

Deconstructing the Reality:

To what degree are the Ph.D. students using their computer(s) to support their research practices?

KwongNui Sim and Sarah Stein

Abstract— Under normal circumstances, it is assumed that Ph.D. students will make use of ICT (e.g., computer technologies) throughout their research journey for a variety of generic and specialised purposes. Yet, there is limited documented research about postgraduate use of ICT beyond their information sourcing skills and general knowledge consumption. This paper reports the first stage of a study that aimed to examine how Ph.D. students use their computers to support their research practice, by taking into account not only their computer use skills, but also ICT use within the broader context of the research journey. Monitoring software that harvested computer activity data over a period of three months was installed on the computers of nine doctoral students from the same university who self-reported as being skilled computer users. Regular discussion sessions were held with each student to review computer activities in the light of their own research and study contexts (Ph.D. stage and discipline background). Analysis of data gathered at this first stage of the study indicates that there is no difference among the students at any stage of their doctoral research in terms of the level of their engagement with their computers, and there is no difference in the use of computer (applications and documents) among the students despite their different discipline backgrounds. At this point in the study, there is a strong indication that while ICT are playing a dominant role in doctoral student's daily lives, ICT use to support research practice is limited. While these students used computers daily, the computers seemed not to be as crucial to their research practice as was expected. It appears that current perceptions in research literature about the importance of computer devices for student research practice may need to be questioned. This first stage of a larger study therefore provides the basis for further investigation.

Keywords- *E-learning; higher education; e-literacy; postgraduate students; research practice; monitoring software; ICT use; postgraduate study; actual practice; computer use*

I. BACKGROUND/CONTEXT

Widespread use of Information and Communication Technologies (ICT) has changed the way we work, learn and communicate. At all levels of formal education, ICT has had a dramatic impact on teaching and learning. In addition, associated research has indicated that ICT is a necessary part of academic practice in higher education (Aspden & Thorpe, 2009; Dahlstrom, Grunwald, de Boor, & Vockley, 2011;

Guidry & BrckaLorenz, 2010; Smith & Caruso, 2010). Under normal circumstances, Ph.D. students from all discipline areas have to use ICT in some form throughout the process of their research, including the preparation, fieldwork, analysis and write-up phases of their studies.

Generally, documented studies on ICT use among graduate and postgraduate students have been focused on their eLiteracy (e.g., Blignaut & Els, 2010), communication (i.e., Lawlor & Donnelly, 2010), entertainment use (e.g., McCarthy, 2012) and the use of earning management systems (i.e., Sultan, 2010). These studies have highlighted a range of aspects including skills in computer use, the variety of ways different technologies have been used for learning and students' self-confidence in the use of technologies. More specifically, where the role of graduate and postgraduate students' use of ICT to support their research processes is concerned, existing studies are generally limited to how they use technologies to access resources from libraries (e.g., Sutton & Jacoby, 2008) and their knowledge consumption (i.e., Griffiths & Brophy, 2005). The place of ICT in the study and research activities of these students is often limited in the literature to activities such as web browsing or data collection habits and skills such as finding relevant information for learning, conducting research and teaching in their future lives. It is not surprising that graduate students are described as "binge" users of e-journals and as having a preference for electronic resources (Dange, 2010; George et al., 2006; Liew, Foo, & Chennupati, 2000; Rowlands, Nicholas, Jamali, & Huntington, 2007; Tenopir, 2003) during their dissertation writing process. It is acknowledged that all doctoral students will be using computers for their study. Depending on the field, major or research theme, some will use software such as *SPSS* for *NVivo* for data analysis. Some will use software designed specifically for work in their field of study. Most, if not all, will use widespread applications that facilitate searching references and typing and archiving documents. What is important is that the nature of Ph.D. students use of ICT for the integrated tasks involved in their study, including background research, conducting the research, writing the thesis, and for all other aspects of each of the research phases, is unclear in current literature.

The aim of this paper is not to debate whether computers play an essential role in research practices, but to report an investigation that explored the nature of student use of computers to support Ph.D. study, within context: how students made use of ICT as an integrated and embedded part of their everyday research and study practices. Because ICT has become increasingly commonplace, integral and even essential to, academic research practice in higher education settings, it is valuable to determine the significance of ICT in Ph.D. students' process of doctoral research.

II. THE CURRENT STUDY

A search of recent publications reveals that most empirical research on postgraduate students' use of ICT in higher education is based on students' self-reports (Aderibigbe & Aramide, 2006; Blignaut & Els, 2010; Dange, 2010; Divaris, Polychronopoulou, & Mattheos, 2007; Shaw, 2000).

For example, according to Aderibigbe and Aramide's (2006) study, graduate students self-reported as "binge" (excessive) users of e-journals or prefer using electronic resources during their postgraduate study. However, the results in some studies suggested that postgraduate students are not even competent at using Office applications such as *Excel*, *Power Point*, and *Access* (Dange, 2010). There is also a report stating that students had high levels of ownership of application types they did not frequently use (Shaw, 2000). So why did the findings from these studies raise different scenarios of postgraduate students' use of ICT? One reason could be that these studies on student use of computers in higher education rely on perception data, often gathered via surveys and questionnaires. As a consequence varying outcomes are described, for example, one study stated that the "first necessary step of this process is an accurate and realistic assessment of the actual computer skills of the student" (Divaris et al., 2007); while according to Conole, de Laat, Dillon and DeCicco (2008), "more in-depth research is needed to understand the nuances of how students are using technologies to support their learning" (p. 512).

Thus, it is our contention that such findings, while relevant to explorations of postgraduate students' perceptions of ICT use, fail to offer a clear picture of their research practice. Anecdotal evidence from the authors suggests that postgraduate use of computer technologies is not as straightforward and simple as the research cited above suggests. These findings fail to offer a convincing picture of student practice as experienced by many colleagues in academia, insofar as the studies the claims are based on are from only one perspective - that of the student - and on a minimum number or type of data sources. As a result, evidence underpinning claims emanating from such research may be limited and one-dimensional. Research that explores educational phenomena benefits from underlying views about knowledge that assume the legitimacy of multiple perspectives and the richness and complexity of context, setting and experience (Lincoln & Guba, 2003). The focus and aim of the current study therefore, was an exploration of Ph.D.

student use of computer technologies to support the processes of their research, within their context(s).

The inquiries of the research focus were established:

- How do Ph.D. students utilised their computers for their doctoral research purposes?;
- How Ph.D. students' in their daily research practices had adopted computer use?

III. METHODS

In order to better understand the role of ICT plays in the everyday study lives of Ph.D. students in an uncontrived context, the study adopted the interpretive, naturalist enquiry and analysis approach proposed by Guba and Lincoln (1989). This approach underpinned the decision to select a small number of participants from within a particular context to investigate their understandings of their experiences and use of ICTs to support their research. In other words, use of this approach provided the underlying framework and epistemological basis for exploring "the meanings and purposes attached by human actors [in this context] to their activities" (Guba & Lincoln, 1989, p. 106).

In line with Lincoln and Guba's (2003) criteria to enhance trustworthiness and authenticity, the overarching process of the research comprised: working with the participants over an extended period of time (prolonged engagement); focussing on observing and monitoring identifiable/documentable aspects of ICT understanding and practice (persistent observation); and employing techniques of a hermeneutical dialectic cycle that incorporated peer debriefing, member checking, analysis and fair presentation of assertions. In addition, a variety of data sources were drawn upon and used in triangulation processes, to ensure that claims made by the researchers about the students' understandings about their use of ICTs were consistent with a variety of data.

To address the research focus for the current study, it was important to gain an understanding of the way in which Ph.D. students use, experience and integrate ICT into the process of their research. Of necessity then, we located data collection as close as possible to the students' daily research practices in order to increase the ecological validity of the study.

Participants: Twenty Ph.D. students who expressed their interest in participation in this study were invited to complete a short questionnaire to ascertain their perceptions about their computer use for their research and study. The questionnaire comprised five questions:

1. What is your discipline background?
2. What is your current research phase(s)? (Circle as many as it suits)
 - a. Preparation
 - b. Data Collection
 - c. Analysis

- d. Write-up
3. Please indicate the percentage of workload you use computers to support your research according to the research phases you have chosen in question 2.
 4. How do you rate your ability to use computers?
 - a. Expert and skilful
 - b. Fairly
 - c. Not at all skilled
 - d. Not applicable
 5. List your selection of ICT devices, tools and networks you use for your research.

Students were selected for inclusion in the study based upon their questionnaire responses. Nine students were invited to participate in the study. These students represented a balance of discipline areas and progress through their course of study (Q2 of the questionnaire). This group of nine also all identified themselves as (b) “Fairly Skilful” in response to Q4 of the questionnaire.

Table 1 presents a summary of the discipline area and phase of study of each of the students who were selected to participate in the study.

Table 1. Participants’ Discipline Background & Ph.D. Stages

Participant (Pseudonyms)	Discipline Background	Ph.D. Stage
Charles	Sciences	Middle
Elizabeth	Health Science	Early
Jeremy	Humanities	Final
Mandy	Humanities	Final
Patricia	Sciences	Early
Sam	Commerce	Early
Shaun	Commerce	Middle
Steve	Health Science	Final
Xavier	Commerce	Middle

All participants were studying full time and were based on-campus at the same university. As shown in Table 1, the Ph.D. Stages were labelled as ‘Early’, ‘Middle’ and ‘Final’ to acknowledge the position in the general progress through the research process of each student (e.g., ‘Early’ refers to a student who is in the broadly described preparation phase, while ‘Final’ refers to a student who may be in the process of writing up their thesis and nearing the time of submission of their work for examination).

IV. DATA SOURCES

A. Computer Activities

A software programme, *ManicTime* (Mininday, 2009), was installed on each of the participants’ computers. This software captures usage data about applications, websites visited, documents accessed and the associated times and duration these activities occurred. These usage data were gathered for three months in 2013, from October to December. ‘Naturally-occurring’ activity data generated through this means is a source of rich information that is different from the traditional perception or self-reported data that tends to be gathered through survey and/or interview methods used in most studies about student computer use. It allows the researchers to review the software applications used, documents accessed, websites visited and duration of use. In the current research, this tool provided a dataset that subsequently was triangulated with other forms of data gathered for the study.

At the end of December 2013, the lead researcher (the first author) met with each of the nine participants to extract their computer activity data from their computers. *ManicTime* generates reports of computer activity data assembled in tables and figures showing Day, Duration, Top Applications, Top Documents, Top Computer Usage as well as some Custom fields. Once the Computer Activity Data was captured, it was imported to a spreadsheet application for calculation and generation of more targeted tables and figures according to categories. This process involved reducing the dataset to the top three software applications and web services used. Categories were generated based on the data captured.

A summary of the categories that were generated is shown in Figure 1.

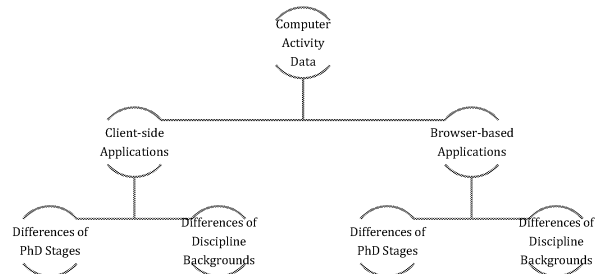


Figure 1. Generation of categories from the computer activities

As shown in Figure 1, the computer activity dataset was divided into two categories entitled Client-side Applications and Browser-based Applications. Client-side Applications refer to all the built-in-application programmes on computers used for different purposes. One example is *Microsoft Office*. Browser-based Applications include website services (i.e., *Facebook*) and website pages (e.g., *Youtube*). The allocation of the categories was not difficult, given that all the URLs and file names accessed were recorded in the computer activities list. In each student’s report, the Client-side Applications and Browser-based Applications listed were labelled according to

the Ph.D. stages and the discipline backgrounds of that student (see Table 1).

In summary, this dataset which was gathered using the software programme, *ManicTime*, provided evidence in the form of a trace of each student’s computer use (software applications, web-based services/pages and documents) from their (normal) daily research practice.

B. Discussions

The lead researcher (first author) met with each participant individually three times, at the end of each month, October to December, 2013. The purpose of the meetings was to discuss the Computer Activity Data that had been generated for the previous month. The discussions provided an opportunity for the researchers to gain an understanding of each student’s contextual background to their numerical Computer Activity Data. Simultaneously, the meetings provided the opportunity for the individual participants to articulate their perspectives on their own computer use in the light of the Computer Activity Data and to reflect on their practices and behaviours. In this way, the researchers were able to make assertions about how the students used their computers within their research practice and to develop insights into the participants’ contexts. Each discussion was audio recorded and transcribed. The transcripts were returned to the participants for comment.

This process of data collection described above provides an illustration of how mechanisms were built into the study to enhance trustworthiness and authenticity (Guba & Lincoln, 1989). It also illustrates how this study encouraged participants to take on a “researcher-like” role and experience an invested outcome of the study (Green, Rafaeli, Bolger, Shrout, & Reis, 2006). In addition, the study provided the environment to focus on the student voice, and the students’ on-going use, experience, and perception of technologies (Conole et al., 2008) which was at the heart of the research intentions.

V. RESULTS AND DISCUSSION

In this section, we present the findings of the study. We pose questions about the evidence gathered through this study and present assertions about the Ph.D. student participants’ ICT-related practices. We make reference to the literature and show how our study has highlighted aspects of Ph.D. student use of computers that have not been reported before due to the limitations of the data gathering approaches used in other studies.

As shown in Figure 1, the computer activities dataset was divided into Client-side Applications (e.g., *Windows Media Player*) and Browser-based Applications (e.g., *Google Scholar*). Table 2 shows the average use of client-side software and browser-based services retrieved from every participant’s computer activity data across the three months.

Table 2. Student use of Client-side Applications and Browser-based Applications

Participants (Pseudonyms)	Average Percentage (%) of Total Hours	
	Client-side Applications	Browser-based Applications
Charles	34.20	35.14
Elizabeth	17.08	79.10
Jeremy	58.24	26.63
Mandy	30.90	59.12
Patricia	22.47	68.90
Sam	17.82	74.99
Shaun	17.77	70.29
Steve	27.97	48.72
Xavier	43.83	29.25

At the level of application use, the Computer Activity Data revealed that the most popular application used was the browser (*Firefox*, *Google Chrome* and *Internet Explorer*), with browser-based use considerably higher than client-side software programme use (average = 55%). The top three browser-based services used were *Facebook* (15.97%), *News page* (12.08%) and *Emails* (6.93%). As for client-side applications, *Windows Explorer* was ranked the highest (average = 6.31%) followed by the reader (either *Adobe* or *Foxit Reader*) at the average of 5.32% and *Microsoft Office* at an average of 5.17%.

The computer activities were then divided into two main groups, according to Ph.D. stages and discipline backgrounds. Figure 2 shows the average hours each participant engaged with computers for the duration of the three months of the study so far, alongside their Ph.D. stage (presented in Table 1 above).

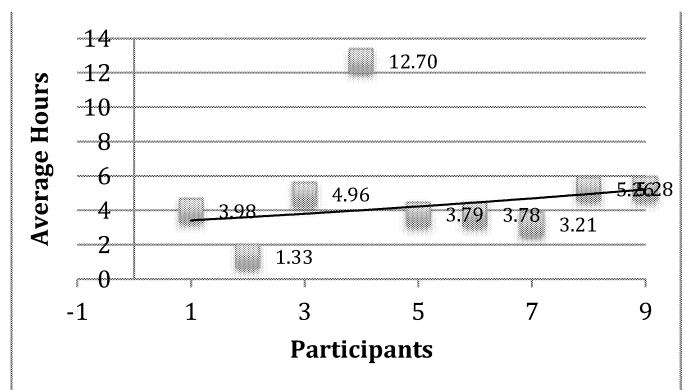


Figure 2. Average hours of daily computer use for each participant

Figure 2 indicates that the average time the participants engaged with computers was approximately 4 hours per day

over the duration of the three months, regardless of their Ph.D. stage.

Table 3 below shows the top three software applications and web services used by each participant alongside their discipline backgrounds.

Table 3. Participants and Their Top Software Applications and Web Services Uses

Participants (Pseudonyms)	Discipline Background	Top 3 Software Application and Web Service Usage		
		First	Second	Third
Charles	Sciences	News	<i>Facebook</i>	<i>Office</i>
Elizabeth	Health Science	<i>Facebook</i>	<i>Twitter</i>	Email
Jimmy	Humanities	<i>Microsoft Office</i>	Email	eBook
Mandy	Humanities	<i>Microsoft Office</i>	Email	News
Patricia	Sciences	<i>Facebook</i>	Commercial Site	<i>Youtube</i>
Sam	Commerce	<i>Facebook</i>	Email	News
Shaun	Commerce	Email	<i>Google</i>	<i>Youtube</i>
Steve	Health Science	<i>Facebook</i>	<i>Microsoft Office</i>	<i>Youtube</i>
Xavier	Commerce	Social Network	<i>Google</i>	Institution Site

Table 3 illustrates that greater similarities of the top software application and web service use by all the participants were found than we anticipated, despite the students' different discipline backgrounds. The participants did not use many specific software programmes that reflected their discipline backgrounds or fields of study.

In short, this first stage of the larger study showed that there was no significant differences in the level of engagement (i.e., range of programmes and applications used and percentage of time in use) with computers and use of computers among the participants, despite variations in stage of doctoral research and discipline background.

During the individual discussions held with participants, a review of the daily use of computers as well as consideration of the top three software applications and web services used over three months revealed that most usage was for non-research work purposes. The students participating in the study expressed surprise with this data during the individual discussions. For example, Sam said, "I am not happy with that!" when he saw that *Facebook* was his top use. While the students were aware that they used their computers for non-research work, there was a mismatch between their claims about that use and the evidence as it was revealed in the Computer Activity Data. Jimmy, Mandy and Steve, who were

in the final stage of their doctoral research, expressed the biggest mismatch. These participants perceived that they had used their computers much less often for non-research work purposes than the Computer Activity Data showed. For example, Sam said, "I am usually reading and I have been busy reading" on the computer for the past month. However, his computer activity data said the opposite – see Table 3.

We were not surprised to see the degree to which students were using Browser-based Applications over Client-Side Applications, but the use of Browser-based Applications for communication and socialising purposes rather than for research work had not been anticipated (see Table 3). This was especially where Jimmy, Mandy and Steve were concerned, whose dissertation submission deadlines were close (see Table 1). While these three of the four participants who spent the longest time engaging with their computers were in the late stage of their doctoral research (see Figure 2), there was no significant difference between their computer activity data and that of Ph.D. students in the early or middle stages (compare Table 1 and Figure 2). It is important to note here that during the discussions with Mandy, it was revealed that she left her computer on all night, hence the high number of hours of engagement that were recorded for her.

We wonder, could it be that while computer technology is a dominant part of these students' daily lives outside academia, the same cannot be said about the academic aspects of their lives (Cowan, 2011)? Regardless of the stage of study, could it be that there is no alignment at all between Ph.D. students' everyday computer use and the way they make use of ICTs Ph.D. for their research work? Further exploration of the students' research and study contexts is needed.

In addition, there was a dominant use of browser-based services for communication purposes such as socialising on *Facebook*, public web services such as news sites and personal web services such as email. Other than document readers and *Microsoft Office*, students did not use most of the software programmes that came with their computers. We had assumed that, because the students participating in this research were advanced academically, they would have been avid users of both web services (server-side) and client-side software. The evidence showed that this was not the case. Client-side Applications designed to support research work, such as bibliography programmes (e.g., *Endnote*), planning software (e.g., *OneNote*), data analysis packages (e.g., *SPSS* and *NVivo*) and other applications, generic time management and note making activities (e.g., calendars, note taking and task applications) were noticeably absent from the captured top three application uses (see Table 3). The findings show that this cohort of Ph.D. students is less reliant on the various software applications installed on their computers than they are on the browser to access the World Wide Web. Given the assumed benefits of using various software applications to improve efficiency and effectiveness of the process of doing doctoral research, we were expecting a higher use of these applications. This low use and reliance on these software applications raises an interesting question about higher

education: if computers are primarily used for communication that is often of a social, non-academic nature, what is their role within the research domain?

Evidence gathered during discussion meetings suggested that for some of these Ph.D. students, their levels of eLiteracy (Blignaut & Els, 2010) or knowledge and acceptance of some typical academic-specific applications such as bibliographic and analytical software was low. For example, one of the students regarded these applications as complex platforms that would require commitment as well as time to master. Mandy said, "I don't do anything [using *Endnote*] to change anything [in a word processed document] because I don't want to screw things up", even though the student had been introduced to bibliography programmes by the lead researcher at the start of this study. Both Jimmy and Mandy, who were in the final stages of their doctoral research, typed their bibliographic references, one by one, using the *Word* or *Excel* applications, instead of using *Endnote*. This view of *Endnote* - as an application that could 'screw things up' - was set against their perspective that applications such as *Twitter* and *Facebook* were intuitive and simple to use. For instance, Mandy said, "My *Endnote* always crashes and that makes me lose my references" while showing the researcher her references on *Word*.

Another example comes from Elizabeth who commented that, "I follow a lot of things until I am ready to engage" on *Research Gate* but "I am very comfortable with [*Twitter* and *Facebook*]". Perhaps this finding aligns with a considerable portion of the current literature on computer use in academia, which concludes that postgraduate students now require more computing competency in order to advance their research processes (Case, MacKinnon & Dyer, 2004; Wallace & Clariana, 2005). The discussions held with the students in this study so far, suggest that there is a perception that some software, usually that used for socialising, is 'easy' and 'intuitive', while that same perception is not necessarily the case about software that has been developed specifically to support their study. Again, these questions warrant further investigation and will be incorporated into the next phases of the study.

Another common thread that emerged in these discussions was that where non-academic applications were concerned the students showed a high level use of 'social networking' applications. Apart from practices focused on consumption (*Google* searching) and public applications (news sites), all other computer activities had a social or shared aspect (e.g., *Weibo*). Butson and Sim (2013) reflected on the high student use of social networking in their study. They contemplated how academic use of typical academic-specific applications might be enhanced if a social aspect was integrated into them somehow.

It appears that the key driver [for students] for developing eLiteracy was the opportunity to be social (to share, to connect or to be-connected). Academic applications did not have this aspect; in fact they were in stark contrast,

focusing purely on independent activity. One can only imagine what would have been the outcome if academic practices were much more social. (p. 7 & 8)

For instance, what if a bibliographic programme such as *Endnote* had a social connection like *Twitter* embedded in it? Could the social interactions that have driven the substantial growth of digital device usage outside the academic environment be shifted into an academic environment? In other words, could it be that it is time for higher education to become more social?

On the other hand, should any concern be raised about the fact that students seem to be more at ease with social networking software and applications than those designed to support their research? Are behaviours and practices more closely linked to purposes, intentions and perceived risk or level of task outcome quality? Or do we have to be concerned that the students might not be aware of how technologies can support their doctoral research and the efficiencies the computer technologies might offer to them?

Social networking sites and applications are used in the main, for self-determined purposes, intentions and outcomes. They tend to be used within environments that are low-risk and involve task outcomes that do not have to stand up to rigorous scrutiny by other academics. As a result, most users are able to achieve their goals by using basic features of such software and have no need to explore the more complex aspects, if indeed there are any. While research-oriented software may be used to achieve self-determined purposes (as related to Ph.D. research that an individual is willingly undertaking), use of them and the outcomes they help produce are under rigorous scrutiny by others. The environment in which they are used is not low-risk and because the software has been designed with particular academic purposes in mind, there are often many features that *do* need to be explored if the software is to have the full benefit in terms of facilitating efficiency and effectiveness.

Data gathered through discussions with participants in the current project suggested that some participants felt intimidated by academic applications and, as a consequence, exhibited a degree of resistance toward them. Some students saw these applications as 'heavy weight' applications that were complex platforms requiring commitment and time to master.

Despite encouragement from supervisors and experience of specific training, the translation of their use into practices that are embedded into everyday academic behaviour does not happen without effort. The student can see risks, and the effort that it takes to minimise those risks of making errors in the use of the software is not worthwhile. For instance, James emphasized that he could not see the reason why he should stop using his *Excel* bibliography management, as it had worked well for him so far. This was despite having been introduced to the idea of using bibliography software, such as *Endnote*, when he was in the writing phase of his Ph.D.. Not only did he show resistance to using this software (by providing arguments on the 'benefits' of using *Excel* rather

than *Endnote*), he also appeared uncomfortable about learning new academic-related software. The concept of making a move to using different software was too risky for him in terms of time and effort.

Given the arguments concerning the role of ICT in research processes and graduate students' engagement with ICT, what can be made of the impact of ICT on enhancing a Ph.D. student's process of research as represented in this study? While this study is focused on a specific group of nine Ph.D. students, it does offer important insights into current understandings of postgraduate use of computers within higher education. More broadly, the technique used in this study of collecting computer use data directly, and as it occurs, signals a shift from the prevailing post-event approach of questionnaires and interviews to a more valid and appropriate method of exploring ICT in Ph.D. study.

VI. SUMMARY AND CONCLUSION

Exploration of Ph.D. students' use of ICT in their processes of research is an emerging area of research. This study, of which the first stage is reported in this paper, aimed to contribute to the literature in this emerging area by investigating the use of ICT by Ph.D. students within their everyday research practices. Drawing on data gathered from the participants' computers by a software monitoring programme and through one-to-one discussions with participants, this study was the first stage in an attempt to understand the role that computers play in supporting Ph.D. students' research practices. More specifically, the aim was to discover the manner in which Ph.D. students integrate computer technology into the process of their doctoral research and the ways they use computers to support their research work.

It is acknowledged that, because this was the first stage of a larger project, the investigation has raised many questions that still have to be answered. The finding that, for the participants in this study, there seems to be no difference in the levels of engagement with computers in relation to stage of doctoral research or in terms of discipline backgrounds, will form the bases of the next stages of the study. The next stages will focus more deeply on the different contexts in which each of the participants' research and study.

The findings of this study thus far are relevant to the broader tertiary population in that they will help to engender awareness of a different way to understand research into student behaviour. In this way, the study will provide an opportunity for academics, especially supervisors of postgraduate research students, to understand to what extent ICT plays a role in Ph.D. students' research processes and/or to what degree technological support might be required to support Ph.D. students. Further, the study adds another voice or aspect to the growing interest in the role and impact that computer devices are playing in higher education.

ACKNOWLEDGMENT

The study in the paper is derived from one aspect KwongNui Sim's Ph.D. research project, which will be completed at the University of Otago, New Zealand in 2016. Her supervisors are Sarah Stein, Jacques van der Meer and Russell Butson. This paper was presented at The 4th Annual International Conference on Education & e-Learning (EeL 2014), Bangkok, Thailand and appears in the proceedings of that conference.

REFERENCES

- [1] Aderibigbe, N. A., & Aramide, K. A. (2006). Institutional factors and perceived usefulness as predictors of internet use by postgraduate students at the University of Ibadan, Nigeria. *PJLA Quarterly*.
- [2] Aspden, E. J., & Thorpe, L. (2009). "Where do you learn?": Tweeting to inform learning space development. Retrieved June, 2012, from <http://www.educause.edu/ero/article/where-do-you-learn-tweeting-inform-learning-space-development>
- [3] Blignaut, S., & Els, J. (2010). Comperacy assessment of postgraduate students' readiness for higher education. *The Internet and Higher Education*, 13(3), 101-107.
- [4] Butson, R., & Sim, K. N. (2013). The role of personal computers in undergraduate education. *International Journal of Digital Literacy and Digital Competence*, 4(3), 1-9. doi: 10.4018/ijdlc.2013070101
- [5] Conole, G., de Laat, M., Dillon, T., & Darby, J. (2008). 'Disruptive technologies', 'pedagogical innovation': What's new? Findings from an in-depth study of students' use and perception of technology. *Computers & Education*, 50, 511-524. doi: 10.1016/j.compedu.2007.09.009
- [6] Cowan, B. (2011). 'Digital Natives' aren't necessarily digital learners. Retrieved from <http://chronicle.com/article/Why-Digital-Natives-Aren/129606/>
- [7] Dahlstrom, E., Grunwald, P., de Boor, T., & Vockley, M. (2011). ECAR National study of students and information technology in higher education (pp. 1-54). Boulder, CO: EDUCAUSE Center for Applied Research: Educause.
- [8] Dange. (2010). Post Graduate Students' Computing Confidence, Computer and Internet Usage at Kuvempu University--An Indian Study. *International journal of instruction*, 3(2), 39-62.
- [9] Divaris, K., Polychronopoulou, A., & Mattheos, N. (2007). An investigation of computer literacy and attitudes amongst Greek post-graduate dental students. *Dental Education*, 11, 144-147.
- [10] George, C. A., Bright, A., Hurlbert, T., Linke, E. C., St. Clair, G., & Stein, J. (2006). Scholarly Use of Information: Graduate Students' Information Seeking Behaviour. *University Libraries Research*, 21, 1-27.
- [11] Green, A., S., Rafaeli, E., Bolger, N., Shrout, P., E., & Reis, H., T. (2006). Paper or plastic? Data equivalence in paper and electronic diaries. *Psychological Methods*, 11(1), 87-105. Retrieved from http://docsfiles.com/pdf_paper_or_plastic_data_equivalence_in_paper_and_electronic_diaries.html doi:10.1037/1082-989X.11.1.87
- [12] Guba, E. G., & Lincoln, Y. S. (1989). *Fourth generation evaluation*. Newbury Park, Ca: Sage.
- [13] Griffiths, J. R., & Brophy, P. (2005). Student searching behavior and the web: Use of academic resources and Google. *Library Trends*, 53(4).
- [14] Guidry, K., & BrckaLorenz, A. (2010). A comparison of student and faculty academic technology use across disciplines. Retrieved from <http://www.educause.edu/ero/article/comparison-student-and-faculty-academic-technology-use-across-disciplines>
- [15] Lawlor, B., & Donnelly, R. (2010). Using podcasts to support communication skills development: A case study for content format preferences among postgraduate research students. *Computers & Education*, 54(4), 962-971.

- [16] Liew, C. L., Foo, S., & Chennupati, K. R. (2000). A study of graduate student end-users' use and perception of electronic journals. *Online Information Review*, 24(4), 302-315.
- [17] Lincoln, Y. S., & Guba, G. (2003). Paradigmatic controversies, contradictions, and emerging confluences. In Y. L. N. Denzin (Ed.), *The landscape of qualitative research – Theories and issues* (pp. 253-276): Thousands Oaks, CA: Sage.
- [18] McCarthy, J. (2012). International design collaboration and mentoring for tertiary students through *Facebook*. *Australasian Journal of Educational Technology*, 28(5), 755-775.
- [19] Rowlands, I., Nicholas, D., Jamali, H. R., & Huntington, P. (2007). What do faculty and students really think about e-books? Retrieved August 2013, 2013
- [20] Shaw. (2000). A Survey of Graduate Students as End Users of Computer Technology: New Roles for Faculty. *Office systems research journal*, 18(1), 21-40.
- [21] Smith, S. D., & Caruso, J. B. (2010). The ECAR study of undergraduate students and information technology, 2010 *Educause* (October 2010 ed., pp. 118).
- [22] Sultan, N. (2010). Cloud computing for education: A new dawn? *International Journal of Information Management*, 30(2), 109-116.
- [23] Sutton, A. M., & Jacoby, J. (2008). A comparative study of book and journal use in four social science disciplines. *Behavioral & Social Sciences Librarian*, 27(1), 1-33.
- [24] Tenopir, C. (2003). Use and users of electronic library resources: An overview and analysis of recent research studies (pp. 1-72). Washington, D.C.

AUTHORS' PROFILE

Dr Sarah Stein is a Director of Distance Learning at the University of Otago. In her role, Sarah works in collaboration with the Deputy Vice Chancellor (Academic & International), Pro Vice-Chancellors, Heads of Departments, Programme Coordinators and other staff in the area of supporting and facilitating change and development in distance teaching and learning. Her interactions are mostly at a strategic level, but can also be at the research-informed practice level. Her actions are guided by the Distance Learning Advisory Board (a standing Committee of the Senate) and she plays a key role in facilitating the achievement of the University's Distance Education Strategy. The Strategy focusses on enhancing learning and support of distance students, and ensuring excellence in distance education. She has particular interests as a researcher and practitioner in student evaluation, distance learning, curriculum and teacher development.

KwongNui Sim is a Ph.D. candidate in Higher Education Department Centre, University of Otago, New Zealand. Her research focuses on ICT (Information Communication Technologies) beliefs and practices held by students.