, hence the need to investigate barriers hindering uptake. Eighteen Australian Army personnel participated in this study. Purposive sampling ensured diversity in participants' gender, age, rank, and Corps. Individual interviews explored device ownership and use, mobile experiences and preferences, perceived benefits, opportunities, and challenges. Data analysis used Braun and Clarke's (2012) thematic analysis approach, uncovering five themes and seven subthemes. Army personnel were generally positive towards the use of apps, but identified barriers such as security, privacy and a clash between technology and traditions. The results are presented and discussed within the context of theoretical models such as the Technology Acceptance Model (TAM) (Davis, 1986), Health Information Technology Acceptance Model (HITAM) (Kim & Park, 2012) and Mobile app rating scale (MARS) (Stoyanov et al., 2015). Recommendations for further research are also discussed.

### Declaration

This thesis contains no material which has been accepted for the award of any other degree of diploma in any University, and, to the best of my knowledge, this thesis contains no material previously published except where due reference is made. I give permission for the digital version of this thesis to be made available on the web, via the University of Adelaide's digital thesis repository, the Library Search and through web search engines, unless permission has been granted by the School to restrict access for a period of time.

### Acknowledgements

Firstly, I am grateful to have been accepted into the University of Adelaide Honours Bachelor of Psychological Science program and to the course co-ordinators Dr Mathew Dry and Dr Irina Baetu for their support through the course. I would like to thank my supervisors' Dr Aspa Sarris (University of Adelaide), Dr Susannah Whitney (Department of Defence) and co-supervisor Mr Philip Temby (Department of Defence). Thank you so very much your guidance through the process which is Honours and your unwavering encouragement and support through the year. I would also like to thank my children who will be happy to never hear the word 'Thesis' again, though I hope my achievements encourage them to believe they can accomplish anything they set their minds to, whatever that may be. I am grateful for my sister, who often brought me lunch and then left me to 'get on with it', and to all my family and friends who believed in me and have so patiently waited for me to again be 'available'.

### Contributions

Contributions to the study were made by Dr Susannah Whitney and Phil Temby (Department of Defence), and Dr Aspa Sarris (University of Adelaide). Specifically, Dr Aspa Sarris and Dr Susannah Whitney supervised the entire Thesis and offered comments, advice and suggestions throughout the process. Dr Aspa Sarris, Susannah Whitney and Phil Temby contributed to the initial structure and development of the study and the process of acquiring Ethics approval

through the Department of Defence Ethics Panel. Dr Susannah Whitney also organised all interviews with Defence personnel and assisted throughout the interview and analysis process. Phil Temby assisted with valuable insights through his extensive experience with thematic analysis.

## CHAPTER 1

### Introduction

#### 1.1 Overview

Mobile applications commonly referred to as 'apps' are software programs used on computers, smartphones and tablets. 'Mobile learning (m-learning), digital learning (d-learning) and electronic learning (e-learning) are terms of electronic learning used indifferently or in a complimentary way to mean technological learning' Kumar Basak, Wotto, and Bélanger (2018, p. 191). Mobile learning is 'the delivery of learning to students anywhere anytime through the use of mobile devices and wireless internet' (Wang, Wu, & Wang, 2009, p. 92). Current interest in m-learning and the use of mobile apps is growing at a rapid rate due to ownership growth of mobile devices, presumed cost-effectiveness, and the benefit of anywhere anytime use. Organisational transformation is at the forefront of much discussion, in an effort to match the unprecedented speed at which the world is changing (Vey, Fandel-Meyer, Zipp, & Schneider, 2017). By promoting 21<sup>st</sup> century skills through mobile technology, learning becomes more accessible, has the ability to reach more people, is often self-paced and convenient (Tsinakos & Ally, 2013). A popular assumption is the younger generation born into the technological era, are digital natives, or have high digital literacy skills, and therefore will readily accept new technology.

Several studies in civilian samples report effective uptake and use of mobile apps with learning and training benefits in education, health and mental health (Briz-Ponce, Pereira, Carvalho, Juanes-Méndez, & García-Peñalvo, 2017; Gray, Hood, & Farrell, 2015; Shore, Miller, Noonan, & Bae, 2018). Though there have been some challenges also reported, such as privacy risks in education.

Military forces are organisations that have ongoing training and development requirements for a broad range of skilled people and an interest in keeping their people at the highest competencies relevant to their specific job or role. Worldwide military forces are pursuing opportunities to enhance training through the use of mobile technologies. The Australian Army is currently undergoing a training transformation and part of this involves adopting novel training technologies such as mobile apps to keep their people future ready (Army, 2020). The current global pandemic (Covid-19) has highlighted the need to be adaptive in training due to traditional face-to-face or classroom instruction becoming impossible while maintaining social distancing requirements.

In terms of research, studies examining the evaluation of app-based training in military populations are limited, and the results of these studies have been mixed. For example some studies report that military personnel are willing to use mobile devices and apps (Mercado & Spain, 2014) while other studies show a poor uptake of apps when trialled in military settings (Grant & Pavlovic, 2015; Simon & Paper, 2007). The reasons for this are unclear, although we know from previous work that digital literacy assumptions concerning military personnel are often not true. For instance, when digital literacy was investigated as a measure concerning uptake of mobile technologies among defence personnel mixed results were produced (Bollard, 2014; Bollard, 2013). While debunking popular assumption, a limitation to the work surrounding digital literacy was there was no explanation as to why military personnel did not use mobile technologies made available to them. The successful transformation of training and learning naturally requires the learner or trainee to uptake the new technologies available to them. Therefore, the question that remains unanswered is; “Why are learners not utilizing the tools available to them?”

The benefits and challenges of mobile technologies have been examined (e.g. (Louise, Marcos, & Chris, 2018; Mercado & Spain, 2014; Reid, 2014; Simon-Arndt, Hurtado, Kohen, Hunter, & Sanchez, 2019; Tucker, 2010), though research has not fully examined the general attitudes and experiences of military personnel toward the uptake of mobile technologies. Theoretically framed (Kim & Park, 2012; Stoyanov et al., 2015; Venkatesh & Davis, 2000) with intent to explore experience of use, motivation, and attitude toward use, the current study aimed to identify enablers and barriers toward the uptake of mobile technologies for training in the Australian Army (also referred to as “the Army” or simply “Army”). A qualitative approach was

undertaken with a sample of Australian Army personnel to uncover the general attitudes and acceptance of using mobile-app technologies within the Australian Army. Gathering information relevant to new training options allows Army to collaborate and tailor future ready training programs that address the uptake of usage gaps before introducing any new technology, saving valuable time and improving the transition of implementation. It is envisaged that this study will aid in guiding future research integral to informing best practice recruitment efforts and training guidelines for the Australian Army.

## 1.2 App-based training and learning

Mobile phone growth has been increasing significantly with 2019 statistics showing ownership averaging 91% throughout Australia (Deloitte, 2019). With approximately nine out of ten Australians owning a mobile phone, apps present as a promising tool for learning and training. The traditional model of training which depends on 'inactive guidance' and unreasonable modifications is one that most educators and trainers agree needs to shift to a 'scholarly experience and long-lasting enthusiasm in the psyches of youthful students' (Ahir, Govani, Gajera, & Shah, 2020, p. 2). Back in 2007, research suggested that 'educators engage in mobile learning or the students will continue to feel a disconnect between school and the world' (Swan, Kratcoski, & van'T Hooft, 2007, p. 10). However, learning is increasingly becoming realised as a somewhat autonomous lifelong process, and job training an ongoing progression of development with no age barriers. Training apps have proven very useful such that the learning can now be delivered, undertaken autonomously or in groups, and across organisations.

Several studies report positive outcomes to using apps for learning and training in medicine and education (Briz-Ponce et al., 2017; Latip, Omar, Jing, & Syahrom, 2017). Despite mobile apps becoming effectively a popular platform in the education sector (Briz-Ponce et al., 2017; Weng, Yang, Ho, & Su, 2018), there are still concerns from educators, however, around distraction, safety, and privacy (Mohammad & Yousef, 2014) and a continuing focus on overcoming the barriers to implementation (Reid, 2014; Vey et al., 2017; Weng et al., 2018). Some studies have suggested a constructivist approach to mobile learning, where the learning experience is shared, and even somewhat defined by the learner (Tsinakos & Ally, 2013).



The health sector is a particularly popular forum for trialling and using mobile apps with many reports of success in areas such as fitness, health (Matt, 2019; Shore et al., 2018), and mental health (Louise et al., 2018; Mak et al., 2018; Matt, 2019; Peng, Kanthawala, Yuan, & Hussain, 2016). In tune with mind-body wellness, autonomous app-based training such as mindfulness-based training and self-compassion training through cognitive behavioural therapy have been shown in some studies to produce significant improvements in mental well-being during the intervention (Mak et al., 2018; Torous et al., 2018). However other studies report low uptake of use, such as in an analysis of user perceptions on consumer health wearables (Peng et al., 2016).

Research has shown that Medical practitioners and their instructors are benefiting from the convenience of mobile technologies and the ability to access up-to-date information (Gray et al., 2015). Mobile Apps providing multi source feedback to Medical practitioners have been developed to promote excellent clinical practice, through improving training and clinical supervision (Gray et al., 2015). A similar app may prove useful to medic training within Army (for example). The app acts as a supervision logbook and allows daily feedback by both the trainee and the trainer to facilitate and improve development and training (Gray et al., 2015). Instructional components of such an app, relevant to medical training, would allow trainees to have information ready for anywhere anytime use.

### **1.3 Military specific learning, training and interest in mobile technologies**

Military organisations have been conducting training for centuries and are continually looking for ways to produce superiority in training and learning methods whilst catering for both job specific roles and physical training requirements. In recent years extensive scientific research has become important to improving training outcomes (Temby & Whitney, 2019). With people considered to be the heart of the military, rapid growth of ownership has seen smart technologies (mobile phone and tablet) emerge as possible worthwhile training options, revolutionising ways to think about and facilitate training and learning (Army, 2020). Military organisations worldwide continually seek to capitalise on opportunities to develop and make use of new technologies to improve individual and small group training (Schatz, 2019). This

includes simulations, computer games, and delivery of course content through smart phones and tablets (Hills, 2010; Killilea et al., 2013; Mobley, 2011; Orme, 2013; Raybourn, 2013), (Bollard, Kerry, Whitney & Fidock, 2014).

#### **1.4 Training transformation**

An interest in mobile technologies is part of a wider training transformation program initiative currently being primed within Australian Defence (Army, 2020). The program strategy states 'Transformation to a future ready training system will demand innovative thinking, committed leadership, integrated and empowered teams as well as iterative development process' (Army, 2020). In order to train people to be future ready and to out-think, out-perform and out-last adversaries in accelerated warfare, Army must attract, acquire, develop and retain a multi-talented and highly skilled workforce (Army, 2020). To achieve this, the Army work force must be adaptable to continuing change and agile in its structures (Army, 2020). In this current era of intelligence, constant transformation of training systems is needed to match today's evolving demands. It is therefore important that all military personnel have the skills, knowledge and attributes needed to successfully contribute to Army's capability (Bollard, 2013). Temby and Whitney (2019) highlight that there is no single method of training that works in every situation and delivery of training is best when systematic. For example, an integral aspect of military training is skill retention. Whilst there are many reasons for keeping skills at a 'ready' level, task repetition and increase of cognitive abilities through evidence-based approaches could aid retention of information and training and learning outcomes (Temby & Whitney, 2019). Mobile apps allow the trainee to access training autonomously, increasing repetition which is benefiting to the trainee.

#### **1.5 Past research specific to Military**

Despite the growing reliance on digital technology, few studies have examined the evaluation of app-based training in Military populations. Furthermore, these studies concerning app use in Military have presented mixed results. For example, while Mercado & Spain (2014) suggest that military personnel are willing to use mobile devices and apps, other studies report low

rates of usage (e.g. (Grant & Pavlovic, 2015; Schatz, 2019; Simon & Paper, 2007; Simon-Arndt et al., 2019)(Black et al. 2020).

Grant and Pavlovic (2015) report that although military personnel (Canadian) had access and instruction to use a marksmanship training app for a week, the uptake was minimal, and some participants did not access or use the training app at all. The reported uptake or use of the marksmanship app did not reflect the participants accounts that a mobile training app would be useful, nor the usability of the training app being rated by participants as the same as a printed version of the same material (Grant and Pavlovic, 2015). In the study reasons were unclear for the lack of uptake of new technology and it was suggested that perhaps; participants believed that (i) they had already mastered the materials, (ii) the material was not valuable, or (iii) they were not motivated to learn the material. It was concluded the participants still require direction and motivation (Grant & Pavlovic, 2015). However, relevance of material is an important factor in training and irrelevance of material must be acknowledged as a barrier to the acceptance of technology.

Similarly, an app-based resilience training program introduced in a U.S. Naval operational setting reported the uptake of the app to be minimal. Participant (N=56) ratings were high for the workshop instructors and relevance and somewhat positive for the app, though app usage was reported to be low, with many users opting not to use it at all. Post-hoc recommendations were to make the app available for smartphone use as a tablet was used during the experiment and was found to be cumbersome (Simon-Arndt et al., 2019). Similar results where military participants did not complete the required number of training sessions were obtained in a study evaluating a cognitive training app (Black et al., 2019).

In a focus group study considering games as a platform on mobile phones for teaching young military personnel medical-related concepts and health safety procedures, findings suggested that game-based learning models may be affected by underlying negative connotations to frequent video game use and uptake was poor (De Leo, Bonacina, Brivio, & Cuper, 2012). The researchers suggested that assumptions of digital literacy concerning young soldiers follow through into assumptions of gaming ability and acceptance(De Leo et al., 2012). There are also studies on soldiers as gamers and using games to train warfare which report it cannot be

assumed that age correlates with gaming attitude or ability (Orvis, Moore, Belanich, Murphy, & Horn, 2010). (Levy & Green, 2009; Mao, Chen, & Sun, 2017; Mao, 2020; Orvis et al., 2010)

A study by Mercado and Spain (2014), found that contrary to popular belief many young soldiers in the United States Army reported not owning a device and had higher usage rates of tablets and e-readers. The study found age correlated with activities used on mobile device with younger soldiers reporting higher use of a greater variety of activities. According to Mercado & Spain (2014), if the United States armed forces were to leverage mobile devices as tools for training, soldiers would embrace them and use them, though Officers were more open to using an Army-issued phone than other ranked soldiers. The study also compared university students to soldiers and found the students to have higher usage rates and be more open to using an issued phone (Mercado & Spain, 2014).

One of the main objectives of mobile technology use in the military is to enhance quality, efficiency and safety, during live training. Targetry Range Automated Control and Recording (TRACR) is an app currently being used to control lane based and manoeuvre targets at Army live-fire ranges (de Armas, Tori, & Netto, 2019). U.S. Army research improved on the original model of TRACR, with the development of TRACR Ultra Lite (TUL); an android tablet based *live* training app, that permits the trainer to directly and efficiently control the trainee's exercise, minimising risks to safety and cost to the U.S Army (Borkman & De la Cruz, 2012).

A report of emerging trends from delegates of five countries; The USA, Great Britain, Canada, New Zealand and Australia, suggests mobile learning to be rated as a popular trend, and reports that training and education stakeholders have a unique opportunity to capitalize on the high level-levels of interest in mobile learning and the simultaneous development of 5G capabilities (Schatz, 2019). Across all five nations respondents were concerned with barriers implementing the technology which could delay or prevent its full adoption. Australia rated higher than other countries in terms of interest in using mobile app technology (Schatz, 2019).

In a literature review by Tucker to identify potential approaches for incorporating smartphone technologies in US Army training, noted are student outcome benefits such that by giving independence to the student, the diverse and individual needs of the student were met,

requiring minimal need for the facilitator to update learning platforms (Tucker, 2010). Findings also showed higher levels of motivation and attendance rates, more engagement with peers and collaboration with the instructor, better knowledge acquisition and development of critical thinking skills (Tucker, 2010).

According to Tucker further research that determines if the smart phone is the right tool for learning objectives and the potential benefits of blended learning approach for field exercises is needed as there is a paucity of empirical evidence, specifically regarding the effectiveness of mobile learning technologies (2010). Further research examining the use of apps in the Australian Defence Force is paramount to gain insight into the attitudes of uptake and use. Similarly, Bollard (2013) has highlighted that there are gaps in existing research examining the access and use of personal digital technology in the Australian Army.

### **1.6 Mobile App Benefits and Barriers to Uptake**

For the most part research to date is unable to determine the reasons for poor uptake of mobile technologies and neglects to enquire about the attitudes of soldiers and military personnel concerning the use of mobile technologies. Whilst there are challenges to overcome implementing digital technology into training systems, there are also many benefits that may outweigh these challenges such as anywhere anytime training and learning possibilities.

A study by Reid (YEAR) clusters barriers to adoption under the headings (i) Faculty (ii) Administration (iii) Process (iiii) Environment, and (iii) Technology, listing barriers such as resistance to change, misunderstanding of required effort, tensions between administration and academia, faculty/staff/student support and access/reliability and complexity of technology (Reid, 2014).

A study by Menaker & Spain (2013) that has useful insights into digitizing organisations and overcoming barriers to implementation. According to Menaker & Spain (2013) the following approaches are recommended when digitizing organisations and overcoming barriers to implementation: (i) Limited connectivity – use native or hybrid apps, optimize the design of MLearning content, use local infostructure for low technology solutions; (ii) Security of Data,

Devices and Users – acquire MDM (mobile device management services) (Menaker & Spain, 2013).

Assumptions concerning age as an indicator of use, though popular opinion, do not alone predict digital literacy, however digital literacy may be viewed as an indicator of uptake of use of new technologies (Bollard, 2013). Cost effectiveness to organisations such as the Australian Army should also be considered.

### **1.7 Unprecedented times increase interest and opportunity**

This year (2020) has accelerated the need to explore new ways to deliver safe and effective training due to implications of the Global pandemic. Mobile learning may have been viewed as a long-term goal with recommendations for a hybrid learning to build on existing curriculum (Menaker & Spain, 2013), however recent social distancing requirements warrant cause for a re-evaluation of the timeline for its implementation. The Covid 19 pandemic has forced many organisations to go digital in order to maintain communication and deliver learning and training. Prior to 2020, much of Australian Army's training was classroom based, group based, or required personnel from a range of locations to travel to a central location. COVID restrictions on face to face gatherings and border closures affected the ability to conduct this form of training. As it is essential for Army personnel to continue training in order to maintain readiness, there is now an increased interest and increased opportunity to explore how novel training technologies may support ongoing training and learning during this time. In an article released in March 2020, referring to suggestions to platform U.S. training for warfighters through gaming, the report suggests that training that was formerly delivered in a classroom should now be delivered on a secure web browser (Colabatistto, Kehr & Mc Ardle, 2020). Importantly, games for training can meet some short-term needs but they are limited due to the need for specific software and hardware that may not be available, and the extent to which it needs to be deployed to warfighters who may be physically scattered due to social distancing (Colabatistto et al., 2020) In comparison, the Australian Army effectively delivered training to soldiers on the COVID frontline via mobile technology to ensure correct procedure for managing the pandemic safely in the community. The world is changing, and Armed forces must adapt accordingly.

## 1.8 Theoretical framework

To capture the attitudes of Army personnel of change toward a more digitised future it is important to have theoretical grounding as a basis to achieve well-founded empirical evaluation. Theories of behavioural intention for technology acceptance of an individual were utilized as framework for this study to provide grounding for the exploratory research and cross disciplinary relevance of perceptions, perceived benefits and barriers associated with mobile technologies for training purpose in the Army. Low usage of new technological systems installed in organisations has been recognised as ‘a major factor underlying the productivity paradox’ (Venkatesh & Davis, 2000). A range of frameworks and models focus on factors that can affect user acceptance of technology. For instance, the theory of reasoned action (TRA), states that human behaviour can be explained through attitudes, social norms, and intentions (Fishbein, 1979). It was TRA that became the foundation of other models, including the Technology Acceptance model (TAM) (Venkatesh & Davis, 1996). Significant progress in bridging the knowledge gap between technology investments and usage is likely due to the development and use of the Technology Acceptance Model (TAM), which has accumulated much theoretical and empirical support in its favour (Venkatesh & Davis, 2000). ‘The TAM consistently explains a substantial proportion of variance (typically about 40%) in usage intentions and behaviour’, highlighting the importance of constructs; perceived usefulness, perceived ease of use, and subjective norms (Venkatesh & Davis, 2000). Furthermore, the Health Information Technology Acceptance model (HITAM) was included as theoretical framework to explore motivation, and the MARS (MARS) engagement, functionality, aesthetics and information content.

Civilian studies have used the Technology Acceptance Model as framework to explore the uptake of mobile technologies (mobile apps) reporting positive outcomes in areas such as medicine, school teaching, and many more (Tucker, 2010; Weng et al., 2018). One of many examples where TAM is used to gauge attitudes of acceptance, is a study in which ankle technology device was used to monitor patient psychology in rehab athletes (Latip et al., 2017). In comparison, a study investigating user acceptance of voice recognition reports low acceptance of use in the U. S. Navy (Simon & Paper, 2007). There do not appear to be any

studies to date concerning the uptake of training apps by the Australian Army, theoretically framed a relevant model such as the Technology Acceptance Model.

## CHAPTER 2

### Method and Procedure

#### 2.1 Study Aims

The aim of the study was to examine the attitudes and experiences of military personnel regarding the use of mobile apps for training and learning. The study also aimed to identify particular possible benefits, enablers and barriers to the use of mobile apps for training purposes in the Australian Army.

The following research questions were addressed:

1. What are the general attitudes of Army personnel towards using mobile apps for training and learning?
2. Where do Army personnel perceive that mobile apps could have greatest benefit for training and learning?
3. What do Army personnel perceive as the benefits, enablers and barriers to using mobile apps for military training?

#### 2.2 Study Design

In line with Thematic analysis approach developed by Braun and Clarke (2012), individual, semi-structured one to one interviews were conducted with 18 participants to enable them to speak freely and openly about their views, personal experiences, and attitudes toward the use of mobile apps (Braun & Clarke, 2012) . The semi-structured format of interviews allowed participants to speak freely and in privacy and enabled them to elaborate on their responses. The interview questions were designed to allow additional information and themes to emerge



without the bias of any established theory, consistent with a grounded theory approach to qualitative inquiry (e.g., Chun Tie, Birks, & Francis, 2019).

### 2.3 Participants

Participants were 18 current serving members of the Australian Army, including Full-Time, Regular Army and Reservist personnel. Specifically, the TABLE 1 Demographic information:

Variable	<i>N</i>	%
Age (mean in years at time of interview)	45.44 (range 27 - 59, SD = 8.55)	
Gender		
Women	7	
Men	11	
Army service category		
Australian Regular Army members	12	
Australian Army Reserve members	6	
Length of service (mean years at time of interview)	23.3 (range 3 - 41, SD = 10.71)	

Participants were from a range of Army training establishments and headquarters across Australia, in roles including health care professionals, leadership roles, and educational professionals. Individuals were recruited through purposive and snowball sampling. The initial invitation to participate, including a consent form, was circulated by one of the Defence Science and Technology (DST) Group supervisors to numerous Army personnel in training and learning development roles. A cross-section of participants from different ranks, Corps, gender and age were selected for inclusion. All participants were a minimum 18 years of age, fluent English speakers and had used mobile app(s) within the last month prior to commencing the study. All participants gave informed consent to participate, including consent for interviews to be recorded. Participants did not receive any payment but were considered to be 'on duty'

at time of the interview. Participants were invited to nominate personnel they believed would be interested in participating in the study. As data collection progressed, the researchers began to target specific groups within Army (e.g. particular ranks, age groups, Corps) in order to achieve a diverse representative sample. Enlisted personnel were of the ranks Private to Warrant Officer, and Officers were of the ranks Captain to Colonel. Participants belonged to one of the following Corps shown in TABLE 2:

TABLE 2

Royal Regiment of Australian Artillery
Royal Australian Engineers
Royal Australian Corps of Signals
Royal Australian Infantry Corps
Australian Intelligence Corps
Royal Australian Corps of Transport
Royal Australian Medical Corps
Royal Australian Army Ordnance Corps
Royal Australian Electrical and Mechanical Engineers
Royal Australian Army Educational Corps
Australian Army Psychology Corps

Sample size was determined by the principle of data saturation, whereby no new information of themes were identified from additional interviews.

## 2.4 Apparatus and Materials

Interview questions were designed based on a review of relevant literature and including theoretical frameworks such as the Technology Acceptance Model (TAM; Venkatesh & Davis,

2000), Health Information Technology Acceptance Model (HITAM; Kim & Park, 2012) and the Mobile Application Rating Scale (MARS; Stoyanov et al., 2015). An online conference or three-way conference phone call was used as the platform for interviews and audio recorded using a voice recorder. Handwritten notes were also taken during the interview process. A copy of the interview schedule is at Appendix A.

## **2.5 Ethics**

The study received ethics approval from the Defence Science and Technology Low Risk Ethics Review Panel prior to recruitment and interview commencement (data collection). The researchers also received approval from Army to directly approach individuals to invite them to participate. All participants provided informed consent prior to interviews being scheduled, and at the start of each interview the researchers reconfirmed that the participants consented to taking part. A copy of ethics approval is at Appendix B.

## **2.6 Data collection**

Prior to commencing official interviews, a pilot study was run to check equipment and flow of interview questions. Interviews were conducted by the Honours student (first interviewer) and one of the student's DST supervisors (second interviewer), with the second interviewer providing support with note taking and answering Defence-specific questions. Interviews were conducted using online video conferencing and phone with individual researchers and participant being situated in different locations, keeping in line with current COVID-19 distancing restrictions. Participants were provided with the interview questions at least one day prior to their interview in order to give them time to review the questions. With participants' consent, interviews were audio recorded and professionally transcribed. Transcripts were crosschecked independently by investigator 1 and 2 and sent to participants for accuracy verification. Data saturation was confirmed by analysis.

## **2.7 Analysis**

The interview data was analysed using Braun and Clarke's six step thematic analysis (Braun & Clarke, 2012). This method involves; 1) data familiarisation by re-reading and verifying the

accuracy of the interview transcriptions, 2) confirming and generating initial codes, 3) searching for themes, 4) reviewing and reducing themes into the most prevalent ideas, 5) defining and naming themes, 6) reporting the results.

A deductive, reflexive and inductive approach was used to interpret the data, which is presented based on emergent themes from exploring participants' responses to the research questions. The transcripts were reviewed by the researchers independently. The list of constructs was decided by the two investigators prior to analysis using the theoretical frameworks relevant to the study and definitions of each construct from each of the original papers. For instance; Perceived Ease of Use and Perceived Usefulness, constructs taken from the Technology Acceptance Model (TAM), were utilised to map codes in this study. Constructs from the Mobile Apps Rating Scale (MARS), utilised were Engagement, Aesthetics, Functionality and Information content, and from the Health Information Technology Acceptance Model (HITAM) the construct Motivation was also utilised. Some discussion was required where some topics did not map clearly to one construct and agreement by was made before commencing independent analysis. For example; 'security' was discussed by a number of participants in the interview process. Defence personnel are required to follow a range of security policies and procedures and information security is important. It was considered these topics could be coded under either 'ease of use', as security requirements can affect the effort required to use an app, or under 'subjective norms', as security requirements are behavioural constraints imposed by others who are important to the participant. In this case the analysts agreed to code security-related topics under the construct subjective norms. Themes were then identified from the coded data, recognised by their recurring nature within the data, and these were reviewed and reduced into a single list which linked back to the research questions. There was 100% agreement across the researchers on the themes.

Table 3 contains definitions of constructs onto which data was mapped and coded.

Construct	Definition	Source
Perceived usefulness	The degree to which a person believes that using a particular system would enhance his or her job performance	Technology Acceptance Model (Davis, 1989)
Perceived ease of use	The degree to which a person believes that using a particular system would be free from effort	Technology Acceptance Model (Davis, 1989)
Subjective norms	An individual's perception that other individuals who are important to him/she consider if he/she could perform a behaviour.	Technology Acceptance Model (Davis, 1989)
Engagement	Fun, interesting, customisable, interactive (e.g. sends alerts, messages, reminders, feedback, enables sharing), well-targeted to audience	Mobile App Rating Scale (Stoyanov et al., 2015)
Functionality	App functioning, easy to learn, navigation, flow logic, and gestural design of app	Mobile App Rating Scale (Stoyanov et al., 2015)
Aesthetics	Graphic design, overall visual appeal, colour scheme, and stylistic consistency	Mobile App Rating Scale (Stoyanov et al., 2015)
Information content	Contains high quality information (e.g. text, feedback, measures, references) from a credible source	Mobile App Rating Scale (Stoyanov et al., 2015)
COVID-19	Any direct or indirect reference to COVID-19 and impact on Defence. Direct references include specific mention of COVID, indirect includes COVID management requirements such as social distancing or quarantine.	Emergent theme

## CHAPTER 3

### Findings

Thematic analysis of the attitudes and experiences of Australian Army personnel revealed five major themes. Table 3 lists these five themes and associated subthemes, grouped under three broad domains consistent with the three research questions. In the direct quotation, text in square brackets indicates either a clarification, or a replacement of potentially identifying details.

Table 4: Themes and subthemes with associated research questions

<b>Research question # 1: What are the general attitudes of Army personnel towards using mobile apps for training and learning?</b>	
Theme # 1:	Get in, get out, get what you need: Apps for specific times, places, and context
Subthemes:	intuitive and simple
	more positives than negatives
	Apps supporting Army-related activities
<b>Research question # 2: Where do Army personnel perceive that mobile apps could have the greatest benefit for training and learning?</b>	
Theme # 2	Value add and great potential: Participants identified a range of use cases for Army training and learning using apps
Subthemes:	Apps supplement existing methods of training and learning
Emergent theme:	Training in a COVID-19 world

**Research question # 3: What do Army personnel perceive as the benefits, enablers and barriers to using mobile apps for military training?**

Theme # 3      Bleeding into personal lives: Blurring boundaries between Defence personnel's personal and private lives and work

Subthemes:    It knows more about me than I do: Security and privacy  
Participants recognise organisational challenges in managing security

Theme # 4      Young punks, dinosaurs and IT numpties: Assumptions and evidence about digitally literate generations

Theme # 5      Training like its 1999: Tensions between technology and tradition

**3.1      Research question 1. What are the general attitudes of Army personnel towards using mobile apps for training and learning?**

All participants reported using apps on their smartphones, albeit some more than others. However, generally the attitudes towards the use of apps was of acceptance that apps are part of every-day life.

**3.1.1    Theme 1. Get in, get out, get what you need: Apps for specific times, places and context**

When participants were asked which mobile apps they used the most they collectively showed preference for apps that don't take up too much of their time and that serve a specific purpose. Our participants were using lots of different apps for different purposes in their personal life. They showed a strong preference for apps that were easy to use and were unlikely to continue with apps that were difficult to use or didn't suit them. The majority of participants expressed benefits from using apps as long as they were user friendly such as is described by this participant:

*I think if it was beneficial and useful in some aspect and that then yeah I'd probably have no problems with doing that and using them. Yeah. As long as they were user-friendly, beneficial and there was a reason for them, they didn't keep crashing or they weren't awkward or difficult to use. (P.2)*

There were many apps being used by participants for specific reasons including web browsers, messenger and weather apps:

*They have a particular purpose, so they have an isolated function. So like if I go to the weather app, I know I'm going to get the weather. I know what I'm in for I guess, that's very clear. (P.6)*

Fitness apps were a very popular choice of use among participants and some used the free versions while others opted for the subscription to fit their purpose. Other apps, such as mental health trackers were utilised as required. This participant spoke of using apps when required and then deleting them:

*Yeah, so I think it depends on your life at the time. So there's apps that I've ... fitness apps that I've used maybe for a couple of months at a time and then got bored or perhaps it's too expensive, the subscription model. So you end up deleting it and moving and finding something else. (P.6)*

### 3.1.2 Subtheme: Intuitive and simple

Many of the participants mentioned they preferred apps that were simple to use and intuitive, adding to the benefit of time saving. This participant talked about being drawn in subconsciously to an app:

*Yeah, definitely. On a subconscious level I think that the more intuitive it is, the more likely you are to come back to it and use it. If you feel like you're getting what you're looking for out of it quickly, you'll be more drawn, you'll come back to it. Whereas some apps, you know, you don't*



*feel like you're achieving something through using it, you tend to just stop using it. (P.18)*

After claiming to not be particularly “*technical in nature*”, another participant spoke of how they use Google and how it connects across apps:

*I like its intuitive nature, how it actually links to other Google sponsored applications though, both Gmail and both which I use as a private email account. Most of it's full of rubbish, but it's there. And they have Google Maps as well. So, even though Google could be better supported on an Android device, I still use it intuitively across all of the applications. (P.15)*

### 3.1.3 Subtheme: More positives than negatives

There were a couple of extremes at both ends of the continuum of use comparison, with one participant choosing to use apps to coordinate their life:

*Because I have apps that I use on a daily basis to kind of coordinate my life in a way. So there'll be like [public transport app]. So ascertaining when buses are coming, weather, or Google Maps on how to get somewhere, or [banking app] just to make sure I have money in my account, that type of stuff. And then I've got the other kind of apps that are more sort of interest or lifestyle choices. (P.6)*

In contrast another participant expressed they would much prefer to use their PC than app on a mobile, taking that option whenever possible:

*I only use my mobile for those apps when I don't have access to my PC. My preference is to use it the PC because it's got a much better screen; so it's a backup device to access those when I don't have my PC. (P.5)*

Overall the responses to questions concerning mobile app use in general captured participants views that using apps comprised more positives than negatives. When asked about their general attitude towards using mobile apps one participant responded:

*I think it's really positive. So, I've got the SOFIT app [a health and fitness app designed for military personnel interested in special forces selection and training] on my phone. I also have the Library app, Libby, and another one.*

*(P.14)*

Another participant reported 'more positives than negatives' regarding the fitness app they are currently using:

*I think certainly it's got more positives than negatives. As I say, if I didn't like it, I wouldn't be using it. I use it for, like I'd say, convenience by the fact that I can be anywhere, whether it's in my home, out in a playing field or say, if I'm traveling in a hotel, to be able to have a program through which I can follow and also track my progress. (P.3)*

### 3.1.4 Subtheme: Apps supporting Army-related activities

The subtheme 'more positives than negatives' reflected onto the general attitudes of the participants towards the use of mobile apps for activities that are Army-related. Almost all participants made reference to apps they were using that were beneficial to their work lives, blurring the lines between work and personal use of apps. This participant spoke of time saving benefits gained by using Google on their phone for work purposes, rather than using a work computer:

*I generally use it (google) for research, for work-based research stuff. I generally find it's quicker to use my phone than it is to use a work computer, so if there's a topic I'm researching or something I need to check to confirm,*

*I'll generally jump on Google, I'll do a quick search, and find either a research article or a news article that relates to the topic. (P.18)*

Another participant spoke of using 'health and wellness apps as good mental health is part of the social norms' in the Army:

*I think the health and wellness ones are important, particularly to Defence personnel. Because it's part of the social norms or the values that they preach. (P.6)*

Another participant spoke of apps linking to Army-related performance:

*So ABC news, I read it because of work to see what's going on on a day-to-day basis. The fitness apps again, tracking of personal performance whether it be running times or training times with reminders, et cetera. Yep (P.12)*

### 3.2 Research Question 2. Where do Army personnel perceive apps could have the greatest benefit for training and learning?

When participants were asked about where they thought apps might be most beneficial to training and learning in Army there was a great range of positive responses with many suggestions. Participants commented on apps that could be beneficial across ranks and Corps, from private soldiers to captains.

#### 3.2.1 Theme 2. Value add potential

There were many great suggestions of using or developing apps for references or to support procedures, including things like 'the Cove [<https://cov.army.gov.au/>], an Army

educational website] as a resource, access to Army's dress code manual (P.13), keeping track of your kit (p.16), (P.3), and physical manuals and publications. (P.2) One participant suggested a 'app as a planning function tool would be an amazing app for any military officer'.(P.12) Another participant expressed their views of 'great potential' for apps in the Army suggesting benefits to not only 'any type of learning, which requires some reading', but also the possibility of enabling collaboration between groups 'through the app':

*Oh, I think there's great potential for the use of apps for mobile learning. So any type of learning, which requires some reading. A little bit of input as well, where someone can respond in its most simplistic formats. That's where it can be used in informing a person, allow them to reflect and think about information they've taken in. And then either responded to that, through that same app to get a transfer of thoughts and ideas between two groups. (P.11)*

Another participant spoke of 'an app being used to deliver training to some of the rural and remote reserve units', again reflecting the concept of mobile apps enabling connectivity between groups, connecting trainer to remote trainee:

*Even things like... Example is the reservists accessing training. You've got a Reserve Depot in Lithgow or Broken Hill or something like that. How do you get training to those people for what's not their corps? ..... So you see an app could be used to deliver training to some of these rural and remote reserve units who don't otherwise have access. (P.13)*

Another suggestion was made by this participant for a 'ready reckoner' which might assist Army personnel through giving them 'some sort of template to guide people':

*I think perhaps things maybe like a ready reckoner. So whether they've got sort of templates to guide people through giving orders or when they're sort of becoming first familiar with it, or things like critical information requirements, if there's an incident and you're in a leadership position and*

*you've got to respond to it, sometimes you're in the middle of the event and perhaps you're stressed or you're not a hundred percent sure on who you're to call and when, or what process you have to go through. So something that kind of guides that thinking, I guess, would be useful. (P.6)*

### 3.2.2 Subtheme: Supplemental benefits

Overall, the participants were of similar opinion, proposing mobile apps would not be an efficient stand-alone form of training and learning. Most of the participants spoke positively about the possibility of mobile apps supplementing current methods of training. Several participants while favouring apps as an additional training method, mentioned the need to maintain connections with people in order to achieve the best possible learning and training outcomes. This participant, who worked in a healthcare role, spoke of mobile apps 'complementing what we do as a supplemental function':

*I think it's absolutely a supplemental function. I don't think it'll replace our psychologists or our psychiatrists or our counsellors. I think what it does is gives people the ability, again, at a point of time and a point of their choosing to engage in their own health and well-being. And so I think it'll be complementing what we do. And we're seeing different apps all the time come out to do that. Again, whether it's in the physical space, or the wellbeing health space. I don't think it could ever replace the apparatus we've got in the services world. (P.9)*

Another participant spoke of the need to 'reinforce learning face-to-face'. However, they also mentioned this could be achieved through 'group chats', which in fact is suggesting using a second app (group chat) to support the first language learning app (Duolingo):

*So yeah, I think that they would work well, but I think that we would be silly to say... So an app can do, whether it maybe be concurrency training or maybe lead in training, but I think it needs to either reinforce other, maybe*

*the face-to-face training or other training, not just be standalone by itself. So it's not the Duolingo, do I think I'm going to learn Korean by an app alone? No, I need either reinforcing face on face or group chats or things like that to bring me up to speed. (P.12)*

This participant reflected several participants' opinions that it is important to maintain the 'human element' of training and learning:

*Well, I mean, in the classroom situations you've got that human element, you've got that X factor, you've got that opportunity to confront the lecturer and say, "I have a problem with such and such an area." (P.8)*

### 3.2.3 Emergent theme: Training in the future

With the Global pandemic having such a profound effect on the world due to the rapid spread of COVID-19 and its dire consequences, it was not surprising the topic surfaced throughout the interview process. Many participants spoke of the necessity to change the way things are done considering the new social distancing requirements:

*I think having now grappling with the reality of trying to get soldiers onto a battle space or a training area in a COVID environment, it's forced us to reassess how we do business to only what is a must do, and driving us to find better, intuitive ways to train. I think in relation to education and training, noting they're two separate fields, interlinked but separate. I think if we're not maximizing technology or we're not embracing the transformative environment, then we fail. (P.15)*

Another participant who was involved in supporting the Army's COVID assistance taskforce, recalled the use of mobile technology to aid in delivering a training package for hand hygiene enabling people to retrain whilst undertaking their duties for the COVID-19 response:

*If I reflect back on the work that I've been doing over the last eight weeks trying to communicate with people who were spread across the nation, but more in particular in Victoria, we had people sequestered in hotel rooms everywhere and we were trying to communicate with them. I think, apps are the way to go. We used a training package for hand hygiene and bits and stuff for COVID-19 training, in particular, which we sent out a link to everyone's iPhone where they could revisit the package. Because we felt that people needed to retrain after a number of weeks whilst they were undertaking their duties for the COVID-19 response. So look, I honestly think that it is the way to go. (P.10)*

### **3.3 Research question 3. What do Army personnel perceive as the benefits, enablers and barriers to using mobile apps for military training and learning?**

Participants raised a range of perceived benefits, enablers, and barriers, which are discussed in the following themes.

#### **3.3.1 Theme 3: Blurred boundaries**

Smartphone ownership and internet connectivity were recognised as potential barriers to some personnel using mobile apps. Participants varied in the extent to which they are prepared to accept, and capable of accommodating changes in the boundary between their personal and professional life. Not all personnel want to use personal phones for work and not all personnel have access to appropriate technology or data outside of work. This participant spoke of 'smart phone ownership' and 'connectivity issues':

*So we found quite quickly via COVID that you just assume that people have smart phones and have connectivity at their house, so that's allegedly an assumption that we make. But it's not really a true assumption, as in, so we found out that with a series of our staff, they don't have Wi-Fi at home. (P.12)*

Another participant expressed that 'not everyone subscribes':

*Well, not everyone subscribes. I mean, most people do, I don't know what the percentage is. Even in our work together, there's always one or two people that don't have a phone for whatever reason. So there's that issue, or that may become less prevalent in the next few years, but there'll be a couple of people. Not everyone maybe uses their phone as much as the majority of people do, so you might preclude some people from doing it. (P.10)*

This participant highlighted the same barriers and added:

*... if Defence started to go, "We want you to use this app," who's going to pay for the data? (P.3)*

This participant suggested that using apps for work purposes would be 'bleeding into personal lives' and proposed that 'Defence needs to come up with some sort of BYO plan or some sort of allowance in IT and connectivity allowance to enable the use of apps for work purpose':

*So if we're going to push things to you using it on your own device, Defence needs to come up with some sort of policy where they either say to you, when you enlist, we're going to give you an iPhone. .... Because what we're now doing is bleeding into their personal lives.... (P.12)*

### 3.3.2 Subtheme: Security

Concerns about data security and privacy were recognised as potential barriers to app usage. Participants were generally aware of (individual and organisational) security and privacy risks, and consequences regarding privacy breaches associated with using commercially available apps. Participants also expressed concern about how their information might be used by Defence after being collected through Defence apps. Some Participants expressed concerns



that Defence needed to have better strategies in place to manage security and privacy risks. Overall, participants acknowledged security as a 'challenge' reflected by this participant's statement:

*I also think... Security is a massive challenge for us, I acknowledge that. But I also think that in our COVID world where we've moved away from offices and doing a lot more virtual logins and for the Reserve elements, there's a lot of potential out there that apps can draw us in. We just have to be conscious about how we're using them and why we have them. (P.13)*

### 3.3.3 Subtheme: Risks to privacy

This participant spoke of 'being on the ball with your privacy settings':

*Yeah, probably just the data collection side of it. If you're not on the ball with your privacy settings, before you know it, you're getting targeted advertising from your private conversations... So if you don't specifically turn off your microphone for the apps, then they are actually actively listening even if you don't have your phone unlocked, they are actually actively listening to your conversations at all times. (P.18)*

When asked if there was anything they don't like about Facebook, this participant spoke about 'the AI knowing more about me than I do':

*It's probably the advertisements. And again, probably for the same reasons that have a funny feeling that the AI knows more about me than I do. Because it seems to pop up the right targeted advertising at the right point in time. So, but yeah, I find it distracting for what I use the platform for. (P.9)*

Another participant spoke of 'the stakes being quite high' in regard to personal privacy:

*I think Insta is a bit like that. I mean, there's an opportunity there to connect with people in 2020 in a way that's different to the way that people would connect when I was a kid growing up. And that's the world we live in. But it's very public, you know? It's very public. And I mean, one mistake or one wrong picture or one wrong something, and the stakes can be quite high. (P.8)*

### 3.3.4 Subtheme: Organisational challenges recognised

This participant recalled first-hand experience with organisational challenges in managing the security:

*So basically, the benefits of apps these days is you're always connected, you can upload from anywhere, it's easy to upload and download data. But when we overlay our privacy requirements and security requirements over the top, it's standalone, it's restricted, you can't touch the internet. So basically you take away all the benefits that the apps provide, and then basically give you this product that's just hard to use! (P.18)*

Another participant showed concerns around data collection and use:

*...as long as we can communicate clearly how the information is being used, why it's being used. I mean there's always a level of scepticism of something like that, that's like Big Brother trying to check where and when you are at any point in time. (P.9)*

## 3.4 Theme 4: Digital assumptions

Varying levels of digital literacy within Army may influence app usage. Many participants reported that older generations were reluctant to use apps, and younger generations were more enthusiastic. This did not appear to be limited to any specific age group and was reflected by participants aged in their 30s to their 50s. The reports contrasted with the actual experiences of active app users who were in their 40s and 50s. There was some indication of

participants who found challenges using apps effectively. This participant describes the generational aspect as 'the barriers for use':

*I think the barriers for use probably are more to do with the generational aspect. I think for the use of apps or the take up of apps will probably increase as the generations slowly get replaced. I think the older generation will be hesitant about that using, but the younger generation who have grown up with mobile phones, with apps, using them for everything, will be more relaxed with their use in training, it'd be more one of those things they will reach for naturally as opposed to some of the older generation, dare I say people like myself. (P.3, 49 years old)*

Another participant refers to 'young punks being all up on their phones':

*Yeah. It'd just be the last component being the age of the people. So it depends, if you've got young punks who are using it, obviously they're all up on their phones and they know how to use their apps. (P.12, 38 years old)*

This participant describes people stuck in the past as 'dinosaurs':

*The main one is trying to change people's way of thinking, because I think a lot of people are stuck in the past, we've got a lot of dinosaurs in the army [i.e., people who are not good with technology], and unfortunately that's... I'm more senior myself, but I've worked with technology pretty much all my career. So, but yeah, a lot of people are not onto it, so to speak. (P.4, 48 years old)*

Another participant speaks of 'users who call themselves IT numpties where they're not confident':

*So I've met plenty of users who call themselves IT numpties where they're not confident. They struggled to download an app even, and then they might not*

*have confidence in how do I use it. So giving confidence in how to use the app and that they're doing the right thing when they do that. (P.13)*

In this case, a participant describes 'feeling really confident with their phone' and mentions that some people can't use apps because 'their phone is not up to spec', suggesting some of the issues perceived as age related might be connected to hardware or software update issues with the phone itself which are making it hard for people to use apps effectively:

*Yeah. User confidence and having it readily accessible across a variety of platforms... Example, like, I feel really confident with my phone and I have a VPN set up and I know how to set up my firewall to block apps and let them in or what have you. I know that a lot of users don't. Even in the building that I'm currently working in, there's people that can't download the Microsoft Authenticator app and therefore can't use VERA [Virtual Environment Remote Access; a set of Microsoft Office-based collaboration tools currently used by Defence] because their phone is not up to spec. (P.13)*

### 3.5 Theme 5: Technology tradition tensions

Organisational policies and workplace settings may be barriers to app usage. Armies have been in existence for thousands of years and can be very traditional. Adapting to change is sometimes a slow process. Participants highlighted tensions between Army ways of doing things and new technologies. Emphasised were physical and geographical limitations and organisational or governance issues. This participant commented on '1999 methodology' and 'taking an old paradigm into a new environment', when asked about barriers to implementing mobile app technologies:

*So, in my view, it's quite simple. You either accept the limited risk of self-regulation on things like social media for open application for the huge benefit it provides, or you don't. There's no middle ground. So, don't tell us to use something, but then provide a 1999 methodology about why*

*you shouldn't use it. Because otherwise you're taking an old paradigm into a new environment and it won't work. (P.15)*

Another participant spoke about the Army 'struggling with tech change':

*The only other one, particularly in training and learning is making sure that our instructors and the system knows how to use them effectively. Because we can be attracted to the shiny platform and potentially not use it to its full capacity because we don't know what it's able to do.....And so we try to make the digital platform bend to our old way rather than saying hey this platform gets after it differently, let's adapt our processes. But Army's struggled with that every tech change since 1901, so... (P.9)*

Another participant gave an example of what they described as 'having both hands tied behind your back' when it comes to using social media for work purposes:

*And so, we're going to continue to be hamstrung by our unrealistic policy guidelines, which affect us being able to access various sites or applications. And a good one is social media.....So you get told to do one thing but you got both hands tied behind your back. (P.15)*

This participant highlighted geographical limitations:

*So when you're working in remote areas, so where for instance, you're limited to a SAT [Satellite] phone. So if you've got everything you need on your mobile app, but that is actually, it doesn't work when you go outside of range, unless you've got SAT communications or you've got [a secure Defence communications system]. (P.7)*

In some situations, such as described by this participant, 'there's no way you can use your phone'. The physical work environment of this participants role in the Army doesn't allow safe use of a smart phone while on the job in many instances:

*Obviously, like I said, out in the field, it's not easy to have your phone with you. And also, cause you're doing a lot of physical activity where you're running and jumping and sort of diving, your phone could easily get damaged. So yeah. Outside of that, also at the range, as long as you're not using your phone at the range when you're firing at the actual mound, then you can use your phone. But yeah, there are certain points where you know, obviously when you've got a firearm you can't have your phone on you, I mean, you can't be using your phone. So as long as, as long as you're not sort of, at the combat ready position, if you're on, like, an exercise and simulating going out on patrol, yeah, there's no way you can, you can use your phone. (P.16)*

Within the scope of Army personnel who participated in the study, response contributions were forthcoming, and the input gained is considered valuable to Army's ongoing training interests.

## CHAPTER 4

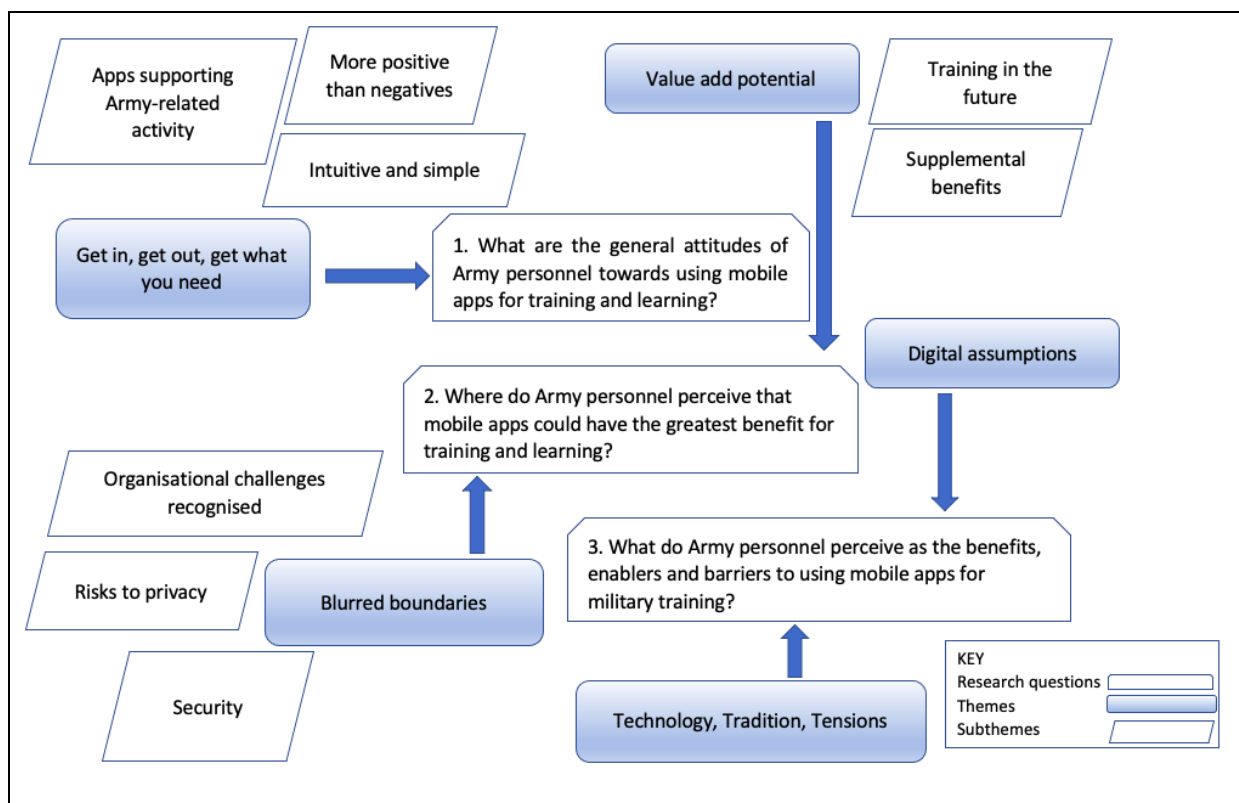
### Discussion

This study examined the general attitudes of Australian Army personnel towards using mobile apps, and enablers and barriers concerning use of mobile apps for training and learning among Army personnel. The results of the study provide valuable insights into areas that mobile apps may be used. Rigorous iterative thematic analysis of the eighteen semi-structured interviews provide an empirical and comprehensive understanding of the enablers and barriers to implementation and uptake of mobile apps in Army (Braun & Clarke, 2012). Results also reveal

a number of possible explanations for the low uptake of mobile apps by military personnel experienced reported in some past other studies (e.g. Grant and Pavlovic, 2015).

Five themes emerged from the interview process and analysis of data comprising: Get in, get out, get what you need; Value add potential; Blurred boundaries; Digital assumptions; Technology, traditions, tensions; and their seven related subthemes: Intuitive and simple; More positives than negatives; Apps supporting Army-related activity; Training in the future; Supplemental benefits; Technology, traditions, tensions; and their seven related subthemes: Intuitive and simple; More positives than negatives; Apps supporting Army-related activity; Supplemental benefits; Training in the future, Security; Risks to privacy; and Organisational challenges recognised.

Table 5: Thematic map



Key drivers for app use by participants was that they met user's requirements *Perceived Usefulness* and were fit for purpose *Perceived Ease of Use*. The theme 'Get in, get out, get what you need' mapped onto constructs *Perceived Usefulness*, and *Perceived Ease of Use* due to many participants commenting they preferred apps that they could access quickly, and that they used for specific times, places and context. Many participants reported using apps for a specific purpose (e.g. buying a house or moving to a new house) and deleting the app when it was no longer required, suggesting an app's *Perceived Usefulness* may be short term or limited

duration. Some participants described their preferred apps as those that were intuitive, such as the triangulation component of weather apps. Many participants commented they were motivated to use simple apps that served one function and contained the right information, hence the subtheme 'Intuitive and simple'. The reasoning behind participants' preferences for keeping apps simple was most likely related to such apps being more time efficient and easy to use (*Perceived Ease of Use*).

The subtheme 'More positives than negatives' reflects participants general attitude towards using apps and results show that many participants are using apps to coordinate all or part of their lives (e.g. calendar apps, school communication). Results also show apps were being used by personnel which support Army-related activities, such as fitness and nutrition, travel and navigation, and information and research. The majority of participants used a fitness app due to base fitness and health requirements of Army and weather apps to aid in planning fitness activities, connecting to constructs; *Subjective norms, Perceived usefulness and Functionality*.

The theme 'Get in, get out, get what you need' and subthemes 'Intuitive and simple', 'More positives than negatives', and 'Apps supporting Army-related activity', respond to the first research question concerning the general attitudes of Army personnel towards using apps for training and learning. The results inform Army that the general attitude of personnel towards using apps for training and learning is more positive towards apps that are easy to use and intuitive, and that most personnel are already familiar with, and using apps that support Army-related activities.

The second theme 'Value add and great potential' informs the second research question which was to enquire as to where Army personnel perceive apps would have the greatest benefit to training and learning. The results of this study presented many areas in Army where apps could supplement training including (e.g. tracking kit equipment, tracking performance over time, delivering training to remote areas, access to publications and documents). These results add value such that Army has information to target specific areas of future app development where personnel have deemed them useful, increasing the likelihood of uptake by Army personnel.



The subtheme 'Training in the future' represents results from several participants who indicated that the challenges that were taking place due to the COVID-19 pandemic and social distancing requirements, compelled Army to reconsider ways of training in the future. This subtheme also aids future research and development of apps due to the results showing acceptance by Army personnel that apps were required to continue training and learning in times of social distancing, along with reports of successful uptake and use.

Challenges identified by participants included the blurring of boundaries (theme 3) between personal and professional life should Army endorse the professional use of apps on personal phones. For instance, some participants voiced concerns that many individuals did not own mobile phones, and therefore could not access work related data outside of work. Security and privacy (subthemes) issues relating to mobile apps were identified by many participants and several referred to concerns about the artificial intelligence component of apps (e.g. algorithms on face-book that suggest links based on user activity). Results showed personnel recognised the organisational challenges (subtheme) faced by Army to ensure security and privacy was protected. Some participants were sceptical and had apprehensions about whether Army could ever move past traditional training methods to enable successful digitization, (e.g. one participant reported having to post on twitter, though the posts were held up by security checks deeming them outdated by the time of release), hence the theme 'Technology, tradition, tensions.'

Past research (Orvis et al., 2010), has suggested young soldiers are more digitally literate than their older counterparts, through being raised in the digital era and having experience with using smartphones, computers. The theme 'Digital assumptions' represents participants perceptions within the data which are similar to past research; one participant referring to the older generation as 'dinosaurs'. However, the overall results from this study with median age of 45.44 (*SD* 8.55), did not support these perceptions, with only one participant reporting they preferred to use their PC rather than an app, and all other participants reporting actively using multiple apps. These findings support the need for further research concerning digital literacy assumptions regarding young and more junior ranked soldiers. The results also inform Army of some of the barriers that should be addressed prior to introducing apps to training and learning

including areas where future research is needed such as; varying levels of digital literacy, varying levels of device ownership and internet connectivity, security constraints and privacy concerns, concerns that Army won't adapt to new training methods.

The two constructs *Perceived Ease of Use* and *Perceived Usefulness* were found to be closely interconnected throughout the data and assisted to inform the study of reasons which affect uptake of apps. For example, if an app was deemed useful, though not easy to use, or vice versa, it would not likely be used or it would be deleted from a device. Results showed the reasons that many participants gave for not using an app included; poor design, poor user engagement, intrusive advertising, and the cost or requirement to pay an ongoing fee per month to enable full functionality of the app. These findings are significant to Army such that further research can be directed to explore these specific areas further and how and why these barriers operate.

There has been limited research concerning mobile apps in a military context and this is believed to be the first study to examine the attitudes of Australian Army personnel towards the use of mobile apps for training and learning. Whilst nothing broadly inconsistent with past studies was discovered, the results from this study provide a number of possible explanations for low uptake of mobile apps by military personnel experienced in other studies (For example apps are not engaging, apps have intrusive advertising, apps contain irrelevant information or information that is not specific to suit purpose).

In a Canadian study, Grant and Pavlovic (2015) found that uptake of apps was minimal in their study of a marksmanship training app. The results of the current study provide plausible explanation for the low uptake of apps in the Canadian study, through similarities in the findings. For example, soldiers in the 2015 study expressed concern over how the introduction of an app would affect their current training methods and findings from the current study suggest Army personnel view apps as supplementary training and have concerns with defence security constraints and privacy issues. Also, The Canadian study reported that soldiers may have lacked motivation to use the app due to the belief they had already mastered the task at hand. The current study concurred that apps must be engaging to interest personnel in their uptake. Furthermore,

An experiment in a Naval operational setting yielded similar results with low uptake of an app designed to build stress resilience, Stress Resilience Training System (SRTS). The platform used to deliver the training was through iPad, which was found to be cumbersome and recommendations for the study were to make the app available for use on smartphones. The current study provides evidence to support the use of apps through smartphones is an accepted and commonly used platform. The results from current study show the majority of participants showed preference for smartphones over tablets or iPads.

In another study which examined the effect of app-based multi-tasking training on situation awareness in civilians and Army personnel completion rates were found to be much poorer in the Army sample Black et al. (2020). The current study supports further research in this area through informing the enablers and barriers to uptake of apps by Army personnel, with recommendations for future research to test how and why the enablers and barriers operate.

### **Implications and Limitations to the study**

With ongoing technological developments there are emergent challenges and benefits to organisations that must be continually investigated. This study uncovered valuable insights into the attitudes of Army personnel towards using mobile apps including some enablers and barriers. However, there were some limitations to the study which must be considered.

Due to the COVID-19 pandemic, interviews were conducted remotely rather than face-to-face, as originally intended. It is marginally possible different results would have been produced if interviews were conducted face-to-face, but it is more probable no effect was caused. It is, however, likely that participants may have been inclined to think differently about the study questions due to the fact they were experiencing a Global pandemic which was having a direct effect on their professional and possibly their personal lives. Since participants were having to make changes to their usual routines of communication and training, their acceptance of technology and using mobile apps may have been somewhat influenced by the impending belief digitization was inevitable.

A strength of this study is that the participants were representative of eleven Army Corps (Artillery, Engineers, Signals, Infantry, Intelligence, Transport, Medical, Ordnance, Electrical

and Mechanical Engineers, Education and Psychology), almost half of the twenty-three Corps in the Australian Army. Whilst this is a fairly good representation, it is possible the study may have gained some different perspectives through interviews of personnel in the Corps that were not represented. For example, personnel from the Military Police Corps may have had different insights and experiences using apps to the participant group. However, the main barrier to using mobile apps (security and privacy concerns), was not unique to any particular Corps, therefore, the missing Corps were not considered detrimental to the study and generalisation of the study should be considered applicable.

The study would also have benefited from the inclusion of participants from a lower age range and junior rank. Young and junior ranked personnel were a minority in the study, with most participants aged in their 30s and relatively higher ranked. The inclusion of younger and more junior ranked Army personnel would have been useful in terms of the likelihood that they have more personal experience with digital technologies, including apps and this has also been raised in past studies (e.g. Orvis et.al., 2010).

There is a need for further research in this area, including research designed to further examine how and the enablers (preference for apps that support every day activities, apps for specific times and contexts, simple to use apps preferred) and barriers identified in this study (e.g. not everyone owns a mobile phone or has access to internet) operate, the extent to which some barriers are more important than others (e.g. barriers to using in restricted areas and varying levels of digital literacy), and how the uptake of new technologies for training in the Army may be facilitated or improved, with the removal of barriers.

Furthermore, there were no personnel who did not use apps and no comparison to civilians use of mobile apps. Collecting interview data from people who don't use apps may have informed further barriers to using apps. Barriers were identified in the study; however, it was beyond the scope of this study to test if addressing these barriers improves uptake of apps. Recommendations for future research are to test how and why these enablers and barriers operate, if some barriers are more important to address before others, and how uptake of new technologies such as mobile apps will improve if the barriers are removed. To minimise cost to Army due to low uptake of app use Army needs to endeavour to develop apps that are of good

design, fit for purpose, engaging and don't incur extra costs to their users (Army personnel). In order to augment successful use of mobile apps within Army (inclusive of uptake and continued use), these features of apps should be further explored as enablers. Further recommendations for research are to determine whether positive attitudes towards mobile apps transfer onto the uptake and use of apps for training and learning.

## Appendices

### A. Interview introduction and questions

**Introduction.** Thank you for agreeing to take part in this study. The aim of the study is to explore and understand the attitudes and experiences of military personnel towards using mobile devices for training and learning. The study is being conducted by DST Group and the University of Adelaide as part of a DST research program into training technologies. The focus of our study is on 'apps' that you might use on a smart phone or tablet device. These apps could be ones that you use for personal or work reasons. We are particularly interested in understanding where mobile apps may be beneficial for Army personnel, as well as potential barriers to their uptake and use. We will be interviewing personnel from different ranks and corps, and you have been invited to participate because of your current role in the Army. Do you understand that you have the choice to withdraw from the study at any time, and that you will not be penalised in any way? Do you consent to the interview being recorded using an audio voice recorder?

Questions
<b>A. Personal Information</b>
1. What is your current rank and job title/position?
2. What is your current employment category?
3. How long have you been in the Army?
4. What is your current age?
5. What gender do you identify with?
<b>B. Device Ownership and Use</b>
6. Do you own a smartphone or mobile device? If yes, what type(s) of device? What operating system do you use?
7. How often do you use the device?
<b>C. Mobile App Experience and Preferences</b>
8. What are the three apps you use most frequently?
9. What are the main reasons you use these apps?
10. How often on average do you use these apps?
11. What specific features of these apps do you like?
12. What specific features of these apps do you not like?
13. What factors or situations would motivate you to want to use an app?

14. Can you think of an app that you stopped using?
15. What were your main reasons for starting to use it?
16. What were the main reasons you stopped using it?
<b>D. Perceived Benefits and Opportunities</b>
17. How would you describe your general attitudes towards using mobile apps for military training and learning purposes?
18. Where do you think apps could be of benefit for military personnel?
19. Are you currently using any apps for military training and learning? <ol style="list-style-type: none"><li>If YES, can you please name the app and describe how you use it?</li><li>What do you like about it?</li><li>What don't you like about it?</li><li>Would you recommend this app to others? Why/why not?</li><li>If NO, what are some of the reasons?</li></ol>
20. Have you ever stopped using an app for military training and learning? <ol style="list-style-type: none"><li>If YES, can you please name the app and describe how you used it?</li><li>Why did you start using it?</li><li>Why did you stop using it?</li><li>Is there anything that would make you go back to using it?</li></ol>
21. In your current role or employment category, can you think of an area where a mobile app could supplement current military training methods? If so, how would you imagine it could be used?
<b>E. Perceived Challenges &amp; Supplementary Information</b>
22. What do you think might be some challenges with using mobile apps for military training and learning?
23. Do you have any other questions, comments or suggestions before we conclude?
24. Would you like to receive a summary of the results once the project is finished?

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