USE OF MOBILE APPS FOR TEACHING AND RESEARCH

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Abstract. Applications (apps) are software specifically designed for mobile devices. This paper reports on the results of an online survey about app use for teaching and research by students and academic staff at the University of Waikato. The questionnaire had 138 respondents. The results of the data analysis indicate that among respondents apps are primarily used for communication, data storage, and collaborative work. Nearly a third of respondents reported not using. any apps for academic purposes, with almost half that number citing a lack of knowledge about possible uses. In teaching practice, apps were reported to be used as a means to push information to students, e.g., for distributing reading materials and other teaching resources. In research, apps appeared to be used to self-organise, collaborate with other researchers, store information, and to stay current with research. This paper concludes with a list of implications.

Keywords: mobile apps, research methodology, teaching material, academia.

1   Introduction

The use of digital technology in higher education has attracted much interest in recent years. It is a common expectation for academic staff and administrators to investigate options to ensure the learning environment is modern, relevant and capable of producing graduates with attributes aligned with the work environment and their career expectations. Students engage with campus life carrying highly sophisticated computing devices in their pockets. Frequently these students use these devices for a variety of purposes, which are unrelated to learning, thus highlighting a crucial disconnect exists. Institutes of higher education are concerned that both their staff and students are digitally literate, in the manner of learning delivery or method of instruction. Mobile learning has been claimed as the future of learning (Bowen & Pistilli, 2012) and an examination of this claim leads to questions of how institutions are promoting mobile initiatives, what the mobile profile of their staff and students is, and whether their initiatives are progressing learning technology. Applications (apps) are a fundamental feature of mobile devices and the volume and complexity of apps continues to increase unabated. Technological advances in recent years have been quickly adopted by many academic researchers, for example, computer-assisted data analysis packages are now routinely recommended or employed in research (Goble, Austin, Larsen, Kreitzer, & Brintnell,

2012). New applications continue to proliferate and their access is made easier through the increased usage of mobile devices such as smartphones, tablet computers and the availability of WiFi and cloud-based computing. These technologies enable educators and researchers on desktop PCs to synchronise real time and large volumes of data from mobile apps.

Literature in the field is also increasingly suggesting that mobile devices can be valuable in higher education for such activities as gathering and using information, accessing content, promoting communication, collaboration and reflection (Bowen & Pistilli, 2012, Beddall-Hill, Jabbar & Al Shehri, 2011). They offer extended capacity to undertake research across a wider range of locations than traditionally possible and enable the collection, manipulation and sharing of data in real time. Mobile applications have reached a maturity point as a technology suited to academic purposes (Hahn, 2014) and their development and use continues to grow exponentially.

The University of Waikato has identified digital literacy as a key element in the overarching graduate attributes profile to ensure graduates can demonstrate technology competency and the ability to contribute to New Zealand's modern, digitally-oriented, rapidly-changing economy. With literature in the field continuing to highlight the challenge of students attending higher education institutions with high-powered computing devices integral to their real life experiences but which are poorly utilised within their learning situation, it was considered timely to enquire into the present state of the University's academic staff and researcher inclusion of mobile technology, specifically mobile apps, within the curricula and taught research processes.

This paper examines the issue of mobile apps usage for teaching, learning and research purposes across the University of Waikato. It does not seek to examine apps used for purposes other than teaching or research nor does it investigate the broader category of applications, including those used on desktop computers. It is intended to provide an information starting point through the analysis of a snapshot survey of academic staff, researchers and Higher Degree Research (HDR) students. For the purposes of this investigation a mobile app was defined as a software application developed primarily, although not exclusively, for use on small computing devices, such as smartphones or tablets. Mobile apps such as Evernote or mobile app versions of programs such as Dropbox were offered as examples in the investigation. The term 'academic purposes' includes all teaching and/or research activities.

2 Literature Review

The research literature on using mobile apps for research purposes is sparse. The field of mobile computing and the academic environment has been well explored from a range of perspectives (Beddall-Hill, Jabbar & Al Shehri, 2011; Fan, Radford & Fabian, 2016; Kukulska-Hulme, 2014; Kukulska-Hulme, Pettit, Bradley, Carvalho, Herrington, Kennedy & Walker, 2011). The use of digital tools for research purposes has focused on opportunities and challenges, ranging from technical issues, such as battery life, data security or data inaccuracies through to more complex concerns such as how do we prepare future researchers to leverage the capacity of digital tools to influence

all aspects of the research process (Carter, Liddle, Hall & Chenery, 2015; Davidson, Paulus & Jackson, 2016; Garcia, Welford & Smith, 2016; Raento, Oulasvirta & Eagle, 2009). The development of mobile apps has also been well covered, although not necessarily through research publications but rather through conference presentations or workshops. There is much personal comment, often supported by statistics, on news, industry or personal blog sites. Several studies have been conducted on the selection, use or development of mobile apps by or for libraries (Wong, 2012; Hennig, 2014; van Arnhem, 2015). These apps have focused on delivery of information resources to handheld devices, or communication of information about the library and its services.

The Charleston Advisor: Critical reviews of web products for information professionals, runs a regular feature Mobile apps for libraries which investigates in depth a selection of mobile apps and offers consideration of both benefits and pitfalls. An example is Van Arnhem's coverage of apps and gear for ethnographic field research (van Arnhem, 2015) with a useful review of the benefits and weaknesses of a number of apps that could be used throughout the research process. One of the pitfalls of writing about apps in relation to educational activities is the tendency to fall into a description, and occasionally analysis, of the functionalities of the particular app. More rigorous study was undertaken at the University of Chester, where the adoption of mobile note-taking software by undergraduate students was observed with the findings that students took readily to using the applications for specific aspects of their research and students were at low risk of being disadvantaged by being expected to engage with relevant mobile apps (Schepman, Rodway, Beattie & Lambert, 2012).

The concern that not all students have access to a smartphone is not supported by recent data that indicate 86% of American 18-29 year-olds own a smartphone, while 68% of U.S adults own a smartphone, a figure that has doubled since 2011 (Anderson, 2015). However, an investigation by the Pew Research Centre into the use of mobile apps for single–contingent experience sampling method surveys, which, in essence, allowed live streaming of data collection from multiple devices in the field directly to a researcher, examined whether the use of the apps would result in differences to the use of web-based means of data collection and whether survey responses would differ in participant response, including demographic groups (McGeeney, 2015, p. 1). Results showed variance in the feasibility of using mobile apps for conducting the type of survey methods mentioned above. A number of logistical and technical constraints became apparent and, while the investigation participants engaged actively with the app, there were issues with needing time and effort to learn how to use it effectively, leading to the conclusion that using apps results in lower response rates that for web-based data collection (McGeeny, 2015, p. 2, Pew Research Center, 2015, p. 19).

Beyond an examination of the benefits and disadvantages of mobile app use in research, Carlos (2012) identifies the advent of mobile research tools as contributing to the nascent "robust environment of apps that provide limited functionality for research" (Carlos, 2012, p. 440) and proving a useful supplement of the desktop computer. Within the academic environment, technical infrastructure is a consideration in promoting the use of mobile apps. The availability of robust wi-fi connectivity is important and working with the organisational Information Technology Services to ensure their staff are

capable of supporting device requirements needs to be addressed prior to their peda-gogical integration. Adopting an analogous view of mobile technology may assist in exploring its potential. MacNeill, for example, suggests that, for academic staff, a use-ful way to personalise a mobile device is to make use of apps for teaching and research purposes. She suggests this task be approached in the same manner as conducting a literature review, with initial focus on keystone apps around which to build the body of supporting apps (MacNeill, 2015, p. 241). This approach requires the traditional ongo-ing evaluation of continued usefulness or relevance of works/resources and, as such, enables a more comprehensible transition for academic staff and researchers uncertain how to begin exploring strategies for using digital technologies in support of academic processes and routines.

3   Methodology

A study was conducted through an online survey and investigated how mobile apps were being used for teaching, research and learning purposes across the University of Waikato.

3.1   Data Collection

The data collection for this survey was performed using an online, self-administered survey. The survey was intended as a snapshot in time and the two-week timeframe for the survey (3-19 August, 2016) was selected as a period mid-way through the first half of B Semester when academic staff, researchers and higher research degree students would likely be available to participate. As the aim of the research was to understand the usage of mobile apps for teaching, research and learning purposes, purposeful sam-pling procedures were employed. Once ethical approval had been granted and agree-ment to conduct the survey had been received from the Faculty/School Deans, the Re-search and Enterprise Office forwarded the invitation and information for participants to all departmental administrators. Through their email lists the departmental adminis-trators distributed the invitation and survey information to the departmental academic and researcher sample participants. For the higher-degree student sample, the Advisor and Secretary to the Postgraduate Research Committee, School of Graduate Research, emailed all their students and posted the invitation to participate on the School Face-book page. The inclusion of an existing communication network within the University and the use of email invitation for the online survey was intended to ensure as many of the potential sample were invited to participate as possible. This option allowed for reminder emails to be sent through the same channels during the two weeks the survey was open.

The potential sample size was up to 1404, including 65 research-only staff, 415 teaching and research staff and 104 teaching-only staff as well as about 820 Higher Degree Research (HDR) students, (made up of approximately 600 doctoral candidates and 220 Masters by thesis students) completed the potential sample. In some cases the

academic or researcher may have also been a student or the student may have under-taken teaching responsibilities. The questionnaire allowed selection of more than one option.

Participants were made aware that their responses were anonymous. To minimise the potential problem of non-sample respondents completing a publically-available survey with unsolicited responses compromising the quality of the data (Shannon, Johnson, Searcy & Lott, 2002), a closed location, Qualtrics, was used with no other links to the instrument. The URL was provided within the email invitation directly to the selected samples. There are many obvious benefits to web-based surveys (Nulty, 2008), although online surveys are also notorious for low completion rates, technical problems and lack of participant awareness.

The data collection instrument was a 24-item, web-based survey utilising the Likert scale, radio button (including both single and multiple options) and free text questions to gather data on mobile apps usage by participants. Literature in the field has demonstrated the Likert scale as the most popular form of rating scale employed within the surveys in technology acceptance investigations (Kim & Garrison, 2008; Schaper & Pervan, 2005; Yi, Jackson, Park & Probst, 2006).

Depending on responses to key questions, respondents would follow different paths through the survey, so it was unlikely all 24 questions would be answered. The first section comprised four demographic questions, followed by a short section on whether mobile apps had been used, the third section focused on device and operating system used, the following, main section, depending on role and type of academic purpose (teaching or research), sought reflection on aspects of mobile apps use and whether such use had influenced research or teaching practice. For those respondents who had not used, and were not intending to use, mobile apps information was sought on the reason for this situation. The final free-text item sought concluding comments from all respondents.

3.2 Data Analysis

Upon completion of the survey and for the purposes of this snapshot investigation, the results were analysed using a variety of reports, both default and cross-tabulation for measuring association, within the Qualtrics product deployed for the survey. A basic descriptive statistical analysis was applied to the data.

4 Results and Analysis

The potential sample size included approximately 1,404 participants, including 584 academic staff (teaching, research or both) and 820 HDR students. The survey was completed by 138 respondents or 9.8% of the potential sample. Of the four roles comprising the sample, doctoral students formed the largest respondent subgroup, contributing over 52% of responses.

4.1   Demographic attributes

There were 58 respondents who described themselves as academic staff (approximately 10% of academic staff), 73 respondents who described themselves as doctoral students (12.2% of doctoral students), 6 who were Master's thesis students (2.7% of Master's students), and 16 others; see Figure 1. The category 'Other' included respondents from general staff, a librarian, a PGCert student, a doctoral assistant, a research fellow, a research assistant, a tutor, a contracted PLD, a respondent from Management, a respondent from academic and technical support, a GradDipT and a PhD graduate. Respondents could select more than one category and 16 of 138 people did so. It was possible, for instance to be doctoral student and academic staff member.
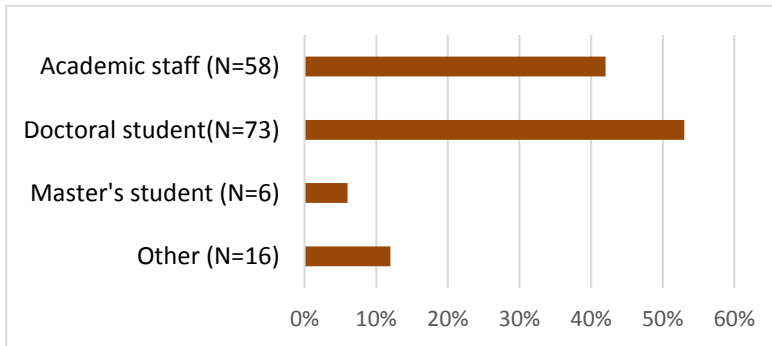
Fig. 1. Respondent roles (multiple selections possible)

The gender breakdown of respondents was 60% female (N=82), 40% male (N=55), with nearly three-quarters of respondents under the age of 50 years (see Figure 2).
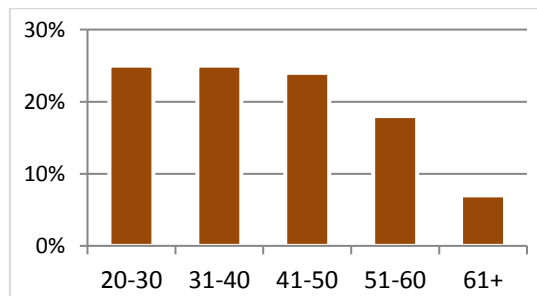

Fig. 2. Respondent age

The respondents, both staff and students, represented a range of faculties, with the science and engineering disciplines well represented, as shown in Figure 3.
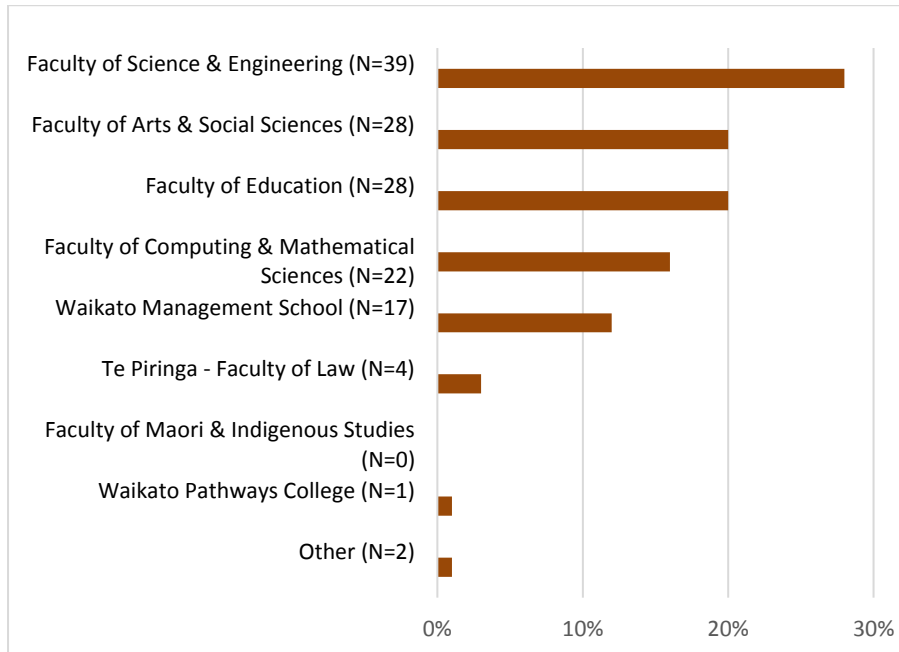
Fig. 3. Respondent by Faculty (multiple selections possible)

4.2 Use of mobile apps

The majority of respondents (90 of 138; 65%) had used mobile apps for academic purposes. Further breakdown of mobile app usage by role showed 71% of respondents who described themselves as academic staff have used a mobile app for academic purposes, a similar percentage of 'Other' roles, with around 67% of HDR students having engaged in this activity (see Figure 4).
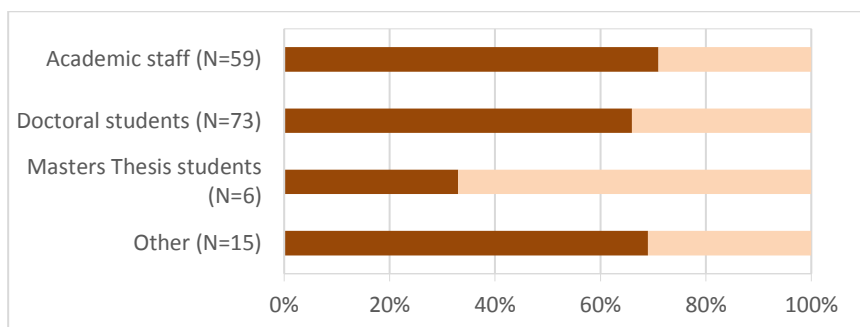

Fig. 4. Mobile app use by role
(dark/light: use vs no use among respondents, multiple roles possible)

Examining the use of mobile apps by age range, the 31 to 40 year-old respondents were most likely to have used a mobile app for academic purposes (see Figure 5).
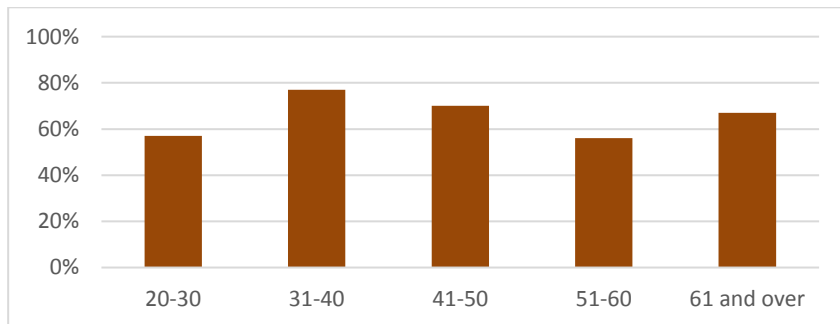

Fig. 5. Academic mobile app usage by respondent age range

Of the 90 respondents who had used mobile apps for academic purposes, the most-engaged age cohort was the 31-40 year-olds at nearly eighty percent usage, with the 51-60 year cohort having used mobile apps the least at 56 percent usage. The small sample size needs to be acknowledged. Examining usage of mobile apps by gender breakdown, of the 55 male respondents 73% had used a mobile app for academic purposes, of the 82 female respondents, 60% had used apps (see Figure 6).
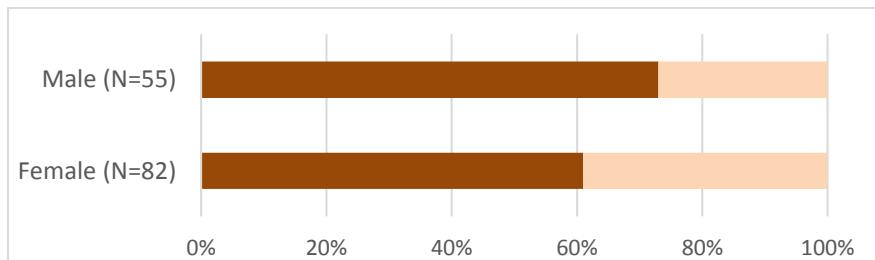

Fig. 6. Mobile app user gender (dark/light: use vs no use among respondents)

Where respondents had used mobile apps for academic purposes, they were most likely to be in the Faculty of Computing and Mathematical Sciences, followed fairly closely by the Faculty of Education, as shown in Figure 7 (faculties where there were fewer than four responses were excluded – this included the Faculty of Maori and Indigenous Studies, Waikato Pathways College, and 'Other').
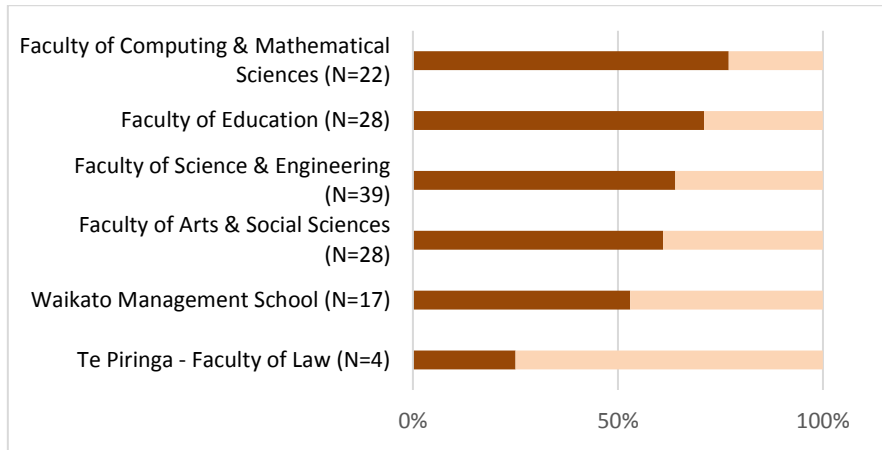
Fig. 7. Faculty use of mobile apps (dark/light: use vs no use among respondents)

Respondents who had used mobile apps for academic purposes were asked which type of device they were on when using the mobile app. 90 people responded by making 156 selections. Respondents showed a clear preference for a smartphone, being twice as likely to use this computing device as the second preference of iPad, details see Figure 8.
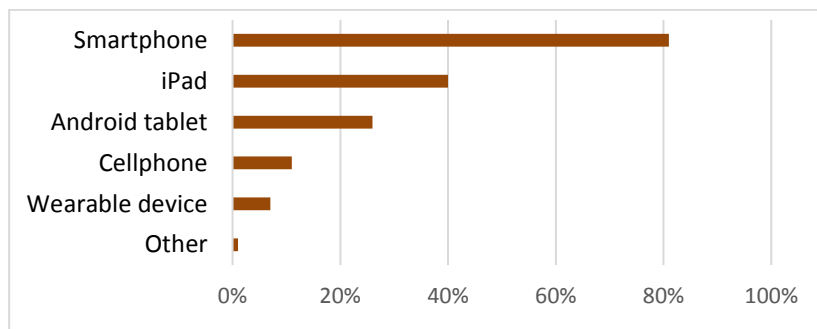

Fig. 8. Type of device (multiple selections possible)

Respondents who had used mobile apps for academic purposes were asked which operating system they were using during this process. 90 people responded to this question by making 114 selections; for details see Figure 9. The option 'Other' consisted of ChromeOS and Microsoft system (surface tablet). Android emerged as the preferred operating system.
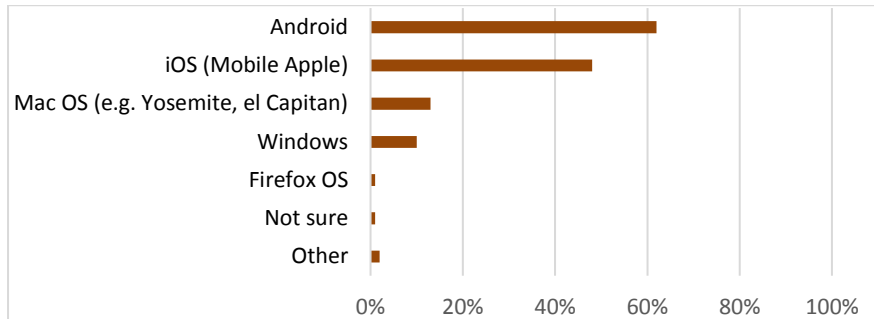
Fig. 9. Operating system used (multiple selections possible)

4.3 Non-users

As outlined in Section 4.2, 35% of the respondents had not used mobile apps for academic purposes (N=48), and, of this number, half indicated they were not planning on using mobile apps for academic purposes in the future.

When asked what was stopping them, 23 people responded to this question by making 37 selections; see Figure 10. Nearly half considered their own lack of knowledge about how apps might be used as the leading factor. Approximately one third each of responses confessed to being uninterested in apps and/or viewing them as irrelevant to their teaching or research. Other responses included the opinion that computers offer better options than mobile devices, with planned obsolescence, and a lack of support also being stated as reasons for future non-use.
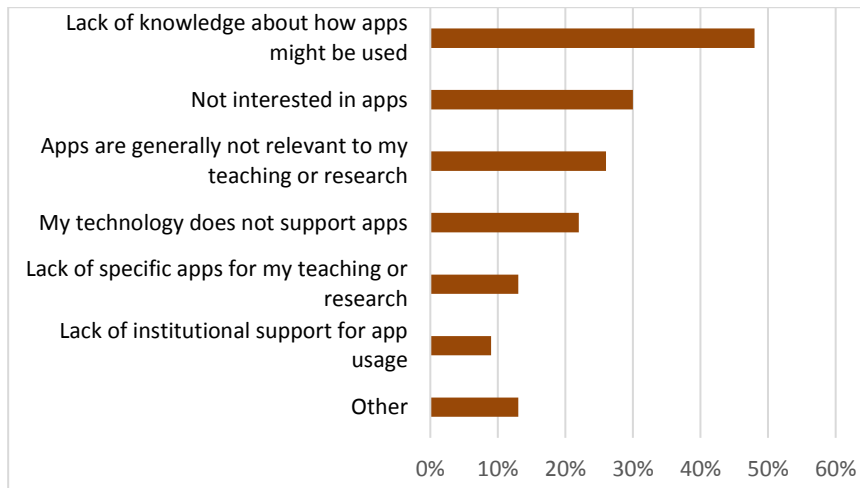

Fig. 10. Reasons for future non-use of mobile apps (with multiple selections possible)

The 50% of non-users who indicated they might use, or were intending to use, mobile apps for academic purposes in the future were asked for what purpose they might use a mobile app. Multiple selections across all options were possible. Twenty-two responded to this question by making a total of 78 selections; see Figure 11. The option 'Other' included communicating with students, reading, and participant signup. The main interest in potential use of apps by non-users was in the ability to share or communicate with others.
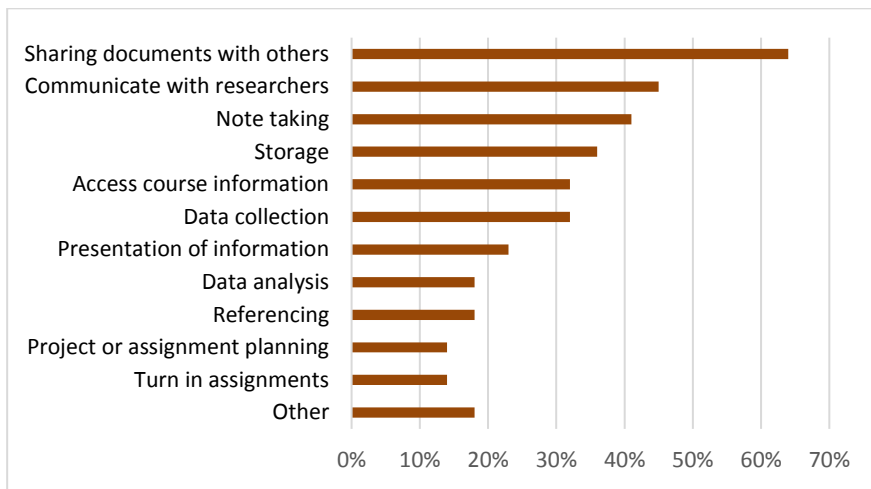

Fig. 11. Non-user possible future use of mobile apps

Respondents who had not used, but might in the future use, mobile apps for academic purposes were asked how helpful the following six factors might be in increasing this usage. Twenty-one people responded to this question using a scale of very helpful to very unhelpful; see Figure 12.
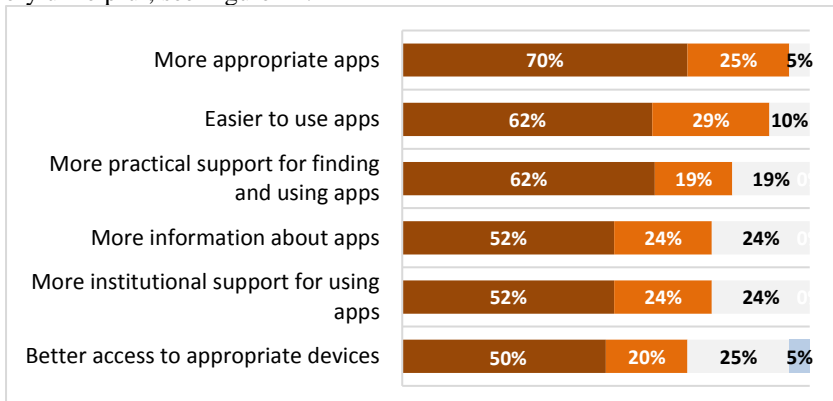

Fig. 12. Factors to encourage use of mobile apps: with scale from very helpful (dark), helpful, neutral, unhelpful, very unhelpful (blue)

Non-users were then asked for further comments. Technical concerns were expressed, such as "Technology moves so fast that planned obsolescence is commonplace. New apps have a track record of failure in their first years: this does not look good to students if suddenly the app for their course falls over", and the reassurance that "they need to be reliable enough that researchers can be confident that they will not suffer data losses if they use just apps". Non-user respondents were also concerned about usefulness from a pedagogical viewpoint, stating that "Within the last 15 years, we have gone into more and more web based teaching, and moodle etc. However, I have seen that … students who will end up as designers in some companies do not gain much from these approaches. In my judgement and experience … use of white board and limited amount of notes uploaded will work well, with lot of laboratory type hands-on elements. I strongly believe that if we [lose] the 'human touch" in classroom setting, it will gradually and negatively affect the quality of the graduates we produce", and being concerned that "One can only move as fast as students are able. One can only do so much introducing of new technology - you can get to a point where you have built a learning task for example on a particular resource and then find that half the class cannot even access it".

Some respondents expressed reservations about institutional support, for example, "Help with mobile apps seems to be largely found in internet searches of forum posts and vendor provided documentation", when they sought guidance on the best apps to consider "It would also be great if there was some sort of online resource on the uni website that lists and briefly explains some of the apps that might be useful when conducting research", and the reservation that "There is simply not the capacity in ITS to support mobile app usage".

The inconvenience of using apps was perceived by some respondents, illustrated, for example, in the claim that "In many instances and situations a well thought out website enhanced for use on mobile will be more useful and less cumbersome than an app. I despise having to download and constantly update several apps, plus they come with intrusive permissions" or they felt, at the present time, apps were "Only useful where use of a real computer is impossible". The context within which apps could be integrated into the learning environment caused some uncertainty, with several comments highlighting this reservation, "It is sometimes challenging to find the most appropriate app to meet a specific teaching purpose" and "The challenge will be to develop apps or modify existing apps to suit the purpose of the user and the context of the user".

4.4   Purpose of mobile app usage

Respondents who had used a mobile app for academic purposes were asked whether they used it for the options of teaching/supervision, and/or research. Multiple selections were possible. Ninety people responded, of whom 36 (40%) had used a mobile app for teaching/supervision purposes while 80 (89%) indicated they had used one for research purposes; see Figure 13.
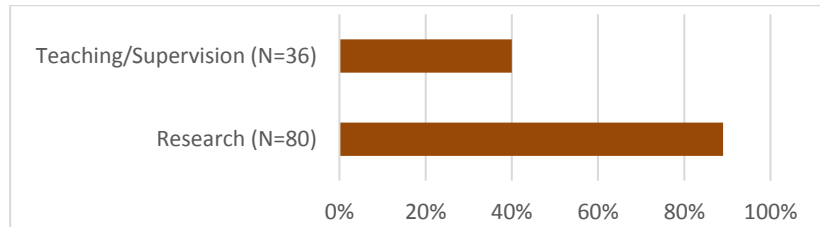
Fig. 13. Mobile app use purpose

Academic staff made up the majority of the teaching/supervision sample although there was a small number of doctoral students who had also used apps for teaching purposes. Both academic staff and doctoral students made up the largest percentage of the research sample although most academic staff used mobile apps for research purposes. Figure 14 shows that, of the 90 respondents, academic staff were more likely to have used a mobile app for teaching than for research purposes, while doctoral students, even when they held a teaching role, were more likely to use apps for research purposes.
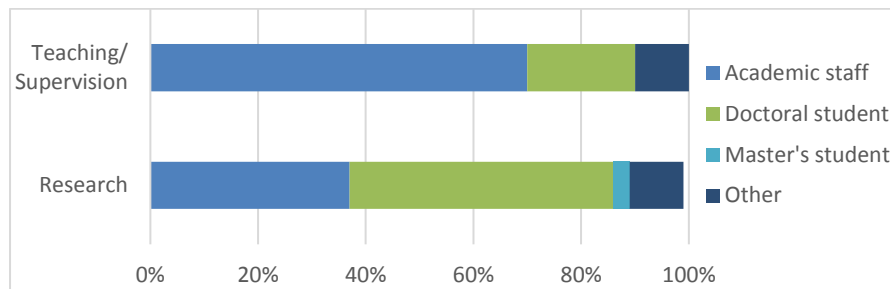

Fig. 14. Mobile app user role and purpose

4.5 Apps for Teaching/Supervision

Thirty-six of the respondents who had used a mobile app for academic purposes did so for teaching/supervision purposes. These respondents primarily comprised teaching staff but some doctoral students and respondents in the 'Other' category had also used apps for teaching purposes. This group of respondents was asked what mobile apps they used for teaching or supervision purposes from a short list of possible academic-related apps. They were also asked whether it was for their own use or whether they had asked students to use the app. Figure 15 shows the number of times respondents identified using an app for their own purposes or required students to do so. There was a substantial number of other options named, including Skype (N=2), Facebook (2), Feedly (1), Viber (1), Kahootz (1), Trello (1), Kindle (2), and Google apps (9) demonstrating the broad range of apps available (not shown in Figure 15).
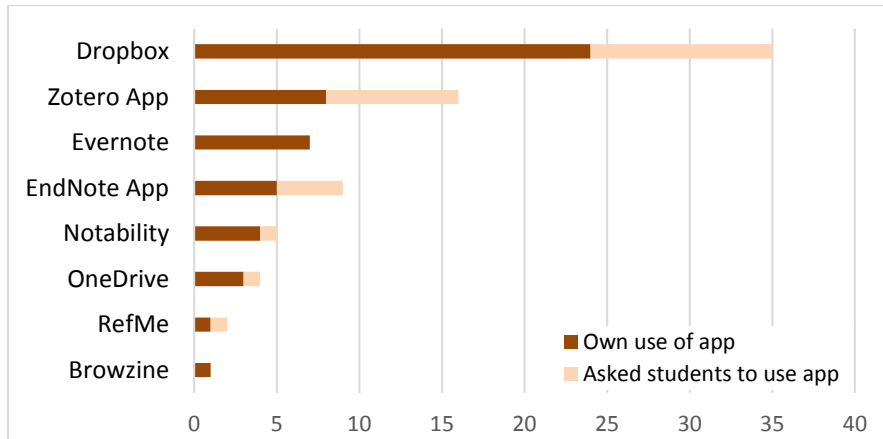
Fig. 15. Apps used for teaching/supervision purposes (multiple selections possible)

The 36 respondents who had used a mobile app for teaching/supervision purposes were also asked for what specific aspects of their teaching practice the mobile apps were used; results are summarised in Figure 16. Communication with colleagues and sharing or storing documents were the aspects teaching staff most engaged in. Lecturers also used mobile apps for communicating with their students, for research or keeping up with recent blogs.

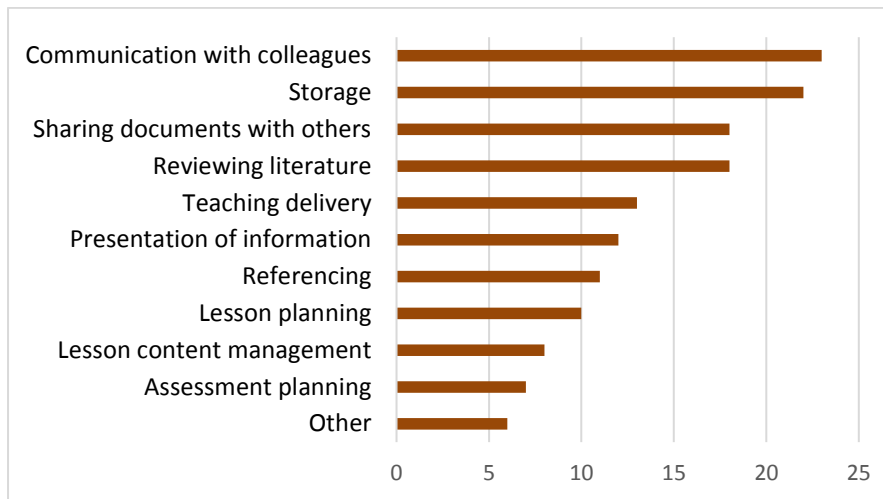**Fig. 16.** Use of mobile apps in teaching practice (multiple selections possible)

Of the 36 respondents who had used a mobile app for their own teaching/supervision purposes, 25 had also asked their students to use mobile apps. They were asked for what purposes they had made this request; results are summarised in Figure 17. Responses in the 'Other' category included feedback, evaluation, creative practice, and

study/learning. The Figure below shows teaching staff had primarily asked their students to use mobile apps for the purposes of communicating and sharing documents with others.
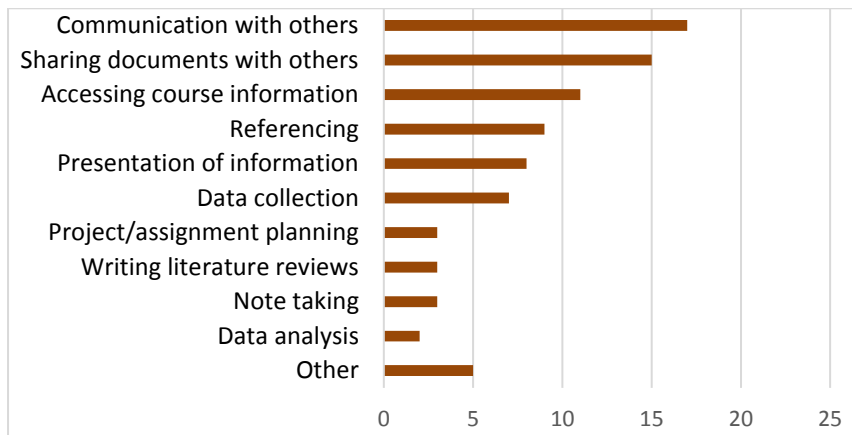
Fig. 17. Purpose for app use requested of students (multiple selections possible)

4.6   Apps for Research

Eighty respondents who had used a mobile app for academic purposes did so for research purposes. This group of respondents was asked what mobile apps they had used for research purposes from a list of possible academic-related apps. Figure 18 summarises the results. There was a substantial number of 'Other' options including Mendeley (N=3), ToDo (1), Keynote (1), iBook (2), Spotify (1), Facebook (1), Skype (4), Compass (1), Trello (1), Mindmeister (1), NoteIt (1), and Google apps (17). The file hosting app Dropbox was popular and used by 68% of researchers.

Fig. 18. Apps used for research purposes (multiple selections possible)

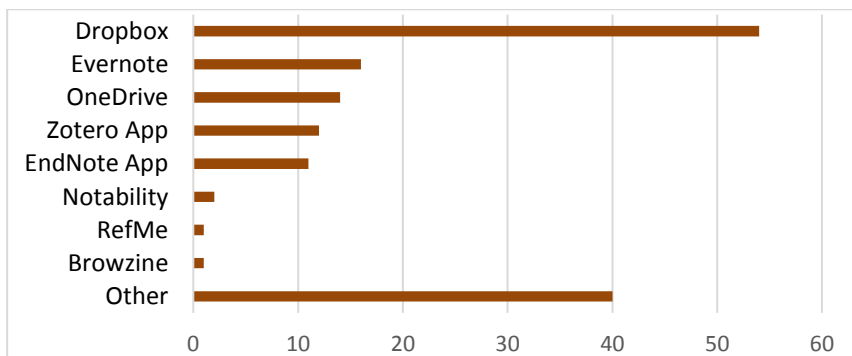Respondents were also asked what for research purpose the mobile apps were used (see Figure 19). File, document or data storage purposes were the main reason for researchers using mobile apps. Other areas included reading and reviewing papers, keeping up with the latest research, translation, computation, recording whiteboards, scanning documents, and the development of new apps

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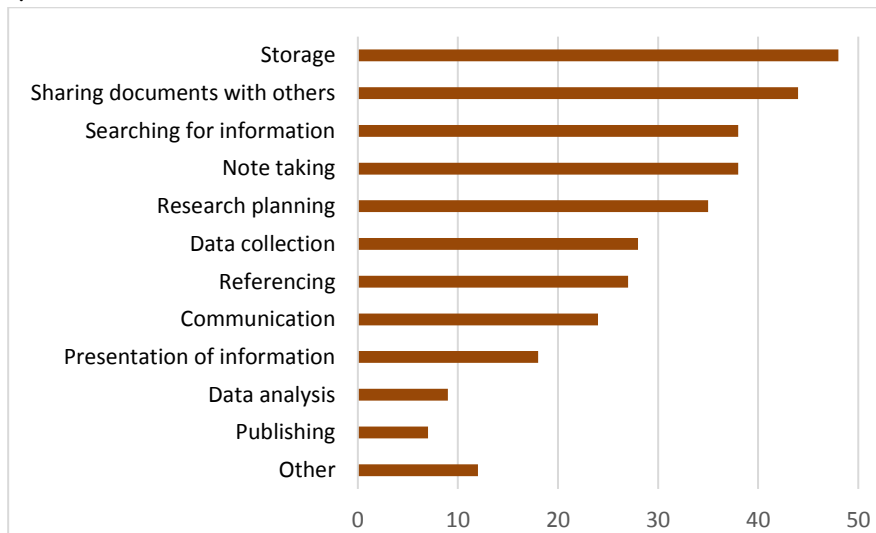
Fig. 19. Research purpose for mobile apps (multiple selections possible)

4.7 Impact of apps on academic experience

All respondents who were users of mobile apps for academic purposes were asked to rate a series of statements related to how the use of mobile apps had impacted their teaching/supervision or research, their knowledge of apps, and their use of mobile apps. They selected a response on a scale of strongly agree to strongly disagree (see Figure 20). Nearly 80% of mobile app users felt their academic activity had benefitted from this inclusion; there was greater parity of attitude regarding knowing where to seek help or finding a suitable app for academic purposes. Less than a quarter of users felt their academic activity had been conducted differently as a consequence or the outcome impacted by the use of the apps. Eighteen percent of respondents had experienced difficulty in using mobile apps.

Fig. 20. Attitude to mobile app use: with scale from strongly agree (dark), agree, neutral, disagree, strongly disagree (blue)

4.8   Additional factors
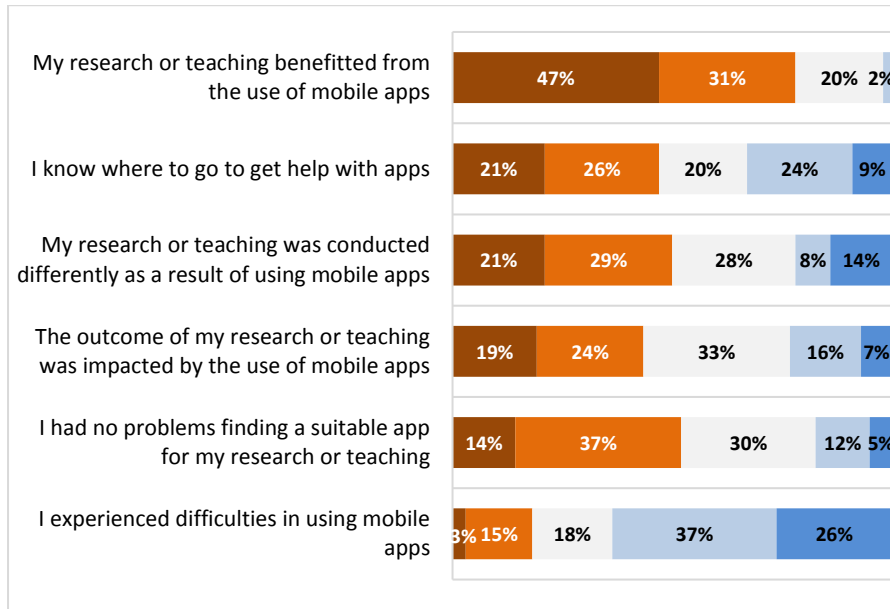
All respondents were offered the opportunity to provide any further comments on mobile app usage in an academic setting. Thirty-three responses were received, covering the five areas highlighted in Section 4.3 when considering negative responses – instructional support, (in)convenience, technical aspects, pedagogical and contextual viewpoints. Several respondents were neutral regarding the inclusion of mobiles apps into their academic practice, indicating it was not a huge matter to adjust to, "I just used the camera. No big deal", and "Whilst I am not using mobile apps for my PhD research I do use for my teaching role". The benefit of training being available was mentioned by five respondents, "Would be great to get some training on this☺", or "It would be great if there was some sort of online resource on the uni website that lists and briefly explains some of the apps that might be useful when conducting research". These respondents indicated that their ability to place context or pedagogical potential around the use of apps was dependent upon their understanding of the app functionality, for example, "I can see that the use of apps will increase in line with predictions of increased usage of web-connected devices. The challenge will be to develop apps or modify existing apps to suit the purpose of the user and the context of the user".

Four respondents mentioned their wish to have an app that would allow access to Library-provided resources. Some respondents were very positive about the potential of apps in the academic environment, "We are moving into the new generation of Apps

is the tool to connect with the students. Let's not hesitate. We need to be engaging successfully to create a sense of new age" and "Apps greatly increases my ability to store quotes and research links".

5 Discussion and Implications

We here briefly summarise our findings and discuss implications and opportunities.

5.1 Discussion

Sample size. As outlined in Section 3, the potential number of survey participants was 1404 academics and higher degree students. The survey ran for a two week period during the first half of August 2016. Despite two reminder notices being sent to potential participants across the Faculties and the School of Graduate Research, the response was less than hoped for. Online surveys are not noted for high response rate (Clayton, 2007; Shannon, Johnson, Searcy & Lott, 2002; Solomon, 2001) even when they are more targeted, as in this case where Faculty administrators used established email lists for sending the invitation and survey link to academic and research staff. The reasons for the low response rate are possibly varied, for example, perhaps the survey was not regarded as being relevant, the timing was poorly-considered, or staff felt over-surveyed. With one exception, the respondents represented the majority of the broad discipline areas across the University and it is clear that mobile apps are being used, in a limited capacity, for academic purposes by teaching and research staff and HDR students at the University of Waikato. Nevertheless, with a sample response rate of 9.8% it is not possible to draw definitive conclusions from the information provided nor to reliably extrapolate the findings. This has an impact upon the value of the findings and any subsequent application. The survey sample was self-selected and, given the limited number of respondents, it is possible that those who had not used mobile apps for the purposes under investigation did not engage with the survey. This limits the viability of the data however, of the teaching and research staff and HDR students who chose to respond, 65% had used a mobile app which indicates that there is, at least, a core of mobile app activity occurring across the University. This core of activity presents a base that the University could consider building upon.

Reasons for non-use. Thirty-five percent of respondents had not used a mobile app for academic purposes and 50% of these had no interest in doing so in the future. Lack of knowledge was the primary stumbling block to future usage, followed by a lack of interest. One quarter of non-users felt that apps were not relevant to their area of teaching or research. A number of respondents identified the need for training support within the University on determining the most useful apps and how best to use them effectively. A concern about obsolescence and the perception that computers offer better options than mobile devices indicates a lack of confidence in the robustness of mobile apps. Half the non-users were prepared to consider using mobile apps for academic purposes in the future. They believed the ability to share documents and to communicate with peers would be reasons for adoption. Convenience in managing information

was another feature that appealed to potential users, particularly the ability to capture and store information. Potential users were nearly all interested in having more appropriate (95%), or easier to use (91%), apps available, indicating that this group of respondents has attempted to access or use apps in the past but has been discouraged for the reasons stated. As mentioned above, potential app users also wanted more practical support for finding and using apps (81%), a factor that aligns closely with information about, and institutional support for, using apps (76% respectively). It appears that non-users could move to mobile app use if they had access to information and support on technical specifications and purpose or application. They remained to be convinced of the overall usefulness of mobile apps to their academic practice, with one non-user summing up opinion that "The challenge will be to develop apps or modify existing apps to suit the purpose of the user and the context of the user".

Apps for research. Nearly 90% of mobile app users had used them for the purposes of research. It is interesting to note that the majority of respondents using mobile apps for research purposes were HDR students. Some of their comments reflect a positive attitude towards mobile apps and this may be a contributory reason for the uptake, "Grad students are sometimes usefully using it for GPS locations, note taking and the like", and "mobile apps are great. If you are in tedious work meetings you can work on easy bits of your thesis and people just think you are diligently taking notes…". Some of the apps mentioned were used for both teaching and research purposes. Academic staff used the opportunity to incorporate mobile apps into teaching/supervisory practice (26%) to almost the same degree as for their activities within the research area (30%).

Where mobile apps have been used for research purposes, Dropbox was the preferred choice with nearly 70% of researchers using this app, compared to the next preference, Evernote, with 20% usage. Google apps were mentioned in various ways by 18% of researchers, with Mendeley, a bibliographic software for the managing and sharing of research papers, also receiving mention. Researchers indicated they chose to use mobile apps for the purposes of storage, sharing documents with others, searching for information and note taking. Nearly 30% had used mobile apps for data collection, although only eight percent had moved beyond this to analyse their data in this manner. Mobile apps, such as Dedoose, MAXApp (MAXQDA app), are available for data analysis, while a considerable and expanding range of apps is available for various data collection scenarios. The low levels of uptake for these stages of the research process may relate to the stated concern that there is a lack of easily-accessible information or training on apps usage across the University.

Apps for supervision/teaching. When using mobile apps for teaching/supervision purposes, a clear preference was shown for an app designed for information storage. Dropbox was used by 67% of the 36 respondents, with 30% also recommending their students use the app. The open source, reference management app, Zotero, was used by eight respondents, all of whom requested their students to use the app. Evernote, designed for taking, storing and sharing notes, was used by seven teachers/supervisors, none of whom recommended their students download the free app for use. Other apps being used by respondents indicate a need to share information or communicate with others, including Skype, Facebook, Viber, Trello and Google apps. The main preference, Dropbox, is similarly a sharing and collaboration tool. The use of mobile apps for

storage and communication with others was corroborated by aspects of teaching practice these apps were used for. Communication, storage, sharing and literature reviews were the main aspects identified. In addition, these teachers/supervisors asked their students to use apps mainly for the purposes of communicating and sharing information with others. They were not interested in using apps for planning purposes, nor did they expect their students to do so. They did not request students to use mobile apps for the purpose of conducting research, such as preparing literature reviews, data collection or analysis. This indicates that, if students are collecting field data for their course work, they are expected to do so using traditional tools and techniques.

Attitude. Those staff and HDR students who were using mobile apps for academic purposes displayed a positive attitude towards their inclusion in research or teaching with nearly 80% perceiving benefit to such use. The majority of users did not perceive difficulties in using mobile apps, however, less than half the users knew where to go to get help and only half had found the experience of locating a suitable app for their teaching or research to be problem-free. One student complained, "It would be beneficial to have an online list, or equivalent, of useful apps for students, varying from note-taking, referencing, data collection right through to ones specific to different fields of study. Many of the apps I now use would have been extremely useful had I known about them when I began this degree." Fifty percent of users believed their research or teaching was conducted differently as a result of using mobile apps and slightly fewer believed the outcome of their teaching or research was impacted. This is an area that would benefit from further study to gather empirical evidence on the application of technology to traditional pedagogies or research methodologies and processes.

5.2 Implications

This study was intended as a brief snapshot to gain information of the current state of mobile app use across the University of Waikato as a whole. The following implications arise from this study and are offered for consideration:

- The data indicates a number of academic staff and HDR students involved in using mobile apps are personally driven and motivated. This indicates opportunities for an integrated approach across the institution.
- Opportunities exist to provide co-ordinated, inclusive training and support to staff and students in the use of apps within the academic environment. Some structures exist but there seems little awareness of these.
- Further investigation offers the opportunity to increase knowledge of the university culture in regards to the use of apps to assist in teaching and research. It would be useful to gain understanding on how mobile devices are being supported or encouraged within the institution.
- It would be useful to extend the preliminary study to investigate a range of aspects of mobile apps within the curriculum to gain empirical evidence on implications for the organisation.
- There are implications for the way in which support areas are keeping abreast of initiatives and developing trends across the institution. To ensure

teaching and learning is occurring effectively, identified appropriate support needs to be interwoven from the earliest stages of planning.

- The use of apps for academic endeavour is currently underutilised, as highlighted in the present investigation and a coordinated effort by the institution could reap benefits from the pursuit of digital innovation in education.

6 Conclusion

Some indicators were drawn from the survey as outlined above and they serve a useful purpose of guiding future work in this area. Mobile apps are being used by teachers and researchers and there is scope for better support of mobile app use for both teaching and research activity. It appears from the comments offered that non-users would consider using mobile apps if there were suitable apps available and if training or support was offered within the University. Mobile apps were more likely to be used for research than teaching purposes, but for both practices the ability to communicate, collaborate and share with others were primary motivators for use. Users were able to perceive the benefit of including mobile apps in their teaching or research practice but were uncertain as to the impact of the apps upon the conduct or outcomes of their practice. The present snapshot indicates a tertiary education environment experimenting with technology within teaching and research practices. The use of mobile apps is an essential component of digital literacy and has huge potential for changing teaching and research practice. However, the survey highlights that the needs of users and potential users of mobile apps are not currently being met.

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