Use of Mobile Apps for Teaching and Research – Implications for Digital Literacy

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Abstract. This paper reports on the results of an online survey about mobile application (app) use for academic purposes, i.e. teaching and research, by Higher Degree Research (HDR) students and academic staff at one of the eight New Zealand universities. Two thirds of the 138 respondents reported they used apps for academic purposes. In teaching, apps were reported to be used as a means to push information to students. In research, apps appeared to be used to self-organise, collaborate with colleagues, store information, and to stay current with research. This paper presents the survey results and discusses implications for personal information management in education context and opportunities for university library services.

Keywords: mobile apps, research methodology, information behaviour, teaching practice, information management, academia.

1 Introduction

Mobile learning has been claimed as the Future of Learning (Bowen & Pistilli, 2012). Mobile apps are a fundamental feature of mobile devices and 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 also 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 (Hahn, 2014). The intervention of technology has the potential to prompt new practices in research, both expanding and constraining relationships with the research process and methodological approaches (Goble, Austin, Larsen, Kreitzer, & Brintnell, 2012). This is not necessarily a smooth path. According to Makori and Mauti (2016), usage of digital technologies is negatively impacted on by a range of crucial factors, including inadequate social computing facilities, insufficient information infrastructure coupled with weak institutional and physical structures, lack of enough information resources, and inadequate knowledge, skills and competencies. Digital literacy is increasingly on the agenda of higher education organisations as they commit to delivering graduates who are capable

of demonstrating technology competency and equally able to contribute to modern, digitally-oriented, fast-paced economies.

We believe that libraries, particularly academic libraries, enter a new service field of making available not the information itself (in form of books and documents) but also the means to acquire, manage and develop relationships with information in digital form, such as via mobile apps. This paper examines the current use of mobile apps for teaching, learning and research at our local university. We analyse the implications for personal information management in education context and opportunities for the university library and future service requirements.

The remainder of this paper is structured as follows: Section 2 discusses current literature and related work; Section 3 gives an overview of our study methodology; Section 4 presents the findings from our survey; and Section 5 discusses implications.

2 Literature and related work

The research literature on using mobile apps for education and research purposes is extremely sparse and significant potential for research in this area is evident in the related work that we are able to present here. Discussion of digital tools for research has focused on opportunities and challenges, ranging from technical issues to complex concerns involving implications for future research processes (Carter, Liddle, Hall & Chenery, 2015; Davidson, Paulus & Jackson, 2016; Garcia, Welford & Smith, 2016; Raento, Oulasvirta & Eagle, 2009). 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), mainly focusing on delivery of information or data about the library services. Mobile apps for libraries are often featured by these authors—an example being apps for ethnographic field research (van Arnhem, 2015). One of the pitfalls of writing about apps with respect to education is the tendency to merely describe app functionalities. The University of Chester observed the ready adoption of mobile note-taking software by undergraduate students (Schepman, Rodway, Beattie & Lambert, 2012). The previously held concern that not all students have access to a smartphone is not supported by recent data (Anderson, 2015). However, McGeeney (2015) observed a number of logistical and technical constraints for using mobile apps, compared to Web browsers, for surveys, including lower response rates, increased costs applied by some survey apps vendors and more design constraints which can involve limiting options such as navigation buttons and check boxes. Due to time and effort required to learn how to use an app effectively, using apps resulted in lower response rates than web-based data collection (Pew Research Center, 2015). Carlos (2012) identified the advent of mobile research tools as a useful supplement to the desktop computer. Within the academic environment, provision of technical infrastructure is an accepted service for both research and teaching/learning. Adopting an analogous view of mobile technology may assist in exploring its potential. MacNeill (2015) suggests that academic staff make use of apps for teaching and research purposes, with initial focus on keystone apps around which to build the body of supporting apps (MacNeill, 2015, p. 241).

3 Methodology

An online survey was conducted to investigate how mobile apps were being used for teaching, research and learning purposes across the university.

Data Collection. The data collection used an online, self-administered survey intended as a snapshot of the situation across all faculties of a single university. The university's research office forwarded invitations to all departmental administrators, who distributed the survey invitation to all the university's academics and researchers via email. For the higher-degree students, the School of Graduate Research emailed their student body and posted the invitation on the School's Facebook page. The potential sample size was about 1400 participants (including 820 students and 580 academics). Responses were anonymous and external participation was excluded through the use of location-restriction in the Qualtrics Survey Software.

Survey Questions. The survey used a 24-item survey utilising Likert scales, radio buttons, and free text questions; for details see (Hinze *et al*, 2017). 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.

Data Analysis. The results were analysed using a variety of reports, both default and cross-tabulation for measuring association, within Qualtrics. A basic descriptive statistical analysis was applied to the data.

4 Results and Analysis

Demographic. The survey was completed by 138 respondents (9.8% of potential sample), with 58 academic staff, 73 doctoral students, 6 Master's students and 16 others (general staff, librarian, postgraduate certificate student, doctoral assistant, research fellow, research assistant, tutor, contracted Professional Learning and Development, management, support, graduate diploma and a PhD graduate). Respondents could select more than one category and 16 of 138 people did so. The gender breakdown of respondents was 60% female (N=82), 40% male (N=55) and one person who did not specify a gender; the age bands were equally distributed between 20-30, 31-40, 41-50 and 51 and over. The respondents represented a range of faculties, the largest groups being from Science and Engineering (~28%), Arts and Social Sciences (~20%), Education (~20%) and Computing and Mathematics (~16%).

Use of mobile apps. Sixty-five percent of respondents (90 of 138) had used mobile apps for academic purposes (71% of academic and 67% of student respondents); with a composition of 73% of male and 60% of female respondents. Of those who had used mobile apps for academic purposes, most were in the Faculty of Computing and Mathematical Sciences, followed by the Faculty of Education. Respondents showed a clear

preference for smartphones (twice as likely as the second preference of iPad); further options were android tablets, cellphones and wearable devices. Most were using android devices (>60%), followed by iOS (48%); Mac, Windows and others made up (~26%); multiple selections were possible.

Non-users. Thirty-five percent of respondents (48 of 138) had not used mobile apps for academic purposes; half of these indicated they were not planning to do so either. When asked what was stopping them, 23 people responded, some noting more than one impediment. Nearly half considered their own lack of knowledge about how apps might be used as the leading factor. Approximately one third of the responses indicated that the responder was uninterested in apps and/or viewed them as irrelevant to their teaching or research. Other responses included the opinion that computers offer better options than mobile devices, with a lack of support also being stated as reason for future non-use. The 50% of non-users who might use apps in future named a range of potential uses, such as document sharing (64%), communication (45%), note taking (42%), storage (36%) and access to course information and data collection (both 32%). These respondents were also asked to rate factors in increasing app usage; the question was answered by 21 participants (see Figure 1).

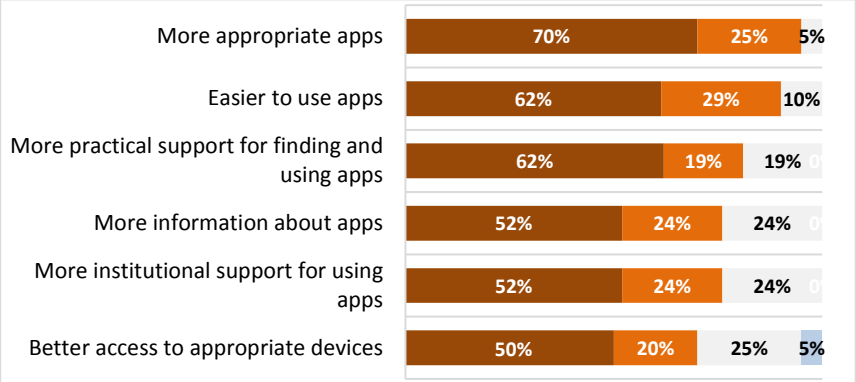

Fig. 1. Factors to encourage apps use: from very helpful (dark) to very unhelpful (blue)

Non-use factors. In their further comments, non-users expressed technical concerns ("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") data safety concerns ("need to be reliable enough that researchers can be confident that they will not suffer data losses if they use just apps"), pedagogical usefulness ("[…]we have gone into more and more web based teaching […]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 […] you have built a learning task on a particular resource and then find that half the class cannot even access it". Some respondents expressed reservations about institutional support and felt "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". Some respondents found apps inconvenient ("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". Several participants noted that "it is challenging to find the most appropriate app to meet a specific teaching purpose" or "to modify existing apps to suit the purpose of the user and the context of the user". Some of the comments by participants reveal concerns that seem born out of a lack of practical experience with apps (e.g., having to constantly update apps and student not willing or able to engage with apps).

Purpose of app usage. All of the 90 people who had used apps, responded to a question about the purpose (multiple selections possible): 36 (40%) had used them for teaching/supervision and 80 (89%) for research purposes. Figure 2 shows the distribution of roles of the users of mobile apps.

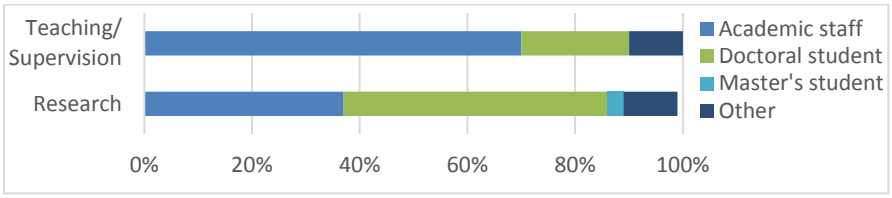

Fig. 2. Mobile app user role and purpose

Apps for Teaching/Supervision. The 36 respondents using apps for teaching and supervision were asked to select which apps they used from a list. They were also asked to indicate if the app was for their own use or if they had asked students to use the app (see Figure 3). There were 19 other options named, not shown in the figure: Skype (2), Facebook (2), Feedly (1), Viber (1), Kahootz (1), Trello (1), Kindle (2), and Google apps (9). The same respondents were asked about the specific aspects of their teaching practice the apps were used for (see Figure 4). Twenty-five of 36 had also asked their students to use mobile apps (for purposes see Figure 5).

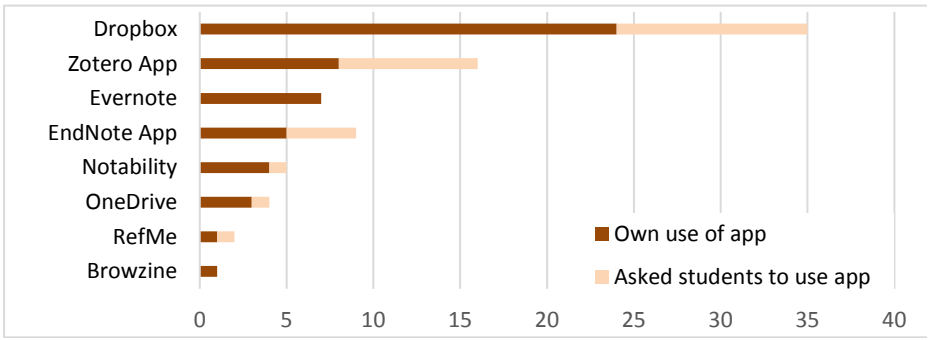

Fig. 3. Apps used for teaching/supervision purposes (multiple selections possible)

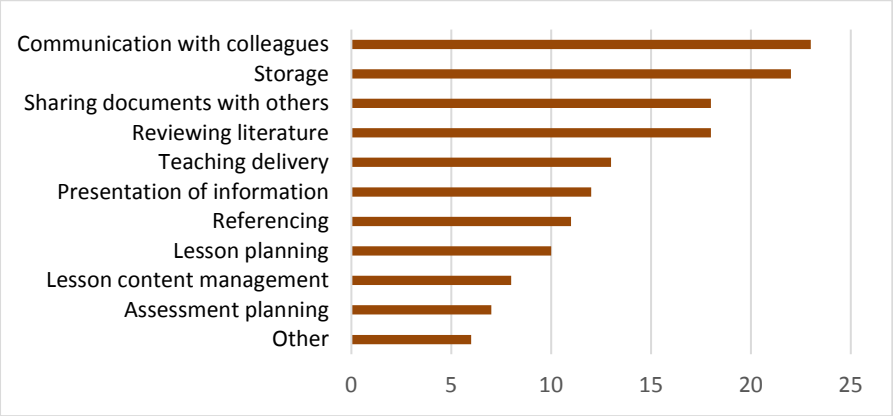

Fig. 4. Purpose of used apps in teaching practice (multiple selections possible)

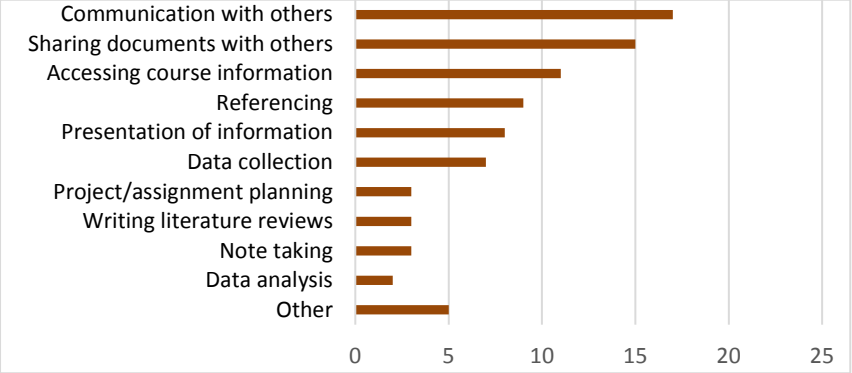

Fig. 5. Purpose of used apps requested of students (multiple selections possible)

Apps for Research. Eighty of the 90 app-using respondents did so for research purposes. They were asked what mobile apps they had used for research, with results summarized in Figure 6. The 40 others include Mendeley (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 research purposes are summarized in Figure 7.

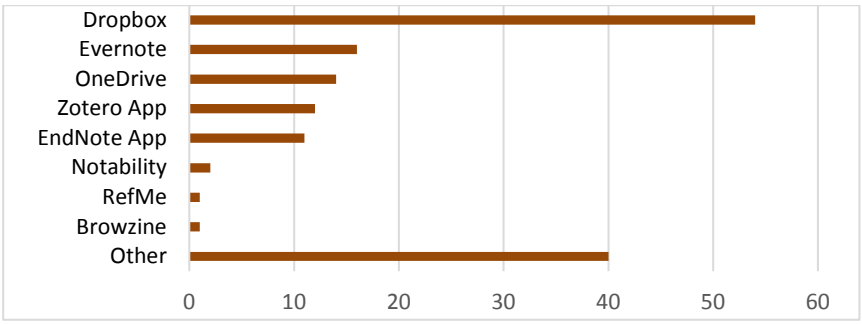

Fig. 6. Apps used for research purposes (multiple selections possible)

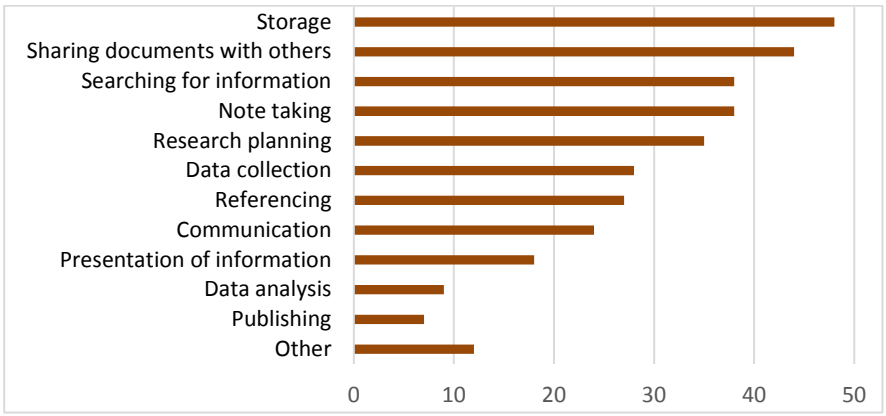

Fig. 7. Research purpose for mobile apps (multiple selections possible)

Impact of apps on academic experience. The users of apps for academic purposes rated the impact of the app usage, see Figure 8. Nearly 80% felt their academic activity had benefitted from mobile apps. Half the users believed their academic activity had been conducted differently as a consequence of using apps. Eighteen percent had experienced difficulties.

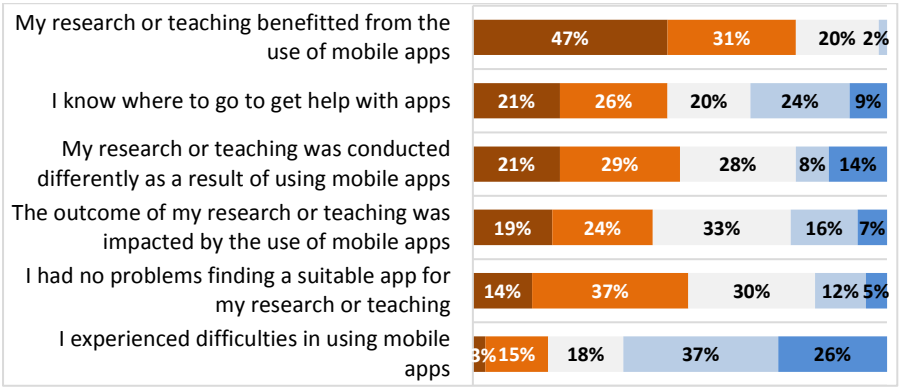

Fig. 8. Impact of app use: from strongly agree (dark) to strongly disagree (blue)

Additional factors. Thirty-eight responses were received covering instructional support, (in)convenience, technical aspects, pedagogical and contextual viewpoints. Several respondents were neutral regarding the inclusion of mobiles apps into their academic practice ("I just used the camera. No big deal"). Five respondents mentioned the need or benefit of training ("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 wished for an app to gain access to Library 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").

5 Discussion and Implications

The main findings indicate limited use of mobile apps with a stated preference for organisational provision of information training and support to enable greater engagement. This has implications for support areas of the university, including library service planning and delivery, and their involvement in academic information behaviour and information management including the use of mobile apps.

5.1 Summary of main findings

Naturally, a response rate of less than 10% of the potential sample size was less than hoped for, and constitutes a limitation of the collected data. Online surveys are not noted for high response rate, even when they are more targeted, as in our case. We

cannot draw definitive conclusions but rather read these as indicators, such as that a core of mobile app activity is occurring across the university which may be built upon and which would benefit from a platform of co-ordinated support. Further research in this area is required to strengthen the recommendations possible from the snapshot results. Here we list the main findings:

Apps for research. Where mobile apps were used, most participants had used apps for research, with the majority being post-graduate students. The main purposes were storage, document sharing, searching, referencing and note taking. While nearly 30% had used mobile apps for data collection, only eight percent had moved beyond this to analyze their data in this manner.

From this study the reasons for this lack of use of apps during the research planning and research analysis phases is unclear. However, comparison between the results of app user and non-user respondents reveals both groups demonstrated preference for apps enabling document sharing, communicating and note taking. It is interesting to note this mirroring of preference for app functionality. Additionaly, neither app users nor non-users expressed strong preference for data analysis, referencing, or presentation apps. This co-incidence of preference may be a reflection of the identified lack of support and training available across the university campus.

Apps for supervision/teaching. For teaching/supervision purposes, a clear preference was on apps for communication or document and data sharing with colleagues and for storage. Some of the apps were used for both teaching and research purposes. Academic staff used apps for teaching/supervision (26%) to almost the same degree as for their research activities (30%). Teachers/supervisors asked their students to use apps mainly for the purposes of communicating and sharing information. Apps for planning were barely used nor were apps for research tasks such as reviewing literature, data collection or analysis. Responses indicate that use of apps in both teaching and research practices focused upon the purposes of sharing documents, storage and communication with colleagues. It is, therefore, unsurprising that teachers/supervisors requested their students to engage in app usage for similar purposes, rather than venturing into areas of app use with which they, themselves, were unfamiliar. This indicates that students collecting field data for course work were expected to do so using traditional tools and techniques.

More support requested by non-users and users. Among those not considering apps, lack of knowledge was the primary stumbling block followed by a lack of interest. They also challenged the university to determine the most useful apps and how best to use them effectively. Potential users were nearly all interested in having more appropriate or easier to use apps available, indicating that this group of respondents has attempted to access or use apps in the past but had been discouraged. Potential app users also wanted more practical support for finding and using apps. 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. It remains the need to convince of the overall usefulness of mobile apps “to suit the [academic] purpose and the context of the user”.

Those respondents using apps for academic purposes had a positive attitude – nearly 80% perceived a benefit from app use. The majority did encounter difficulties, however, less than half the users knew where to go to get sufficient help. Only half had

found the experience of locating a suitable app for their teaching or research to be problem-free. One participant observed that "many of the apps I now use would have been extremely useful had I known about them when I began this degree."

Impact needs further study. Fifty percent perceived a change in research conduct and almost as many felt their teaching 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 provides a small snapshot of the current state of mobile app use across a university. The following implications arise from this study and are offered for consideration:

- The data indicates that academic staff and students involved in using mobile apps are personally driven and motivated rather than supported by clearly-planned, identified and integrated infrastructure across the institution.
- While some aspects of using apps for communication were reported, the majority of usages was related to management of documents, text, and data. This indicates an opportunity to frame and explore academic app use as an issue of personal information management. It may also indicate a need to explore scholarly workflows and which role apps could play when their use was embraced and supported by the academic institution.
- Introduction to the possibilities and limitations of mobile apps for non-users provided by the institution may serve to increase the uptake of tools during teaching and research.
- There are implications for the way in which support areas, such as libraries, are keeping abreast of initiatives and developing trends across the institution. To ensure teaching and learning is occurring effectively, identified information management and digital literacy support needs to be interwoven from the earliest stages of planning.
- It is institutional strategy to invest in innovative applications of digital technology in research and teaching. The use of apps for academic endeavour is currently underutilised. A coordinated approach is needed to enable digital technology acceptance to transform 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 to a limited degree, both in staff numbers and in range of mobile apps and there is a clearly-identified need for a strong platform of support for staff and students. It appears that non-users would consider using mobile apps if there were suitable apps available and if training or support was offered. Similarly, app users expressed that they

would welcome more information and guidance. We propose that libraries, particularly academic libraries, are in a position to address this particular problem. Today, libraries and librarians are uniquely placed to provide patrons with the means to acquire, manage and develop relationships with information in digital form, such as via mobile apps. Investigation into best-practices around the provision of this next generation of support is required. 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. The response of our participants indicate that both individual and shared workflows in the field, the classroom, and the office may be enhanced by these mobile apps should appropriate digital literacy programmes be present to enable effective use within teaching and research. However, the survey highlights that addressing the needs of users and potential users of mobile apps for academic purposes is an area yet to be fully explored. A larger study of academic use of mobile apps is currently underway, with additional universities to be invited in future.

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