Chapter 8 Collaboration, Information Seeking, and Technology Use: A Critical Examination of Humanities Scholars' Research Practices

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Abstract Despite a rise in collaborative research, resulting in complex collaborative information seeking (CIS), few studies have explored the CIS experiences of academics in the humanities. This research explores the CIS activities of digital humanities scholars within the broader context of their collaborative research practices. Data from qualitative semi-structured interviews and guided interactions with digital tools are analysed using the conceptual lens of "parallel work" to best understand scholars' engagement with CIS. The results demonstrate the complexities of research contexts and how CIS is shaped by individuals' research needs, technology use and general information behaviours. The findings demonstrate how digital tools enable and constrain collaborative information work, and show how availability, ease of use, and other peoples' activities often determine which tools and seeking practices are used in collaboration. Additionally, while scholars in the digital humanities work collaboratively, they continue to work as solo scholars, at times working quite independently within a collaborative project. Of particular note are results that show a lack of group-based information seeking practices within collaborative research practices. The model of Parallel Research Practice is proposed as a way to understand how digital humanities scholars engage in collaborative information activities.

Keywords Collaborative information use • Research collaboration • Parallel work • Digital humanities

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8.1 Introduction

Contemporary research cultures herald the benefits of collaborative research practices, as demonstrated by an increasing interest in collaborative projects by funding bodies, practitioners, and academics. Research teams allow larger and more complex problems to be explored in new ways, which can increase the scale of accomplishments, enabling new and different methods to emerge (Houston et al. 2009). Collaboration is also a mechanism for increasing the quantity and quality of research outputs (He et al. 2009). This interest in collaborative research has come, in part, from a desire to share expertise (within and across disciplines) and to work together to do more than could be accomplished individually. The increase in interest in collaborative work is also seen in information science (IS), where current research in this area has begun to give a window into the ways in which people work, find information, share goals, and accomplish tasks (Shah 2010). However, empirical studies have not yet explored collaborative information seeking – or other collaborative information behaviours – in the context of research practice.

This chapter contributes several aspects to the topic of collaborative information seeking (CIS). First, it takes a holistic look at CIS in the larger context of collaborative information work for a particular group of academics. Collaborative information seeking is only one aspect of teamwork and of collaborative information behaviour, generally; CIS follows from other decisions made within teams and the roles assigned to collaborators, therefore occurring (or not occurring) due to the broader contexts of technology use, information needs, information use, etc. CIS cannot be examined in isolation from the needs and experiences of the larger team or the individuals involved, including workflows, project planning, and the role of technology in collaborative work. Second, the chapter presents results gathered using qualitative research methodologies not commonly discussed in CIS research. The findings stem from using semi-structured interviews with scholars alongside guided interactions with digital tools to examine tool use. Qualitative methodologies provide space to listen to participants' perspectives, without imposing researchers' presumptions of activities, a benefit when exploring emergent topics such as CIS and other collaborative information behaviour activities. The results are examined using a critical theory lens to make sense of the data, questioning common assumptions and examining not only what exists within the dataset and the larger field of study, but also what is missing. For example, where participants do not engage in particular information activities, or do not use particular technologies, these data also provide valuable findings that enhance understanding of scholars' collaborative research practices. Lastly, the participants in this research come from an under-studied group, as much of the current CIS research focuses on business, healthcare, and STEM (science, technology, engineering, and medicine) disciplines. This study explored the collaborative activities of scholars' working in the digital humanities; these scholars are typically trained in traditional humanities disciplines (such as English, philosophy or linguistics), with a decidedly computational focus to their work. As different disciplinary traditions have varied ways of working (and as the humanities and computing disciplines are often quite different in their approaches to solo versus team-based research), this exploratory project presents a unique set of data that extends current understandings of CIS in research contexts.

In addition to these contributions, this chapter also discusses the idea of what we have termed "parallel work" as a way that collaborative teams may function, in reality. Although innovative systems are now being designed and tested for their support of enhanced collaborative information searching (e.g., Shah 2013; González-Ibáñez et al. 2013; Morris and Horvitz 2007), such systems (and labbased testing environments) may presume that users are collocated, or working together in 'real time,' or engaging in other collaborative practices that are quite different from what scholars do, in practice, in research collaborations. Where the term collaboration may presume a true partnership, with joint decision-making and shared activities informing research practice, our data show a parallel work structure, where individuals engage in solo work, in parallel, to their colleagues while members of collaborative teams. This concept is informed by the concept of "parallel play" (from the theory of social play in developmental psychology) and is used in our analysis to describe a particular way of interacting with others in a team. The findings of the research have important implications for how collaborative information seeking is studied, how it is theorised, and for understanding how an under-studied group approaches collaborative projects. The findings may also inform the design and testing of tools designed, specifically, for collaborative information searching activities, given the context of scholars' research practices and general information activities.

8.2 Literature Review

Universities, granting agencies, and researchers have embraced collaborative research designs. This has evolved, in part, as a response to government and institutional pressures: (1) to maximise efficiency of research dollars by aligning expert knowledge and resources; and, (2) to ensure that publicly-funded research has tangible, transparent outcomes that benefit society (see Labi 2012; McCabe 2012). Research granting agencies worldwide promote interdisciplinary research, with collaboration posited as beneficial for complex research problems (e.g., Williford and Henry 2012). While universities support researchers engaging in collaborative work, the increased focus on outcomes can mean that fostering the 'soft' skills (e.g., effective teamwork) may be overlooked (McCabe 2012). Collaboration is a complex activity not easily described or understood. Although there is a long history of teambased research in many disciplines the small body of existing research (e.g., Dixon and Sharp 2007; Cummings and Kiesler 2005) points to key issues that adversely affect successful collaborations:

1. The enduring strength of disciplinary 'silos' (e.g., research contexts, training) that shape researchers' work;

- 2. The continuing quantitative vs. qualitative 'divide' in many disciplines, despite an interest in mixed methods;
- 3. Few studies on librarians' and administrators' practices in shaping the collaborative research enterprise; and,
- 4. Few studies on research practice, particularly in terms of technology use to facilitate team-based research.

The next section examines several areas that have not yet been explored in current research into collaboration.

8.2.1 Gaps in Current Research on Collaboration

Despite the current interest in collaboration and the work done by many researchers, there is generally a lack of critical analysis of the topic. Many studies, for example, lack clear definitions of collaboration or do not fully explain the purpose of collaboration, what collaboration accomplishes, and whether collaboration is a worthwhile venture. The literature in public administration provides useful guidance from a management perspective, having looked critically at collaboration in the workplace. Within this body of research limitations have been noted: failing to define collaboration (Thomson et al. 2007; Wood and Gray 1991); collapsing all forms of teamwork under the umbrella term 'collaboration;' and, portraying collaboration as a panacea for workplace engagement strategies (O'Flynn 2009). As O'Flynn (2009) notes, in failing to examine what collaboration is or what it means to do collaborative work, "suddenly everything is collaborative" (p. 112). This lack of critical examination of the concept, including its broader contexts and individuals' perceptions of the experience of collaborating with others, exists in many disciplines and hinders research in those fields.

In reviewing the IS literature a similar problem emerges with the lack of a coherent definition of collaboration. While terms such as collaborative information seeking, collaborative information behaviour, and collaborative information retrieval are discussed and defined (e.g., Foster 2006; Hansen and Järvelin 2005; Hertzum 2008; Karunakaran et al. 2013), many authors fail to first define the concept of collaboration itself. At other times, collaboration has been simply defined as working together (e.g., Evans and Chi 2010). This may indicate that authors believe the definition of collaboration is self-evident or straightforward. However, our research demonstrates the complex contexts that can inform and shape people's collaborative activities.

In addition to a lack of critical examination, there are aspects of collaboration that are not addressed in the literature; overall, there is little empirical research into how people seek information collaboratively. Many of the articles on the topic of collaboration present descriptions of collaborative research projects (e.g., Bindler et al. 2012; Biocca and Biocca 2002), rather than research into and/or theorising about collaboration and the implications for information seeking. Also absent in the

literature is evidence of how collaboration is integrated into best (work) practices for engaging in information seeking or other information behaviours within a collaborative environment. Another gap in the current research is an examination of collaboration within different disciplines, with implications for information seeking. Sonnenwald (2007) notes that with a longer history of collaboration there is more research on collaboration in the natural sciences than in other disciplines. This point is particularly salient for the humanities, which has a long history of solo approaches to research, leaving collaborations in those disciplines unexamined in any depth. Scholars working in digital humanities, for example, may then have few models within their traditional academic specialisations to guide successful team-based practices, as might be the case for their colleagues in computing science or other disciplines. These deficits in the current literature signal that research into collaboration – including the implications for information seeking and use – is still an emergent area of study and requires further investigation across disciplines and contexts.

8.2.2 Principles of Collaboration and Information Seeking

Despite these gaps in the research, there has been a great deal of work done on collaboration within the field of IS in the last decade. Researchers such as Shah (2010), Hansen and Järvelin (2005), Reddy and Jansen (2008), Hertzum (2008), Haythornthwaite (2006), and Hyldegård (2006) have examined topics such as collaborative information behaviour, information seeking, and information retrieval. Of particular interest, Shah (2010), in reviewing the literature on collaborative information seeking, defines collaboration as "a process involving various individuals who may see different aspects of a problem. They engage in a process that goes beyond their own individual expertise and vision to complete a task or project" (p. 6). Shah's model outlines the necessary components of collaboration: communication, contribution, coordination and cooperation. That the creation of a solution is more than the sum of the contribution of its members differentiates collaboration from coordination (i.e., "a process of connecting different agents together for a harmonious action") and cooperation (i.e., "a relationship in which different people with similar interests take part in planning activities, negotiating roles, and sharing resources to achieve joint goals") (pp. 5-6). Beyond looking for information, CIS combines information seeking and actively constructing a shared understanding of available information, in which knowledge is embedded in cooperative work arrangements (Hertzum 2008).

While no one definition of collaboration may exist, there are many similarities in the identified practices that can lead to successful collaborative endeavours. In examining some of the literature in IS and public administration (e.g., Denning and Yaholkovsky 2008; Hafernik et al. 1997; Periyakoil 2008; Pushor 2008; Thomson and Perry 2006; Thomson et al. 2007; Shah 2010; Wood and Gray 1991), themes of relationship building, shared aims, interactivity, clearly delineated governance, and work practices emerge. These publications note, for example, the importance of trust, rapport, and communication in developing productive relationships, the need for shared decision-making, and the value of synchronous, coordinated work for developing successful partnerships. The focus of much of this literature is on building and maintaining relationships.

8.2.3 Collaborative Information Behaviour: Needs, Seeking, Sharing and Use

Ellis' (1993) model of information seeking – which includes the six behavioural categories of starting, chaining, browsing, differentiating, monitoring, and extracting – is used as the basis for much subsequent research into academics' information work. However, subsequent models have included collaboration. Brown's (2002) model includes collaboration at different stages such as idea generation and background work. Palmer et al.'s (2009) model includes collaboration as a core scholarly activity in its own right that involves coordination, networking, and consultation.

Individual and situational aspects can trigger collaborative information behaviour, such as complex information needs, fragmented information sources, lack of domain expertise, and lack of immediate access to information (Reddy and Jansen 2008). It can occur at different levels of the process, such as formulating a query, obtaining results, and organizing and using results (Shah 2010). At different points within the project, group members will change the amount of collaboration, typically beginning more collaboratively and then moving to more individualistic searching (Hyldegård and Ingwersen 2007). Specific circumstances can trigger collaborative information seeking, (e.g., a breakdown in the flow of information), as well as the types of information sources (e.g., when rushed, team members will turn to their collaborators as informal information sources) (Reddy and Spence 2008). The physical location of team members can also affect collaborative information seeking; being collocated encourages more interaction and assessment of the work being done, while working in different locations leads to covering more information and using more diverse information searching strategies (Shah and Gonzalez-Ibanez 2012).

Information sharing is another key aspect of collaborative information behaviour, and includes various types: strategic sharing (purpose driven, to maximise efficiency); paradigmatic sharing (to establish a novel research approach or area); directive sharing (two-way exchange between teachers and students); social sharing (relationship building); and, no sharing (unique projects that cannot be aided by the community) (Talja 2002). When sharing results of collaborative searching, researchers rarely share raw results but instead share information that has been grouped and often annotated, with note taking playing a key role in synthesizing information and preparing it for others (Capra et al. 2010). An interspersed approach to information exchange that needs to take place during continuous and shared tasks is the best way to share information (Sonnenwald and Pierce 2000).

8.2.4 The (Digital) Humanities

The humanities have received little attention from researchers investigating collaboration, to date. Traditionally, humanities scholars have been depicted as working independently and with information behaviours that are shaped by this 'solo' approach to their work (e.g. Stone 1982; Watson-Boone 1994). Many studies examine humanities scholars' information activities (e.g., Baruchson-Arbib and Bronstein 2007; Ellis and Oldman 2005; Stone 1982; Watson-Boone 1994), but few explore their collaborative activities. Research on collaboration, generally, demonstrates that changes in information practices do emerge from collaborative tasks, such as sharing information (Haythornthwaite et al. 2006). However, these changes are not adequately addressed in the IS literature; little is known about how scholars' information seeking activities change with collaborator involvement. Information seeking can become increasingly important (and challenging) when taking into consideration diverse information needs, multiple perspectives, and how to manage the information retrieved. As humanities work often involves researchers' reflections on and engagement with texts (which, unlike bench science, may require little physical or equipment infrastructure), research on humanities scholars' collaborative activities has developed more slowly. Stone (1982) predicted that humanities scholars would continue to work alone into the foreseeable future, despite the addition of important technologies such as computers. More than 30 years later, technology has changed the way humanities scholars communicate and share information (Baruchson-Arbib and Bronstein 2007; Brown 2002); however, many continue to work as solo scholars, tending not to collaborate on research with colleagues or students (Toms and O'Brien 2008). Many humanities scholars state a desire to work with others; however, most work alone and many do not discuss their work either before submitting it or when it is in its early stages (Toms and O'Brien 2008). This desire to work with others may be demonstrative of a shift towards collaboration in the humanities.

Distinct from other humanities disciplines, the field of digital humanities is often seen as inherently collaborative, where formerly 'solo' humanities scholars now work in computing teams. Many of these scholars work with large corpora of texts, much of which must be digitised prior to analysis, resulting in collaborative efforts by large (often international) research teams. Many digital humanists also work in digital tool development, which may involve multidisciplinary collaborators with specialised expertise (e.g., graphic designers, computer programmers). Few studies have explored the impact of team-based research on humanities scholars' work, with little data addressing the implications for research-related information behaviours. This chapter presents research findings exploring digital humanities scholars' collaborative research practices, providing valuable insight into how best to support these researchers' information behaviours, including their seeking activities.

8.3 Theoretical Framework

This chapter has emerged from a larger project that explored the information activities of digital humanities academics. Specifically, the broader study addressed the research questions: (1) How do scholars characterise the collaborative nature of their work?; (2) What are the processes involved in carrying out that work, including implications for information behaviour of academics?; and, (3) How does technology facilitate or hinder collaborative work processes? In academics discussions of the use of technology, their academic information needs, and other issues related to their work, a theme emerged related to collaborative versus individual ways of working and the role of technology in enabling that work. This paper examines the nature of these work activities, using the concept of "parallel play" as an exploratory concept for modelling digital humanities scholars' collaborative information activities. In analysing the data the following questions guided our analysis: (1) How does technology help or hinder academics' work?; (2) How do academics work alone and/or with others?; and, (3) How can the concept of "parallel play" help us to understand their work? In addition to parallel play, the analysis employed critical theory as a way to critically examine the role of technology. Within IS, technology is often under-theorised, focusing on functionality, look, and popularity, rather than critically examining what the systems and sources do (Leckie and Buschman 2010). Many researchers have called for a more extensive use of theory in studies of technology (e.g., Andersen 2005; Benoit 2002, 2007). As Andersen (2005) notes, the "technical and managerial nature of the prevailing LIS discourse" prevents those in the field from examining the role of information systems, their functionality or legitimacy (p. 15). Further, he states that "technical and managerial language often stands in opposition to basic human needs, and is more concerned with how to do things rather than describe and critically discuss how these things (i.e. knowledge organization systems) work or do not" (Andersen 2005, p. 21).

A central goal of this research study, then, was to turn a critical lens on the role of technology in digital humanities scholars' collaborative research – and information seeking – experiences. The theoretical framework used in this study allowed us to question the role of information systems in supporting researchers' (collaborative) information seeking activities, including how collaboration was enacted in the information behaviours of individuals and groups. This critical stance is useful in understanding how these discourses inform individuals' actions, with a particular focus on scholars' information work. By examining the narratives that scholars provide about their research and their workflow, this chapter presents data on the ways digital humanities scholars work with others, and whether their collaborative work is truly "collaborative" in nature. The next section outlines the goals of the project, overall, as well as the methods of study.

8.4 Research Design

This research explored the types of information that humanities scholars seek and use for research purposes, as well as the role of digital resources in supporting research activities and information behaviours. In-depth, semi-structured qualitative interviews were conducted over Skype to explore digital humanities scholars' research-related information behaviours, using a grounded theory approach to explore emergent themes (e.g., Charmaz 2001; Glaser 1992). As discussed by Charmaz and Bryant (2008), grounded theory is a "method of qualitative inquiry and the products of that inquiry... As such, the grounded theory method consists of a set of systematic, but flexible, guidelines for conducting inductive qualitative inquiry aimed toward theory construction" (p. 375). A follow-up interview was conducted with the majority of participants two years later. During the interviews, participants also engaged with various text-analysis tools (such as the word cloud tool Cirrus and the concordance tool List Words); participants shared their screens with the interviewer over Skype, which were captured using Camtasia software. With a text of their choosing, participants were guided through interactions with a set of tools using a verbal analysis protocol (e.g., Guha and Saraf 2005). Participants were asked to demonstrate how they would typically use the tool using a think-aloud protocol and asked questions about the tools such as features they liked, usefulness of the tool, and ways the tool could be improved. These guided interactions provided a context-rich exploration of participants' opinions as they demonstrated their use of particular digital tools.

The study included 20 scholars (five graduate students and 15 university faculty) from the digital humanities, working in five countries (Canada, the United Kingdom, Ireland, Germany, and the United States). Participants were recruited through listservs, professional associations, and through professional networks. Interviewees ranged from novice to expert users of text analysis tools, including some tool developers. Nine female and 11 male interviewees were identified using purposive, maximum variation sampling, resulting in a group of scholars at various stages of career, at various ages (from 24 to 66 years) and working across many humanities disciplines (e.g., English, linguistics, languages). In total, 14 participants (70 %) participated in the follow-up interview. Participants were assigned pseudonyms to anonymise their contributions in discussions of the results. Ethics approval for the study was obtained from the University of Alberta and Charles Sturt University.

Interview recordings were transcribed and qualitative data analysis software (ATLAS.ti) was used to code the transcripts for emergent themes. Qualitative analysis involved a constant comparative method of thematic coding (in keeping with the grounded theory methodology study design) where codes are used to "compare, sort, and synthesise large amounts of data" (Charmaz and Bryant 2008, p. 376). Analytic memos were developed throughout the coding process, which followed a two-stage process of initial/general coding followed by in-depth/focused coding. In focused coding, "the researcher uses the most frequently appearing initial codes to sort, synthesise and conceptualise large amounts of data" (Charmaz 2001,

p. 684). This iterative process continued to the point of saturation of themes across all transcripts. As themes emerged, they were also examined through a series of theoretical lenses drawn from the extant literature (e.g., Xu's 2010 concept of 'parallel play'), generating a theory of collaborative information use within the research practice of humanities scholars. This analytic approach is a key part of the grounded theory methodology, where the data are analysed alongside published literature in order to generate theory about the phenomena under study (see Charmaz 2001).

The final analysis resulted in four major emergent themes (explored in the following section, on research findings): (1) Independent information seeking – a central role in collaborative research practice; (2) Technology tools – enabling and constraining collaborative information use; (3) Parallel work – individualised framing of collaborative information behaviours; (4) Deconstructing collaborative workflows – training versus teamwork; and, (5) Parallel research practice – a model for humanities scholars' collaborative information engagement. Of particular interest across all four thematic categories was the participants' *lack* of collaborative information seeking as part of their research practice; this is highlighted in a discussion on *Independent Information Seeking*, and in discussions of specific findings, in the sections that follow.

8.5 Findings and Discussion

The interview questions explored scholars' research activities, information behaviours, and digital tool use. Many scholars described the workflow of their research in detail, particularly discussing the technologies they chose (or were required) to use in their work. For the majority of digital humanities scholars, technology is an integrated part of their work, and much of the discussion of work and workflow with these scholars centred on technology. From this discussion, issues of technology affordances and how those affordances affect both independent and collaborative work arose. In addition, the data reveal interesting patterns of behaviour with respect to collaborative workflows and information sharing and use by team members.

8.5.1 Independent Information Seeking: A Central Role in Collaborative Research Practice

One of the overriding findings of the study was a lack of group-based information seeking or searching as part of scholars' research practices. Although the participants engaged in a range of collaborative information behaviours – such as sharing citations in collaborative writing, applying shared knowledge during data analysis, and discussing research activities using information technologies – there was a complete absence of group-based searching and seeking activities as part of their

collaborative research practice. Despite participants' engagement in team-based, collaborative research projects, the data demonstrate a continuing focus on independent, parallel work on the part of individual researchers. When information seeking was conducted (e.g., to locate resources, to explore new technologies), this work was conducted independently and not as part of a collaborative activity. These independent information seeking activities shape individuals' understandings of their work and of their roles in collaborative teams, as well as their uses of technologies in support of information activities. The sections that follow explore the nature of researchers' information use in the context of technology use designed to facilitate collaboration. The result is a critical take on the concept of collaboration as enacted by digital humanities scholars, with a focus on implications for a broad range of information activities.

8.5.2 Technology Tools: Enabling and Constraining Collaborative Information Use

Technology can facilitate the work of productive collaborative teams by enabling cross-boundary information use. Many of the participants' descriptions of collaboration explored how technology facilitates working together, particularly related to information sharing. Technology was a central part of the academics' discussions of collaborative workflows and research practices and was described as either enabling or constraining those practices. Overall, many of these discussions reflected on cloud-computing platforms, including Google Docs and Dropbox, as common tools that facilitate collaboration. Oliver, for example, a 34-year-old faculty member, described using cloud-computing software for graduate students and colleagues to share documents and compile information. These applications are built into the workflow of his many research projects:

Tools basically having a very concrete articulated work flow that I can share with students, if we're working on collaborative [projects together]. So...I'll use Google Docs to create and author collaborative documents. ... And the things that I find quite, actually helpful, for real collaborative work would be stuff like Google Forms. So for example I've had a group of students or colleagues that are all working on the same project and what they're gathering related materials to, I'll submit them to a form, they would then be aggregated into a spreadsheet for easy reference and exporting. That's really nice.

Kim, a 27-year-old graduate student, described a key, enabling feature of cloudcomputing software for collaborative workflow, which allowed members of her team to edit documents simultaneously:

So recently, yesterday actually, we were all just hands-on editing our proposal on Google Docs and there's a graphic designer on our team and he doesn't need to write a lot of proposals. And he was watching us like, "Are you guys all editing the same document and you can see each other's changes in real time?" And he was so mind blown! So I take that for granted, so I can see how for some people that's a really good feature.

Fredric, a 57-year-old faculty member who considers collaboration to be a regular part of his academic work, also discussed these types of collaborative platforms as regular and vital parts of his workflow:

I find particularly helpful collaborative platforms, which allow me to collaborate with colleagues in real time or non-synchronous...I find perhaps least productive also are collaborative platforms that place a particularly high demand on uses in terms of ... their learning curve. But the same goes for other applications that are non-intuitive in their use.

Although many interviewees volunteered the names of specific platforms and tools, all of the participants were asked specifically about tools they used in collaboration during the follow-up interviews. Ease of use and availability of tools intended to promote collaboration were recurring comments made about the decision to use particular platforms. These advantages have also been noted by other researchers examining tools used in collaboration; for example, Carusi and Reimer (2010) have noted that the practical utility of these tools has led to their continued use by researchers using more technologically sophisticated collaborative tools. Kim, who worked on many collaborative projects as a research assistant, highlighted the value of tools that were easily accessible to all team members:

Google Drive is a huge one, just so that we can all edit on the same document and it'd be all together and there's always an updated version. And then things like Dropbox too is a very good... shared content management system, I guess. What else has been successful? That's really it. I mean I know that we've always tried to sort of play with a project management tool but in the end, we always just go back to Google Drive because it's just right there.

Trevor, another graduate student who works as a research assistant and as a member of other research teams, also mentioned these tools:

So, yeah mainly it's Google Docs. I've noticed there's lots of tools that in theory should be really good for collaboration but it never really pans out. So Dropbox, I've used that with some teams, but not everybody uses Dropbox. Other people use Google Drive. And, yeah, then you need to figure out a whole other type of technology.

Tracy, who was a 28-year-old graduate student during the first interview and was working as a researcher at a private company at the follow-up interview, talked about Google Docs making collaboration easier:

And also at my firm now and at the [University] when I was a student, we used the Google suite of tools, so spreadsheets, scheduling – spreadsheets especially, we do a lot in Google Docs. I think in general we prefer that over Excel because so much of the work we do is collaborative, it's much easier to collaborate in Google Docs than it is in Excel.

Although Google products and Dropbox were mentioned regularly, particularly in relation to collaborative writing, information sharing and file sharing, some academics mentioned a number of system drawbacks with these tools. Interestingly, these drawbacks did not always translate into a change to other tools, particularly if one's colleagues used those platforms or if using other approaches created other problems. Faculty member Carol (aged 53) described her experience in this way:

Well I don't like Google Docs at all but it is a great way to share. It can do some really weird things sometimes but it's the primary way for me to compose with other people. And,

you know, other than emailing around Word documents, which is a versioning nightmare (which I do, too)... when I can, I use Google Drive and Google Docs.

Carol also discussed other tools she used with team members, again pointing out both the good and the bad features of these platforms:

We use Basecamp [a collaborative working platform] in my office. So Basecamp and...GitHub and we put things up on SourceForge... We do use those kinds of things to share at a higher level and to work at higher levels of collaboration....You know, my staff absolutely loves Basecamp and I just don't like it... because I feel like I spend as much time putting things into Basecamp as I could doing them, you know? And so, like especially if it's to remind myself to write an email. Well, why not just write the email, instead of writing a reminder to write the email. On the other hand, because of that attitude, you know, I see that attitude is wrong in a lot of ways because I think I've gotten to critical levels of disorganisation, you know, with the amount of stuff that I have to do, so I mean I use, you know, Google Calendar. I use things like that to remind myself of things. So, you know, and we use, I should have said we use Google Hangouts a lot to collaborate.

Sandra, a 48-year-old faculty member used Google Docs for file sharing, rather than as a collaborative platform. Here, she discusses her reasons for doing so, due to system challenges with another platform (Basecamp) imposed for use in another project:

I'm on one project that uses Basecamp, so I use it. I don't like it very much so I've not wanted to use it for my own projects. It is handy occasionally. Gone back and looked for files that we've uploaded to it, but I don't find it particularly, I don't find the interface particularly intuitive. I find it hard to locate things and it doesn't seem to me to actually offer much, like it's good, I suppose, as a systematised communication tool, if you want to be sending consistently out to a particular group of people. It manages that quite well and it keeps a centralised record, so I can see the advantages of it, but I haven't wanted to invest in it, I guess.

Carol and Sandra's reflections are interesting as they demonstrate some of the complexities of managing information within busy team environments. Managing information – including data sharing and storage – is a key factor highlighted in the literature as a fundamental part of collaborations (e.g., Jahnke et al. 2012; Lawrence 2006; Simeone et al. 2011). Staying well organised and using technology to support one's various activities are key elements of success, particularly if an imposed system does not fit with one's workflow and/or project goals. With some technologies, the affordances offered can also create more work or require a great deal of time to learn to use well. Balancing new affordances within one's personal workflow (particularly given the focus on the independent nature of information seeking activities) is a key issue for academics, particularly when those tasks and ways of working must also suit the information needs and seeking practices of other team members.

In most cases, the technology tools academics used were simple to use, readily accessible and did not require specialised training or significant time commitments to learn. Capra et al. (2010) discuss the use of "tools-at-hand" by collaborators, finding a preference for adapting old technologies to new needs rather than learning to use new technologies, despite the limitations of the old. Participants used terms

such as "intuitive" and "simple" when describing their preferred tools, noting their frustrations when less-intuitive and/or complex tools were imposed on them. When asked what collaborative tools he used, James, a 63 year-old faculty member, discussed only one tool he used with collaborators. However, the way he discussed his tool use indicated his awareness of other (more complicated) tools and his desire to stick with what worked, particularly when using a simple tool for a straightforward collaborative process.

I mean we just rely on Dropbox for it. Seems such a simple collaborative tool. But that's all I've been using. Maybe I would do better to use one of these more, one of these fancier tools with more bells and whistles but at the moment it's just the collaboration is mainly coauthoring a paper in my case, it's not developing another product. It's an academic paper, so it's just a text document for the most part and maybe some supplementary materials like spreadsheets with the data in so we can share the data. But generally it's just two or more people co-authoring a paper and just using Dropbox for that purpose seems to fit the bill.

Similarly, Sarah, a 43-year-old faculty member, wrote books with a collaborator using Dropbox and Skype. Her experience is an example of the ways that academics are active in both choosing the technologies that suit their work, integrating those tools with their independent seeking practices, and in using the technologies that are available in ways that will suit their needs.

I think [my collaborator and I are] really unusual in that regard because we actually do write together, actively. We'll have 4 hours together on Skype of actual composition. ... We started with Google Docs and it... had so many hiccups. We were constantly getting conflicted documents. So now we use Dropbox and shared folders. And that's how we've submitted the last two book manuscripts, too. So we're, yeah, we're kind of model users of Dropbox and Skype. We should have dedicated our books to Skype.

These examples are important ones, as simplicity of use and the ability to match specific tools to the team's information needs and seeking practices were recurring themes in the dataset. Although other systems may offer more "bells and whistles" (in James' words), researchers were intent on ensuring that technology use between collaborators facilitated the end goal without over-complicating the process. Choosing familiar, at-hand tools may be due to the effort required to adopt new technologies and/or collaborators' preferred tools (Capra et al. 2010). Whatever the reason, individuals adapt familiar tools and ways of working for their collaborative workflows.

Indeed, there are many personal and contextual factors that drive participants' use of information-sharing/storage platforms. Institutional support for the platform is another key issue, which can either enhance or constrain researchers' informational activities. Wade, a 61-year-old faculty member, talked, for example, about his use of Dropbox being limited by his institution:

Well, I confess I mainly use [Dropbox] because I have more than one machine and it's an easy mechanism for copying things around. I do some sharing of folders on our projects ... and since we do a lot with these collaborative projects, we do quite a bit of sharing of materials. But the College as a whole doesn't really encourage you to use Dropbox. They don't think it's secure enough. I disagree about that, so use it any way, like many of my colleagues do. But it means that we don't use it officially in projects very much.

Oliver, on the other hand, discussed his decision to ban Dropbox from the lab because of individuals' misuse of the platform. He notes:

[We had to ban it] because what people were doing, they'd have their own accounts and then they would sync them with lab computers and then all of a sudden the lab stuff was all over the place and it was really confusing. And then there's, you know, a lot of stuff about international storage and where things are going and some kind of iffy Dropbox policies around that.

Those working in collaborations must decide on the shared technology they will use. However, there are often added restrictions on that technology. Institutional constraints and rules about technology use (including what will or will not be supported by a university's information technology support team) also affect researchers' abilities to work seamlessly in collaborative teams. Where institutional policies clash with desired workflows, especially when researchers are trying to collaborate across institutions, researchers may need to work around existing systems (e.g., using unaffiliated products, such as Dropbox) or find other ways to ensure that technology supports their work (e.g., developing their own tools) (Carusi and Reimer 2010). Where institutions try to limit use or impose restrictions on the use of such products, they may introduce other challenges (e.g., making it more difficult to share files across institutions). Understanding how individuals engage with technology, both in terms of what supports the teams' work and what hinders it, is a key issue for system providers and support staff.

In analysing participants' discussions of technology use the literature on best practices in collaborative work was also explored (Denning and Yaholkovsky 2008; Hafernik et al. 1997; Periyakoil 2008; Pushor 2008; Thomson and Perry 2006; Thomson et al. 2007; Shah 2010; Wood and Gray 1991). Interestingly, the data reveal only partial evidence of the best practices presented in the literature. For example, the literature states that before collaborative research is undertaken clearly defined roles, responsibilities, and ways of working should be established based on expertise and resources. While Oliver noted the existence of "a very concrete articulated work flow" for some collaborators, much of the work participants described was done in ad hoc ways. As collaborators worked together, they determined who would take on particular tasks and how they would accomplish the work. The literature also notes that collaboration involves synchronous, coordinated work that is based on a shared purpose. Interestingly, very few participants mentioned synchronous, coordinated work when describing their collaborative activities. As mentioned previously, this included information seeking and searching tasks. Rather, individuals tended to act independently, making choices that suited them personally with respect to when and how to seek and share information, or what technologies might enhance their personal workflow. This finding was analysed in depth using "parallel play" (from developmental psychology) as a lens to explore the meaning behind this type of collaboration. The resulting theme (what we have labelled "parallel work") provides deeper insight into the complex behaviour in collaborative research, which shapes individuals' information activities, including their independent information seeking practices.

8.5.3 Parallel Work: Individualised Framing of Collaborative Information Behaviours

Throughout the interviews, participants described themselves as working on a "section" of a larger research project; they positioned themselves as working separately from their colleagues, who were similarly engaged in their own, individualised activities. This extended to information seeking activities, which were conducted independently and not as part of a collaborative activity. One of the most common images of collaborative research that emerged in these interviews was that of a series of silos, with each researcher working independently, while linked by technological tools for information sharing. Although almost all participants described themselves as members of collaborative teams who engaged in collaborative research goals), their discussions of their actual workflows revealed a great deal of solitude, independent work and (at times) isolation. Although information was shared among team members, decisions about what information to seek – as well as where and how to find it – remained an individualistic activity.

In the research literature, collaboration is often conceptualised as working together at all stages of a project, from planning, designing, implementing and analysing, to writing and publishing (e.g., Kimiloglu 2012; Thomson and Perry 2006; Wood and Gray 1991). However, when participants talked about their work a number of fissures emerged in this vision of collaboration. The work described by participants in this project falls on a spectrum between fully integrated collaborative research practices and fully individualised, solo research. Just as Shah (2010) differentiated between collaboration and cooperation, our data provide evidence of researchers who engage in "parallel work" that, effectively, embeds individualised information seeking within a collaborative veil of activity. When viewed in this way it is not surprising that so many scholars preferred the use of Dropbox to share information, for example, to an integrated system designed to support collaborative work (such as Basecamp). For individuals who are effectively working as solo scholars within a collaborative framework, technological tools that allow them to control information flow and information sharing (e.g., uploading files only when they are ready to share with others) may be preferred. Understanding the complexities of researchers' relationships within team environments can help us to understand what information systems can best support the range of activities in which humanities scholars engage.

The concept of "parallel work" is derived from "parallel play," coined by developmental psychologist Mildred Parten in the 1930s as one element of her theory of children's social play. There are three categories of social play, which become progressively more social: non-social activities (unoccupied behaviour, solitary play, and onlooker behaviour); parallel play; and, social play (associative and cooperative play) (Xu 2010). In associative play, children engage in activities but interact with each other about the activity; in cooperative play, children work together towards a common goal (Parten 1932). In parallel play:

The child plays independently, but the activity he chooses naturally brings him among other children. He plays with toys that are like those which the children around him are using, but he plays with the toy as he sees fit, and does not try to influence or modify the activity of the children near him. He plays beside rather than with the other children. There is no attempt to control the coming or going of children in the group. (Parten 1932, p. 250)

Parallel play, used to describe "playing beside rather than playing with," has been used as a metaphor in several articles that refer to the siloed working practices of researchers. The metaphor of "parallel play" has been used to describe academic and professional interactions (Clark 1999; Kinnaman and Bleich 2004; Seifer and Connors 1997; Warner and Burton 2009; White and Henry 1999), multidisciplinarity versus interdisciplinarity research (Acitelli 1995; Delcambre and Giuliano 2005), research collaboration within a field (Blomgren Bingham and O'Leary 2006; O'Flynn 2009), research in related fields (Conrad 1997), and teamwork (Periyakoil 2008). However, only one previous study, by Robinson and Gaddis (2012), has provided empirical data to determine whether the concept of parallel play was indicative of work practices. This article surveyed schools to determine their level of collaboration with other agencies after Hurricane Katrina in the United States.

The humanities scholars interviewed in this study demonstrated this type of parallel activity when discussing their information seeking activities. Some academics positioned themselves, their research, their workflows, and their information activities as entirely independent and non-social, even when members of a collaborative team. Tracy, a 28-year-old graduate student, discussed engaging in collaborative information activities only at the point of analysis; here, the group would take data gathered independently, break it down together, and start building the analysis as a group.

So, I mean, to do primary research we use cameras, video cameras, take notes. And then when we get back to analyse what we've seen, mostly it's pen and paper or whiteboard, so it's usually group work where we kind of pull it apart together. A lot of post-it notes.

Kim, a 27 year-old graduate student, discussed a collaborative project for which she is a research assistant. There were multiple people on the project and they each took different, individual roles in the creation of a game for smart phones.

Okay, so I'm on two different types or research projects... and we're doing video games and human interaction with video games. So for myself, I'm more on the building process, so I'm working... to develop a smart phone game for them.

At times during the interviews it was difficult to identify whether the work described was solo or team-based work, as participants slipped in and out of using "I" and "we" to describe the project actors. Some academics engaged in collaborative projects in addition to solo projects, with clear identification of the concept of "my work" within the larger team environment. This type of independent work within a team setting mirrors Partens' theory of social play and can be labelled appropriately as "parallel work". Here, research was done simultaneously and in isolation from other members of the research team. Carol's interview transcript regularly slips between "I" and "we" in describing her activities. Within these few

sentences, she talks about the new tools being created in the research as "her" work but in categorising them, states what the group is naming them. She positions this work as her own, but acknowledges her work as part of a project that also belongs to other people.

Yes, I'm building some visualisation tools. I'm building a way to visualise the relationships between people in letters. We're calling it a prosopography tool. And also a poetry visualisation tool that will allow us to visualise metaphors as well as meter.

Similarly Caroline, a 39 year-old faculty member, clearly talks about the tool she demonstrates as a tool she has developed with others. However, in describing the genesis of the tool and determining its usefulness, she positions the tool as her own intellectual property, taking responsibility for it.

So this tool that we're developing looks at the sound of text. So, what we have here is, [demonstrates how the tool works] \dots I don't know, we're still trying, so my job is to kind of figure out \dots so I came up with this idea and worked with people to make it happen and now I actually have to figure out if it tells me anything about this text.

George, a 62 year-old faculty member described using a tool in a project looking at word frequency in different authors' works. While he acknowledged working with a colleague on the project, he made it clear that the spreadsheet written to do the analysis was his own design:

Here's a tool that I use quite often which is an Excel spreadsheet that I've written myself. So it's a very large, roughly 50 MB spreadsheet. With nasty – nasty in a sense of not being fun to write – nasty visual basic that do the analysis. So this particular tool is a tool that is used for figuring out what the characteristic vocabulary is of one or more writers. In this particular case I've got two Russian writers. I was working on a project with a librarian and we were trying to see whether we could come up with the words that are used more frequently by [Russian Writer A] and by [Russian Writer B].

8.5.4 Deconstructing Collaborative Workflows: Training Versus Teamwork

This mixing of the "I" and the "we" in scholars' discussions of their work is symptomatic of a deeper issue at play in humanities scholars' collaborative activities. Given that the current literature in IS defines collaboration as involving people working together, "creating a solution or a product that is more than the sum of each participant's contribution" (Shah 2010, p. 6) and includes interaction, intent, trust, human involvement, and a symmetry of benefits (Shah 2010), one would expect to see these traits in humanities scholars' discussions of collaborative activities. Beyond simply being a part of a project or talking with colleagues about work, collaborative workflow demands the inclusion of others in some aspects of the day-to-day work in research (including information seeking activities), by sharing ideas and goals as part of that work. However, this orientation to collaboration is at odds with humanities scholars' education and training practices as graduate students. James, for example, talked about the individualistic nature of his doctoral training and the fact that he has had to break from disciplinary traditions to work collaboratively. He notes:

On the majority of projects I'll collaborate. I look back on my whole career. I was never trained to do research collaboratively, you know. It was a big thing, it was important, it was a core value in my training *not* to rely on others, to develop the skills in yourself. And your dissertation was something you as a single author wrote and you were evaluated on that and that set the model for your, you know, academic career, you were going to publish stuff by yourself. That was my training in linguistics.

Like James, many participants described the nature of their academic work as requiring solo work, even when working within collaborative teams. Often these scholars discussed their very particular ways of working, which had been honed over time as academics, or of specific pressures in the discipline to demonstrate independent activity. Often these ways of working included specific uses of the technological tools they described or the information sharing activities in which they engaged. Trevor, a 24 year-old graduate student, discussed the hardware he used to establish a workflow that meets his needs. He discussed personal preferences and how he is actively working towards creating a virtual environment to enhance his personal workflow:

I have my work computer and, you know, my home computer. I have my Android phone, my Android tablet. I don't like moving stuff around I don't like having a flash drive. So one trend I'm seeing that I'm still picking up is working on a server remotely. I'm used to having my own work resources on my computer in my own little environment and I'm still getting used to the idea of working on a Unix terminal, plugged into a server, but that's where I see more of my work going in the future since lots of my work is moving there.

Matthew, a 42 year-old faculty member, discussed his development of text analysis tools. Despite knowing about various external tools, he preferred to build tools for his own individual, personalised needs as a way to accomplish the analysis of the text at hand while also creating something new to contribute to the knowledge base of the field.

As an academic...there's pressure to do something new and do something, whatever, especially in text analysis. And so I find myself rolling my own tools more often than not. Although I do use things like, you know, statistical packages like R, which obviously I did not write...So I'd be much more likely to use some kind of framework than to use someone else's tool, however good it might be, just because there's, you know, the sense that well, I have to do something different. Right?

This drive, to create something new while working independently, shapes much of the work in which humanities scholars engage, even while embracing teambased research. Although some research projects remain entirely solo in focus, collaborative team members are also finding unique ways to find solitude within team-based environments. Although some may argue that this type of work does not meet the ideal for collaborative research practices – including information seeking activities – it is important to understand the broader context (including disciplinary tradition) than can shape individual scholars' choices about workflow, technological tools and information seeking, sharing and use. In order to design information systems that support researchers' varied needs – whether working as soloists, in parallel, or in fully collaborative modes – those systems must address these types of individualised preferences.

8.5.5 Parallel Research Practice: A Model for Humanities Scholars' Collaborative Information Engagement

In examining the workflows and practices described by participants – i.e., collaborative, parallel, and solo – all of these could be likened to Parten's concept of social play. Research practice can exist on a spectrum from more to less social, with implications for information seeking and use in collaborative team environments. A Spectrum of Research Practices mapped against Parten's spectrum of social play, would look like this (Fig. 8.1).

Here, non-social research practice (i.e., activities requiring predominantly solo activities with little to no social engagement) would map against the 'solo' researcher's experience. The spectrum becomes increasingly social, with teambased research practices requiring a high level of social engagement. The data in our study (labelled as "parallel research practice") sit towards the non-social end of the spectrum.

The nature of humanities research means that these scholars may always retain elements of parallel research practices even within successful team-based collaborations. In effect, the nature of their disciplinary work is such that even if they can model scientific teams in many of their collaborative practices, they may never fit neatly onto that end of the research spectrum. In the humanities, individual researcher autonomy is not a negative attribute; it is actually an important part of a successful collaboration experience, ensuring that team members achieve their individualised goals while supporting their team members' activities. Even though the research on collaboration may privilege the social aspects of research practice, heralding the benefits of teamwork over solo work, the nature of humanities research requires scholars to retain some level of individualised practice, particularly around



Fig. 8.1 Spectrum of research practices

information seeking activities. The work of humanities scholars (as well as many social scientists) is very different from that of science researchers, particularly those working in laboratories. The presumption of a collaborative model that pulls these scholars away from their solo worlds is not an appropriate construction, as demonstrated by the data gathered in this study. Although the nature of science scholarship is necessarily interconnected and reliant on others' abilities to engage in "social" play/work, humanities scholars can – and do – work independently. The push towards more collaborative research, internationally, means that more and more scholars are engaging in collaborative teams (e.g., Lariviere et al. 2006); however, that does not mean that all disciplines are abandoning the successful solo models on which they were founded. Rather, these scholars are embracing new ways of working; they are using technology to support and enhance their work and to engage with their colleagues in productive ways, while retaining the individualised nature of their disciplinary work.

The Parallel Research Practice (PRP) Model (see Fig. 8.2) is proposed as a way of documenting the research space in which digital humanities scholars work. The PRP boundary is fluid and will reshape with the evolution of research collaboration relationships. Where "best practices" are evident, the boundaries will expand, grow and overlap with colleagues' own space within the PRP. Where "best practices" are not evident, or where these break down over time, the boundaries will retract, restrict and shrink; here, individual scholars pull back into their own, personal PRP spaces – i.e., where individuals or small groups within the team cocoon themselves into their own work. From the outside, then, even where collaborative best practices are not evident, teams may still be very productive (e.g., they may publish papers, they may apply for and obtain additional grants). However, this production may be the result of solo or small sub-teams, only. Similarly, technology can enhance the work that



Fig. 8.2 Parallel Research Practice model

happens within each researcher's own PRP space – even when relationships are not conducive to collaborative work (e.g., by giving access to materials or allow solo activities to be completed more efficiently). However, where collaborative best practices are not in evidence, technology cannot repair relationships, nor can it replace trust, governance models, or other elements of successful research activities.

8.6 Conclusions

There are several conclusions that can be made from the current study. Firstly, a holistic approach needs to be taken when examining CIS, scrutinising the larger context of collaborative information behaviour rather than focusing solely on information 'seeking' or 'searching' activities. Focusing on particular systems or projects also fails to look critically at collaborative research practices or take into account the variety of ways in which individuals work. An open, holistic viewpoint is important particularly when researching in a developing field. Secondly, qualitative methodologies are a beneficial way to explore what people do in their collaborative work, as well as how they think about it. Focusing on in-depth interviewing and hands-on tool use can bring to light individuals' experiences and conceptualisations of work that would otherwise remain obscure. In that vein, using the concept of parallel play, or other theoretical elements, can provide critical lenses through which to further interrogate what is missing in our understanding of collaboration, how technology and workflows affect collaboration, and how we focus on users, rather than systems. For example, applying Fayard and Week's (2014) innovative approach linking affordance theory to Bourdieu's habitus, would allow for additional explorations of key issues of technology use and research practice raised by scholars in this study. Lastly, it is important to examine collaborative information seeking, sharing and use in research activities across a variety of disciplines. While fields in the humanities have traditionally been more independent, there is an increasing amount of collaborative work. Different training and disciplinary traditions have important implications for collaborative information work - including information seeking practices – and how systems need to be designed to support that work.

From the data, there are several implications that can be drawn. The types of tools academics use in their work enable or constrain their collaborative information use. And while academics are active in selecting the tools they use, tools that are readily available and used by collaborators influence tool selection. Even for those who have a high level of technological ability, free, easy-to-use, and readily available technologies are used in collaborative work. Academics develop workflows and ways of working, both with technology and with others. If a technology is not readily available and easy to use, academics will not use the tools. This impacts strategies for collaborative information seeking and sharing.

Many scholars in the digital humanities work collaboratively. However, most scholars still work on projects or parts of projects on their own, including while seeking information for their research. Their training is typically as solo researchers and this training to work independently can shape how humanities scholars work, what technological tools they use, and how they seek, use, and share information. Parallel Research Practice is a useful concept to understand how many digital humanities scholars work in collaborative teams, working independently while in a collaborative environment. Information systems designed to support the variety of ways in which research work must take into account the spectrum of social research practices.

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