

Influences of technology on collaboration between academics and library staff

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Abstract:

This paper presents the preliminary findings of an in-depth case study of the influences of technology in collaboration between academics and library staff in an Australian university. It has investigated the use of the current technologies, enabling and constraining factors of technology as well as the influences of institutional structure on the use of technology in collaboration. Institutional contexts, capability of the collaborator, and the academic and professional divide were analysed to gain further insights. It concludes with recommendations for universities interested in addressing the issues of technology and structure in collaboration between library staff and academics in various academic contexts.

Introduction

The ever-increasing use of technology in higher education has impacted significantly on collaboration practices between academics and library staff. Technology has been utilised in teaching and learning activities, particularly for the integration of library resources, information literacy and research skills training into the curriculum. The instructional roles of both academics and library staff have been transformed by enhanced technologies in a virtual learning environment in which lectures, course materials, library resources and learning support are delivered.

On the other hand, this technology has also presented overwhelming challenges for both library staff and academics. New technologies impact on the nature of work. There is an increasing pressure on working with new and constantly changing technologies, which require much effort and time to understand, and sometimes add new burdens of their own. Online collaboration is also hindered by the organisational structure and roles in which library staff members are rarely involved in the direct development of online courses. The learning management system usually runs separately from the library management system, so may cause unexpected work for both library staff and academics. Further influences of institutional structures, cultures and norms on how people interact with technology both enable and constrain these collaborative relationships.

This paper presents the preliminary findings of an in-depth case study in an Australian university undertaken during 2013. It provides insights into the influence of technology on the nature of the relationship between academics and library staff. The research has three aims: (1) to investigate the use of technology in collaboration between academics and library staff; (2) to elucidate the mediating role of technology in collaboration and any contextual issues arising from the application of technologies, either enabling or constraining their relationships; and (3) to examine the institutional conditions and consequences of interaction with technology in collaboration. Findings were based on 29 semi-structured interviews with 27 academics, library staff and course administrators; a focus group of four library staff; two observation sessions; and a review of internal documentation.

The paper seeks to contribute insights into the opportunities and challenges of using technologies in teaching and learning collaboration, from the perspectives of library staff, academics and involved partners, rather than simply from one side of the equation. It concludes with recommendations for universities interested in addressing the issues of technology and structure in collaboration between library staff and academics in various academic contexts.

Review of literature

Research describing the applications of technology in libraries and in collaboration with academics is increasingly rich in the literature. However, there has been little research studying how technology is used in collaboration practices between academics and librarians, and to what extent technology can enhance and/or constrain their relationship. This section reviews key areas of prior research on the topic, namely: concepts of collaboration in education and library science; influences of structure on collaboration; and use of technology in collaboration.

Collaboration concepts

Collaboration is an emergent topic, which has drawn the attention of organisations and people across disciplines. In education, collaboration is defined as a joint working, learning and sharing process, which specifically focuses on the enhancement of teaching, learning and researching activities among educational participants (Adamson & Walker 2011, Butler, Lauscher, Jarvis-Selinger & Beckingham 2004, Welch & Sheridan 1995, Whipple 1987). Whipple (1987, p.2) claimed that collaboration is “the pedagogical style” that narrows the distance between educators and learners to create a knowledgeable community. The knowledge power of the community allows them to be effectively involved in the educational process to advance their quality of teaching, learning and researching process (Adamson & Walker 2011, Whipple 1987). A study of collaboration in educational settings by Welch and Sheridan (1995) concluded that when knowledge, skills and resources are shared among the community of scholars, their diversity of expertise helps the issues and goal to be conceptualised and answered by various possible solutions.

From the library and information science perspective, collaboration in teaching and learning in universities has aimed to enhance skills development and learning experiences for all students (Smith 2011) as well as supporting the university community in creating and transferring knowledge (Miles, Snow & Miles 2000). The emphasis of the collaborative activities with academics is on the cooperative development of instructional material relating to the curriculum. This area of collaboration reflects the major aims of library staff in the course of developing and fully integrating information literacy and academic skills programs to enhance student learning. Such integration has been recognised as the highest level of collaboration, in which teachers and librarians are working together to integrate the curricula of individual subjects and academic programs and library instruction to offer students “coherent instructions” throughout the whole curriculum (Montiel-Overall 2005). The outcome of the embedded instructional curriculum was also found to be critical to students, as it supports them not only in comprehending the knowledge of the subject, but also in achieving the associated information and learning skills (American Association of School Librarians and the Association for Educational Communication and Technology 1998).

In light of the above, collaboration between library staff and academics is essential in the university environment. Outcomes of their collaboration have been shown in bridging the distinction between teaching and researching (Whipple 1987), enhancing the quality of teaching and learning activities (Achinstein 2002, American Association of School Librarians and the Association for Educational Communication and Technology 1998, Austin & Baldwin 1992, , Butler, Lauscher, Jarvis-Selinger & Beckingham 2004, Corey 2002, Montiel-Overall 2005) countering isolation and promoting collective actions (Achinstein 2002), and supporting curriculum innovation and school reform (Doll 2005, Montiel-Overall 2005).

Structure and collaboration

In reviewing various factors influencing collaboration in organisations, structural dimensions are explicitly stated as the most decisive factors that determine the success or failure of collaboration. Welch and Sheridan (1995) were concerned that

the dominant effects of policies and procedures may either facilitate or impede the partnership, as they govern the way in which educators work together. Besides the formal system such as budget, rules, organisational regulations, staffing policies and structures, external forces outside of schools such as state law and conventions as well as other governing bodies' orders have critically influenced the relationship of educational participants. The notion of "sharing rules and structure" or "emergent governance" and "administrative rules" that governs the actions of collaborators was articulated by many writers on collaboration. Wood and Gray claimed that "the participating stakeholders must explicitly agree on the rules and norms that will govern their interactive process" (Wood & Gray 1991, p.146). Both Wood and Gray (1991) and Shannon (2001) emphasised that structure is "evolving" and continuously created by the agency of actors. Strongly influenced by the collaboration framework in Wood and Gray (1991), Thomson, Perry and Miller (2009) expanded Wood and Gray's framework by incorporating multiple theoretical perspectives i.e., structural dimensions (governance, administration), social capital dimensions (mutuality and norms) and the agency dimension (organisational autonomy) into their definition.

Technology in collaboration

The most widely used social technologies for collaboration in libraries are the Web 2.0 applications. Really Simple Syndication (RSS), blogs, social networking sites (such as Facebook or LinkedIn), wikis, instant messaging, vodcasts (video files) and media sharing (such as YouTube) have become the top adopted technologies in libraries (Mahmood & Richardson Jr 2013). An investigation of 57 university library websites of the top 200 universities in the world, by Harinarayana and Raju (2010), reported that Facebook was the most popular networking site in those libraries. In the University of Texas, the library catalogue, chat with librarians and vodcasts were embedded into the Library's Facebook interface. Along with the use of Facebook and Twitter for marketing purposes, library staff at California State University produced a successful video streaming series on the Library's YouTube channel, to further promote library resources and services to faculty members.

Besides the use of social collaborative tools for communicating general library resources and learning support, learning management systems have been a desired workspace where library staff and academics can work together to help students with specific course-related needs. Tailoring and embedding library instruction, information literacy, research skills and course-related resources into online learning management systems has been a growing trend in universities. Xiao (2010, 2012) presented three examples of a faculty-librarian collaborative course model in which research and information literacy skills were seamlessly embedded into the Blackboard learning management system in faculties of nursing, education and liberal studies in the City University of New York. In these cases, faculty members added the liaison librarian to their Blackboard courses and worked with her in designing and integrating course-specific resources, library database instruction, style guides, research skills tutorials or how to avoid plagiarism using the "Turnitin" detection software.

Podcasts have been better utilised when library staff worked in partnership with academics to design audio and video tutorials, and then integrated the modules into the specific courses within the learning management system. Dobozy and Gross (2010) described the collaborative project between a lecturer and a faculty librarian

in Edith Cowan University, WA, to embed library video modules, such as borrowing, education databases and search strategies into Blackboard. Similarly, Edwards and Black (2012) and Leeder and Lonn (2013) presented the partnerships between library staff and faculty in integrating library guides, podcasts, search demonstrations, forum and instant messaging into online courses.

The evolution of mobile technology and the exponential increase of mobile device users present new opportunities for library collaboration in online space. Library staff in some universities have developed applications that integrate library resources, services and instructions on mobile devices to enhance users' experiences and collaboration. At the University of Utah, health science librarians were called by a faculty member to work on the development of a paediatric clerkship course using mobile devices and web-based collaboration tools for evidence-based material searching and journal evaluation (Le Ber & Lombardo 2012). The outcome of this collaboration project highlighted the importance of librarian participation in collaborative curriculum development to enhance student learning experiences, by using technologies and educational resources in their courses.

Methodology

This research used an in-depth case study method to explore the influence of technology and structure-related factors on the nature of the relationship between academics and library staff in an Australian university. For data analysis, the duality of technology theory by Orlikowski (1992) provided a useful framework for understanding the role of technology in the organisation. This theory focuses on interrelated interactions occurring among technology, people and institutional structure in social practices, and is described more fully under Framework of analysis below.

Research field

The study is being conducted at a large Australian university. The university has ten campuses located locally and internationally, with total enrolments of more than 60,000 in 2012. Collaboration between library and faculties has evolved differently across the faculties and campuses. The main collaborative activities are teaching-related, focused on organising resources for courses, developing and delivering information literacy and research skills, and providing learning support to students. The university has adopted the Research Skills Development (RSD) Framework as a guideline for the development of the educational model, in which the library works in partnership with faculties to integrate skills development within the curriculum.

Several years ago, the library took on the responsibility for managing academic skills advisors, who previously worked in a centre of language and learning support. These academic skills advisors were relocated to the library and jointly worked with contact librarians in a faculty-based team structure. Along with the change in the collaboration structure, there is increasing movement and involvement with various forms of collaborative technologies in the library and academic communities, for their work, teaching or research activities.

Case study

The study was conducted as a qualitative case study inquiry using multiple sources of data, including semi-structured interviews, a focus group, observation and documentation review. It involved six faculties and six libraries based on five different campuses of the university. At the very early stage of data collection, an initial interview with a senior library leader provided important understandings about the library structure, staffing, strategies and the current state of collaboration across the university. This was followed by 29 in-depth individual interviews with 27 participants, who were librarians, library leaders, academic skill advisors, academics, tutors and a course administrator. Interviews were undertaken over a six-month period.

A focus group was conducted in a library that was well known as an exemplar of collaboration with academics. The focus group comprised four library staff; namely, a library manager, two librarians, and an academic skills advisor. Observation sessions of two collaborative projects between library and academics were undertaken: a training session on academic and library skills for postgraduate students, and a formal meeting between an academic, two tutors and an academic skills advisor. Throughout the study, library web-based resources, library annual reports and meeting minutes between library staff and faculty representatives were important sources of documentation review.

Framework of analysis

This study used duality of technology theory (Orlikowski 1992) to examine the role of technology on collaboration practice between academics and library staff in the university environment. The theory was constructed based on Giddens' theory of structuration (Giddens 1984) to yield understandings about the interrelationships between technology, people and organisational structure. Orlikowski named her theory 'the duality of technology' to reflect the recursive interaction between organisations and technology. "Technology is created and changed by human action, yet it is also used by humans to accomplish some action" (Orlikowski 1992, p.405). The centrality of the theory focuses on four main interrelated interactions occurring among technology, people and institutional structure in social practices, as follows:

- Technology is seen as *a product of human action* implicated in the process of design, development, appropriation, and modification of technology in organisations.
- Technology is seen as *a medium of human action* that can either facilitate or constrain social interaction through the provision of rules and values embedded in the technology.
- The *institutional condition of interaction with technology* influences people in their interaction with technology, such as intentions, professional norms, state-of-the-art in materials and knowledge, design standards and available resources.
- Technology *can have institutional consequences* whereby the human confirmation or rejection of technology might reinforce or change the structure of the organisation.

The theory has been widely used in library and information systems research to study information behaviours, knowledge management and the implementation of information in different library sectors (Rosenbaum 2010). In this research, the theory helped guide the analysis of how collaboration between academics and library staff is enabled and constrained by technology and how their ongoing interaction with technology for collaboration impacts on the change of the university structure. Table 1 outlines the potential usefulness and relevance of the theory in investigating the influence of technology on this collaborative relationship.

Table 1: Proposed contribution of the Duality of Technology theory

Type of influence	Potential contribution
Technology as a product of human action	This characteristic is important in examining the use of technology in collaboration and the expectations of academics or librarians on how such technologies can support their collaborative efforts
Technology as a medium of human action	This factor helps understanding the extent to which technology mediates the interaction of librarians and academics, either enabling or constraining their collaboration.
Institutional conditions of interaction with technology	Human interaction with technology is influenced by the structure of the university as a social system. This type of influence is essential in the analysis of how the institutional structure determines the use of technology as a collaborative medium for their interaction.
Institutional consequences of interaction with technology	Consequential influences of technology on either changing or reinforcing the institutional structure. Institutional contexts, capability of the collaborator and social rules and values are significant elements to be contextually analysed to gain further insights.

Findings and Discussion

Consideration of the duality of technology theory interactions (Table 1) assisted in clarifying how technology was used in collaboration, how technology mediated the interactions and how institutional structure impacted on the use of technology for collaboration. This section presents these preliminary insights.

Use of technologies in collaboration

Different types of technologies have been used for communication and collaboration among library staff and academics. The level of use differed between staff members, groups, faculties and campuses, and was impacted by the distance between collaborators and the degree of collaboration. The types and extent of technology used varied from a simple use of emails and Google applications for teamwork, to a “sharing space” in a learning management system, to an advanced application of technology to create interactive materials and to explore new opportunities for collaboration.

Email was mentioned as the communication technology used more extensively than any other collaborative applications. It seems to be the primary means of online communication for various purposes and a preferred tool for contact between academics and library staff. For example, one academic said:

I use Moodle for my own teaching, Google Docs for my own work, social technologies for my research but to work with librarians, I only use email to communicate with them, exchange information, asking queries, get a reply or setting meeting times, setting appointments ...

Email is used for exchanging course-related materials and resources that meet students' interests. One academic noted:

I certainly provided them with copies of our unit guides. I think what they have done is sent us the presentations and we've uploaded [them].

An academic skills advisor described their interaction over email:

So he would just share his unit guide with me and basically leave it up to me and my librarian colleague ... And just email backwards and forwards until we're happy and do it that way.

Over the last few years, the university has migrated the email system to Gmail. The new migration has made other Google applications more popular among academics and library staff. Google Docs seems a very helpful tool for sharing documents among staff and supporting collaborative work on the same documents. For example, the library ran a series of marking and assessment rubrics workshops among library staff and lecturers then put the rubrics on Google Docs for input from everyone, either by commenting, writing or editing. In some faculties, Google Docs has provided a shared space, in which academics and library staff work together to produce important guidelines and style manuals for students. Likewise, Google Calendar has become more popular in sharing calendars and making appointments among library staff and with academics. Google Drive and Dropbox were mentioned as useful virtual storages to share big files with students and library staff. Google Drive would replace a collaborative shared space called Sakai, which some library staff had used to work together on a poster for a conference.

However, academics and library staff tend to use Google applications to work collaboratively with their students and colleagues in the same department. Some academics said that they mainly use Google sites to work with their students, while library staff reported that they use this application only within their library team. In other projects, Google Hangouts and video conferencing tools have been used more for library team meetings, staff recruitment and professional development across the regional and international library campuses, rather than with academic staff.

Along with the popular use of Google applications, social technologies have been a phenomenon around the University communities. Facebook, Twitter and YouTube were found in the library and three out of the six selected faculties. These applications were popular, and were used for updating news, events or topics of interest to staff and students. The library sometimes advertised library classes on Facebook and "very quickly it was booked out, within a day", a library staff member noted. Facebook and Twitter were also reported to be heavily used, along with

screen recordings, to visually demonstrate activities and answers to students' questions. An innovative academic commented:

... in lectures ... [we] use Twitter a lot, so when students send a tweet with a particular hash tag, it appears on the bottom of the slides, and I can use Twitter ... if they tweet in a particular way, we can get them to respond to say a quiz, and have a bar chart of their responses in real time ...

If a student asks a question ... you can answer questions by showing them rather than it's hard to explain, so I'll record me doing it and I'll put that up on a website and then that student gets the answer, but all students get the answer ... And [I] do lots of videos in my lectures.

Likewise, the library has taken advantage of blogs, RSS feeds and wiki technologies to provide students with multiple channels of information about the library and the university in general. The library guides have been effectively used as a wiki for students of all faculties. This application has supported library staff in sharing guides and resources for skills development in English language, communication, general assessment tasks and specific subjects among students and interested staff. The success of the library guide was remarked on by a group of library staff, as it was "the most frequently hit and used one" and "that's got the [faculty] blog and the [faculty] tweets on it".

Another key technology that academics and library staff have utilised was the Moodle learning management system. Moodle provided primary online learning functions, such as material download, assignment submission, grading, discussion forum, instant messaging, calendars and other learning activities. This online system was central to all the teaching and learning activities system, thus it was seen as a desired space where library staff could work with academics for outreach to all students:

The important thing is academics work on Moodle. One of the areas that we now spend a lot of time developing resources for [is] Moodle. (Academic skills advisor)

... access to the technologies that the academics have access to be equal kind of partners; on equal footing and to be talking the same language as they are. Whether that means having the same kind of problems that they have because we're using the same technologies, but I think it's important too. (Liaison librarian)

The strategic focus on online interaction has encouraged library staff to focus effort on creating rich sources of electronic resources to share with academics. Some library staff used the Captivate software to create an online module that academics can actively use or link to. Other library staff started to develop their own Moodle sites. By doing that, they could enrol interested students, academics and faculty staff in a particular unit, in which learning resources are developed and tailored for specific skills development and targeted groups. Furthermore, they had the full administrative right to manage the site as academics do in their Moodle unit.

I am creating a program for students who are failing units. I thought a Moodle unit might be a good way to be able to talk to them as a group and also lecturers ... they can have input too. (Academic skills advisor)

... that is where we will have total ownership of those spaces within Moodle. (Another academic skills advisor)

Library staff have also taken advantage of the institutional repository tools that help identify opportunities for new collaborative initiatives. For instance, they had access to the University business and intelligence system, which stores important information about cohorts, international students, social inclusion and the past failure rates in all units. By having access to that system, library staff will be able to develop classes and resources that target specific groups of students who need learning support for specific skills or resources. This will facilitate conversation with academics about the collaborative activities for particular groups of students.

The other repository system in the library, named Aquila, was found to be significant for internal collaboration and knowledge sharing. Library staff deposited the teaching resources that they have developed into this common space to share with others, and they could benefit from the contribution of other colleagues in the repository:

So if I was doing a whole new class on something, I could look in Aquila and see if someone else had done it, or a similar [presentation]. Then I could download that, modify ... So it saves you having to recreate everything from scratch all the time. (Liaison librarian)

Mediation roles of technology on collaboration

The increasing use of technology in collaboration between academics and library staff has transformed their interactions and the nature of their work. The domain of collaborative activities has shifted radically from physical locations to online space. Today, instead of going to the library and searching for materials, academics access and research library resources in their own places. The digital shift has also created new opportunities for collaborative activities in a virtual environment. Library staff hence focused on developing digital course-related resources and moving towards the same online work platform with academics:

... we also develop resources for research strategies and assessment task which is their essay, so it is quite specific. I mean put them into that blog, and if there are other opportunities in other units, we certainly work with academics on that ... we try to work on that way... and now on Moodle. (Academic skills advisor)

In such a large university, acknowledging and keeping track of what people were doing in other disciplines was challenging. By working together in the same platform, the learning management system, both academics and librarians have developed a clear idea of their partners' expertise and how others can contribute to achieving their mutual goals.

We have to get approval from the academics to load resources for them and we can demonstrate for them the value that we do and value to students. It is quite successful.

Consequently, better understanding about partners' expertise has led to collaborative follow-up actions or new initiatives.

... at the moment more of the work is sort of getting done through the embedded programs and the work on assessment tools and making skill development explicit across units ... Most of the value is coming out of that.

The complementary role of technology in collaboration was highlighted in the way it supported library staff and their academic partners in sharing teaching-related

resources and transferring knowledge. Since library staff experienced a challenge in sharing resources with an international campus library, which operates across a variety of time zones, a Moodle site has been set up for staff in all campuses to put resources on. By accessing the site, the learning skills manager knew what units other staff were working on, so she could connect local staff with overseas staff and suggest they work in partnership to share their knowledge and resources of similar units. This facilitated collaboration, not only by enhancing the team knowledge in those units, but also by helping distant peer learning and staff development. From the leadership management perspective, technology was not only an agent of change by bringing in new ways of doing work, but also a medium for implementing such change through the supporting tools for managing and sharing resources. A university library manager remarked:

It could be a good way of changing the environment too. Like our Aquila repository example, that was a useful way of trying to get more sharing, whereas, without the tool—without the technology—we probably couldn't have done more than we were already doing by just trying to encourage people.

An academic stream leader added further:

Yes, I actually use Dropbox to share [with library staff] some videos that we show to students in teaching Objectively Structured Clinical Examination.

Apart from the advantageous impact of technology on collaboration, the widespread use of online library resources and online services has presented certain constraints on building and nurturing the relationship between academics and librarians. The seamless access to the library resources and the convenience of online interaction presented fewer opportunities for face-to-face communication. An academic who has worked for the university for nearly 15 years commented:

So over my time here, my contact with the library staff has got less, but my interaction with the library electronically, has increased because there's a lot more available electronically with the library, plus you can search it from your desk so you don't have to walk half way across the campus, so when it's raining or whatever, you can sit in your office and do it.

Consequently, a lack of mutual understanding about the work of the partners and the possible contributions that they could make to the partnership was well recognised throughout the interviews with many academics. Given the extensive use of the digital library, the lower levels of face-to-face interaction could be a reason why some academics still kept the old-fashioned perception of the role of the librarians as traditional custodians of books. A course administrator, who has coordinated library staff with academics in a number of collaborative course programs, noted the difficulties for busy academics in keeping up-to-date with the constant change of the other communities in the university. She highlighted the importance of direct interaction on the outcome of collaboration:

But for the personal touch to development of that relationship, you need to meet people. I'm a big believer in meeting people or telephone, especially with meeting, things happen faster.

Another important constraint of technology in collaboration was noted in the separation of the library system and other related systems with the key system of the university, the Moodle learning management system. There were no clear pathways

to have those systems linked or integrated at certain stages, so as to facilitate collaboration in related teaching and learning support activities that both communities acted on. For example, library staff were responsible for the lecture recording system, course-related academic skills resources and the reading list of core materials. These resources were managed in different systems, even though they were closely related to the teaching work of academics on the learning management system. However, the divide of the systems that academics and library staff worked on formed an invisible boundary between these two communities. One academic noted:

LMS [learning management system] is the key system and I think everything else needs to be able to be integrated, that it should always be clearly – easy, clear pathways to integrate into that. So I think the fact that the library and the Learning Management System, the LMS staff, were sort of separate, I think is a problem.

The issues raised from an inadequate system integration that constrained collaborative activities have important implications for studying the impacts of the institutional conditions and consequences of using technologies in collaboration.

Institutional conditions and consequences of interaction with technology in collaboration

Institutional structure and operational policies have been central to how university staff interact with the provided technology. The merger of the academic advisors unit with the library aimed at a more collaborative structure for academic practice within the university. However, communication about the structural change and the role of the academic skills advisors in helping students with learning and research skills was not well recognised among many academics.

No, I think for many, they're just not aware of it. And I guess it's symptomatic of a lot of academics that they can be quite siloed in their thinking about their role.
(Lecturer)

The bureaucratic and complex institutional structure might not help solve the academic-professional divide. There are distinctions between the two communities. Academics seemed to have more freedom than library staff to work in the way they wanted and at the time they wanted, while the hierarchical structure of the library and certain rules limited the flexibility of the work choices of library staff.

... it's [a] much more contained structure in the library where things like, you know, the time you start work is important and the time you finish. (Academic skills advisor)

The choice of whether or not to provide automatic access for library staff to the Moodle learning management system provides a very good example of how rules and structure influenced the use of technology. When the university implemented Moodle, there was a very useful discussion about whether library staff would be automatically included in all of the Moodle units. Library managers reflected on the experience of not having automatic access into the previous learning management system. This had caused challenges for library staff, who had to build good relationships with academics in order to get their permission to access the online unit. When addressing the possibility of automatic access in the new learning management system, they considered the challenge of being automatically enrolled

in thousands of units where they might not be able to work as effectively as expected across all of them. Eventually, they decided not to have automatic access to Moodle, because they would have more flexibility about what activities they were involved in and how they could work with academics. The relationship was considered as the most important starting point.

In fact, getting access to Moodle, a central place of teaching and learning activities, was found essential among library staff who directly worked collaboratively with academics. In order to help students effectively in developing learning and research skills for a specific assessment task, they expected to see the unit guide and the assignment or any kind of learning resources that students were being shown on Moodle. Nevertheless, the need to give library staff access to Moodle is not well recognised among academics. A liaison librarian remarked:

It can be challenging sometimes because lecturers might ask, "Well, why do you need access to Moodle?"

An experienced academic skills advisor added:

They just don't understand that. They think that I can run a workshop on writing this assignment without really seeing much about the assignment itself ... so I always have to request access to Moodle ... So it's not in their minds to do that even though I'm collaborating in the unit.

Academics, on the other hand, assumed that their library partners would give students resources and learning skills in general rather than course-specific support. Two academics who had been working with library staff for years responded:

I think the library staff could have a role there, but I don't personally know what they're doing in that space.

They can request having this access but they didn't need it. Instead they have their own website, they have their own Moodle site and my students can download material from their website.

Many academics gave library staff access to their Moodle site upon request, but "not routinely; it's not something that I would typically do", said another academic.

Since academics and library staff worked on separate systems, there were issues related to the lack of consistency in operating procedures, which caused unexpected duplication of work. Library staff have been responsible for the lecture recording system, which closely relates to the work of academics on the learning management system. A problem occurred when the new version of the lecture recording system had a comment tool in which students could comment about the lecture and receive feedback from the lecturers. However, the learning management system, Moodle, also had a discussion forum tool where students had communicated with lecturers on all course-related issues for years. The overlapping use of discussion tools on both the learning management system and on the lecture recording system created frustration among academics:

... I think that's a structural problem in the university because the LMS people have made decisions that the library people aren't aware of and vice versa.

The separation of the systems has apparently created misunderstanding and unnecessary extra work for academic staff in responding to lecture-related comments on the two separate systems. This example demonstrates the consequences of interaction with technology ultimately producing unexpected outcomes. Hence, greater coordination across these isolated systems towards seamless integration into the main learning management system is critical. It would also help minimise negative influences of technology on the development of collaborative relationships between academics and library staff.

Conclusion

Given various reported constraints in the collaborative relationship, the outcomes of this partnership have presented outstanding benefits to academics, library staff, students, and the university at a whole. Collaborating with library staff, academics have gained a base of support in teaching and enhancing students' learning. Library staff work with academics not only in acquiring most of course related teaching and learning resources, but also in developing and teaching curriculum based information and academic skills to students. On the other hand, the partnership brings in the role of library staff as an essential part of the university teaching and learning community. Working together with academics to reach out to more students, library staff can support the university's strategic goal of improving graduate attributes and skills development. Hence, empirical study into the nature of this relationship and influencing factors was imperative.

This paper has presented preliminary findings of a large research project on collaboration between academics and library staff. It has illustrated the main influencing factors of technology in the collaboration practices between these two communities in a large university. At this stage, the findings consolidate the validity of the duality of technology theory (Orlikowski 1992) in studying the interactions between people, technology and institutional structure. The usefulness of the four types of influences in the theory (see Table 1) was explicated through the insights into the mediating role of technology in collaboration. Technology, as an on-going product of human action, acted as a medium to facilitate collaborative activities, whilst exposing certain constraints either due to the limitations of the particular technology or the drawbacks of the institutional structure. Contributions of the paper are threefold: it provides the groundwork for understanding the uses of technology in different collaboration contexts; it shows how technology enables and constrains the collaboration interaction; and it illustrates the significant impacts of the institutional structure.

In conclusion, Table 2 below highlights some key findings of the research to date, and from each finding draws out recommendations for practitioners confronting issues with collaborative relationships.

Table 2: Key findings and recommendations

<p>Key findings</p>	<p>Recommendations for practitioners It is recommended that librarians:</p>
<p>Communication technology was less often used in small campuses than in the large campuses. The centrality and proximity of the library to the faculty created more opportunities for direct contact and collaboration. More face-to-face meetings occurred naturally and frequently. The direct conversations helped enhance mutual understanding, commitment and motivation, and facilitated collaborative work processes.</p>	<p>(1) Carefully consider the relative roles of interpersonal interaction and technology in developing effective collaborative relationships, including:</p> <ul style="list-style-type: none"> (a) how architecture and space design may enhance or constrain opportunities for face-to-face interaction and knowledge-sharing between academics and library staff; (b) the benefits of face-to-face interaction in the early stages of a collaborative relationship, to enhance engagement and commitment to collaborative action; and (c) the value of technology in facilitating continuity of established collaborative relationships, in overcoming barriers of distance and multiple time-zones, and in capturing online discussions for subsequent retrieval.
<p>Participants highlighted the significant role of technology in: providing new opportunities for collaboration; creating better understanding about partners' value and expertise; sharing teaching-related resources; transferring knowledge within and across teams; and peer learning. However, prevalent use of digital library resources and communication technology limited the chances for face-to-face communication. Here, lack of mutual understanding and pre-existing traditional perceptions about librarians' work were complicating factors.</p>	<p>(2) Explore possible ways of enhancing the awareness among academics about the current library staff, their skills and expertise, and their potential roles in the online learning environment.</p> <p>Possible examples:</p> <ul style="list-style-type: none"> (a) enabling direct interpersonal contact by having formal involvement of library staff in faculty academic meetings related to course design, curriculum development, marking guide and rubric assessment, and the implementation of teaching and learning technologies; and (b) creatively using available technologies to identify opportunities for collaboration and

	potential collaborators, and in supporting collaborative partnerships).
The separation of the library system from the learning management system created an academic and professional divide, and resulted in misunderstandings and extra work burden on both communities.	(3) Enlist the services of computer experts to find ways to integrate the library management system with the university learning management system.
Academics and library staff working together on the learning management system provided students with more discipline-relevant resources and greater enhancement of academic skills. The importance of getting access to the learning management system was highlighted by library staff, while it appeared blurred to academics.	(4) Seek automatic authorised access to the learning management system for library staff, but also consider ways to manage the resultant online workload on library staff.
Working conditions for library staff collaboration seemed more structured and rigid than for academics in terms of working time, reporting system and work flexibility. There would be greater opportunities for collaboration if librarians had more flexible working conditions.	(5) Develop strategies to minimise the negative impacts of hierarchical and bureaucratic structures on collaboration (e.g., allowing library liaison staff to have flexible working conditions so that they can be more dynamic partners with academics).

Further research, investigating the influence of space design on using technology for collaboration, integration of library management system and learning management system, and enhancement of understanding among academics about the roles of library staff in the online learning environment, should be encouraged.

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