Research Collaboration as "Layers of Engagement": INKE in Year Four

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Abstract
Many academic teams and granting agencies undergo a process of reflection at a project's completion to understand lessons learned and develop best practice guidelines. These reviews focus on the actual research work accomplished with little discussion of the relationships and processes involved. As a result, some hard-earned lessons are forgotten or minimized. To address, the Implementing New Knowledge Environments (INKE) project provides an opportunity to explore the changing nature of collaboration over a long-term project's life. Now at the fourth year, team members reflect on the deepening and strengthening collaboration, with layers of engagement between the various individuals and sub-research areas, which has translated into productivity and external validation of the collaboration and its work. The article concludes with recommendations for other teams.

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Introduction

Along with those in the sciences and social sciences, humanities researchers are turning to collaborations to explore increasingly complex questions and implement new types of methodologies (Newell & Swan, 2000; Schreibman, Siemens, & Unsworth, 2004). Granting agencies are supporting this trend with specific programs focused on highly collaborative research, including Digging into Data (2013), Partnership Grants (SSHRC, 2013), and many others. While researchers and other associated team members welcome these collaborations as a way to undertake projects that would not be possible otherwise (Siemens & Burr, 2013; Siemens, Cunningham, Duff, & Warwick, 2011), work still needs to be done to prepare individuals for working within a team where interdependent tasks must be coordinated, knowledge and progress communicated, and an overall research vision must be accepted and enacted (Hara, Solomon, Kim, & Sonnenwald, 2003; Lawrence, 2006; Newell & Swan, 2000).

To this end, in a variety of forms, teams are formally reflecting on their experiences and articulating smart practices for consideration (see Bracken & Oughton, 2006; Bryan, Negretti, Christensen, & Stokes, 2002; Dombrowski, 2013; Kishchuk, 2005; Trnka, 2008; Williford & Henry, 2012; Yu, Lau, & Lee, 2012). This knowledge is supplemented by research studies that explore the experiences of various collaborations (Cramton & Webber, 2005; Diercks-O'Brien & Sharratt, 2002; Hagstrom, 1964; Kishchuk, 2005), and bibliometric studies that measure co-authorship as a sign of collaboration (Melin, 2000; Nyhan, 2013; Pao, 1992; Ponomariov & Boardman, 2010). However, much of this work occurs after project completion, which may mean some learnings have been minimized, forgotten, or not even captured. As part of a larger study that focuses on the lived experiences of a long-term project, this article contributes to this discussion with a focus on an exploration of a mature and effective collaboration, as measured by productivity, positive relationships between team members, and outside validation. It also builds upon earlier reflections (Siemens & INKE Research Group, 2010a, 2010b, 2011, 2012b, 2012c, 2013b).

The article is structured as follows: first, the literature on academic research teams with a focus on characteristics of mature collaborations will be outlined. Next, the case study is described and findings from interviews with team members are reported. The article concludes with recommendations for other research teams.

Context

Research collaborations, especially those involving more than one discipline, are intensive to establish and support (Hall, Stokols, Moser, Taylor, Thornquist, Nebeling, Ehret, Barnett, McTiernan, Berger, Goran, & Jeffrey, 2008). Of particular note is the time and energy required to create, support, and sustain a shared research vision and methodology across the involved disciplines, and perspective over the life of the project (Melin, 2000; Pennington, 2011a). But how does this occur? What are necessary tasks at each stage of a collaboration that ensures productive work relationships? As Amabile and her co-authors (2001) argue, it is necessary to understand the nature of collaboration within academic teams and determine the factors that contribute to its success while minimizing potential difficulties.

As seen in Figure 1, research collaboration undergoes certain stages with specific relationship- and task-oriented steps that must be accomplished at each stage (Kraut, Galegher, & Egido, 1987; Lowry, Curtis, & Lowry, 2004). During the first stage, at the relationship level, a team in formation focuses on finding partners and developing the shared mental model of the research project, along with establishing appropriate research methodologies and the division of academic credit. This process often involves balancing the various disciplinary perspectives. At the same time, the emergent team must also negotiate tasks, budgets, and timelines (Bennett & Kidwell, 2001; Birnbaum, 1979; Bruhn, 2000; Fennel & Sandefur, 1983; Hara et al., 2003; Lawrence, 2006). This process ultimately takes time and energy and may (or may not) result in a grant application (Pennington, 2011b; Siemens, 2010a). Once a team is successful in securing the necessary resources, it must focus on building from the grant application to more specific articulations of ways that members will work together and achieve task completion (Siemens & INKE Research Group, 2012b, 2012c). From there, the team must supervise and sustain the actual research by establishing trust, sharing information, coordinating key activities, and accomplishing research outcomes and outputs, and final disseminating outcomes (Kraut et al., 1987; Lowry et al., 2004). At all stages, the team relies on multiple communication channels, formal and informal meetings, online project spaces, and project charters (Siemens, 2010b).

Figure 1: Stages of research collaboration

Source: Adapted from Kraut et al., 1987; Lowry et al., 2004; Siemens & INKE Research Group, 2012b

As Figure 1 shows, little is known about the relationship- and task-oriented activities at the later stages of collaboration. Do the focus of the activities change? How does a team move from the early stages during which the collaboration is being built to a more mature relationship? This article explores the experience of INKE as it moves into its second half.

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Case study

Funded through Canada's Social Sciences and Humanities Research Council's Major Collaborative Research Initiative granting program (SSHRC, 2010), the INKE research project is a seven year, multidisciplinary project with 35 active researchers plus postdoctoral fellows, graduate research assistants, and partner organizations across four countries with a budget of approximately $13 million of cash and in-kind funding (INKE, 2012a). Spanning seven years, it is focused on studying "different elements of reading and texts, both digital and printed" and contributing "to the development of new digital information/knowledge environments" (Siemens, Warwick, Cunningham, Dobson, Galey, Ruecker, Schreibman, & INKE Research Group, 2009; SSHRC, 2009, 2010). Originally four sub-research areas, the team is now divided into two sub-research areas with a focus on Modelling and Prototyping (MP) and Interface Design (ID). (For a discussion on the reasons for reorganizing, see Siemens & INKE Research Group, 2011, 2012d). In this fourth year of funded research, INKE also underwent a midterm review, and reported on its research outcomes relative to the grant application, initial project planning, and ongoing yearly plans. Beyond reading the report, the review panel interviewed the administrative team, researchers, partners, and past and present graduate research assistants and postdoctoral fellows to understand research outcomes, and collaboration and administrative processes. Ultimately, this review determined whether INKE's research funding should continue for the remaining half of the grant application. Based on its demonstrated productivity and collaboration, the project was renewed.

Methodology

Members of the administrative team, researchers, graduate research assistants, and others will be asked about their experiences collaborating within INKE on an annual basis in order to understand the nature of collaboration and the ways it may change over a grant's long-term life. The interview questions focus on understanding the nature of collaboration, and advantages and challenges associated with it within the context of INKE. These interviews allow the researcher to explore topics more fully and deeply with probing and follow-up questions, while participants reflect on their own experiences and emphasize issues that are important to them (Siemens & INKE Research Group, 2012b, 2012c). This round of interviews is centred on the project's fourth year.

Data analysis involves a grounded theory approach that focuses on the themes that emerge from the data. This analysis is broken into several steps. First, the data is organized, read, and coded to determine categories, themes, and patterns. These are tested for emergent and alternative understandings, both within a single interview and across all interviews. This is an iterative process, involving movement between the data, codes, and concepts, constantly comparing the data to itself and the developing themes (Marshall & Rossman, 1999; McCracken, 1988; Newell & Swan, 2000; Rubin & Rubin, 1995).

Findings

As INKE moves past the midpoint of its seven years, it is no longer appropriate to characterize the project as being in its early stages. Instead, INKE is showing signs of maturity and deepening collaboration. As one administrative leader (AL1)[1] stated as the project moved from year three to four, "layer(s) of engagement" have been formed

within and across sub-research teams. They went on to remark that "fundamental crossover" has been created between the two sub-research areas – researchers from one area are actively working on projects based in the other. Some of this results from the fact that researchers in the new sub-research area, which is now in its second full year of working together, were "more comfortable with each other." Overall, INKE was described as "super perform[ing]" in its fourth year (AL4).

This commitment to each other and the team as a whole was reinforced through the midterm review process. Through this exercise, the team accounted for its outcomes, outputs, and processes. Consequently, INKE team members realized that the project had accomplished much in terms of research relative to project plans, while endeavouring to create a positive and productive experience. There were many successes to be celebrated (AL2). Ultimately, INKE members reaffirmed the desire to work together. The team had a "clear sense of purpose," which it will "use to move forward" (AL4). In addition to the internal validation of the team and its work, the external reviewers also acknowledged the strength of the collaboration with its accompanying accountability structures and resulting output and outcomes (AL4). The deepening maturity also suggests possibilities for the future. One administrative leader (AL2) highlighted that members were creating opportunities for spin-off projects with both INKE researchers and others. Some of this discussion is coming with the realization that the team must turn some attention to future projects after INKE ends (AL3).

Several interviewees highlighted the clear benefits of the collaboration and team approach that have become particularly evident as researchers balance INKE obligations with teaching and other responsibilities. As one researcher (R1) noted, INKE "keeps the momentum" going at times when one's own research might have suffered. They further acknowledged that the project supplied the resources – in the form of graduate research assistants (GRAs) and postdoctoral fellows – that allowed the work to continue. This was combined with a strong sense of not wanting to let team members down. One of the administrative leaders (AL1) highlighted the fact that time-sharing between INKE and other projects meant that an individual could deliver more. They went on to say that the team approach also created a "lab space for idea generation," which keeps the energy going and creates new angles for consideration.

The confidence that comes with working with each other for this length of time has allowed researchers in the sub-research areas to experiment with GRAs and postdoctoral fellows to address some of the challenges of working with these individuals (for discussion of GRA turnover, see Siemens & INKE Research Group, 2012a, 2013b). One administrative leader (AL2) is choosing not to hire one GRA and one programmer for a total of 12 hours per week, but rather experiment with spreading the hours across several GRAs and having the students work in intensive weekly two-hour "hackfests." This system is designed to be "disaster proof" – if someone cannot continue as a GRA, the work can still be completed. Another administrative leader (AL3) is creating opportunities for GRAs, rather than the specific project to move between research sites, thus facilitating integration and learning. However, working with GRAs is not without challenges. As noted by AL3, GRAs have dual roles in INKE. They are both peers in the research while still "learning how to learn." The guidance required by the supervisor can be exhausting. At the same time,

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researchers have other responsibilities and cannot always be directly present when GRAs are working (AL2).

Overall, the GRAs and postdoctoral fellows remain very positive about their experiences in INKE. The interviewed GRAs noted that they were not seen merely as research assistants, rather as collaborators with few barriers between themselves and supervisors (GRA2). This perception was reinforced through opportunities to meet other INKE team members at conferences and the "birds of a feather" (BofF) gatherings (GRA1). For the postdoctoral fellows, they continue to learn new perspectives and skills and gain professional networks, building on the idea that it is not "who you know" but rather "who knows you" (PD1). They recognize that the possibilities for research output, including articles and conference papers, are greater than what is typically possible in other disciplines.

Despite the years of working together, coordination and scheduling against other responsibilities remain an ongoing issue. One of the sub-research teams is spread across four time zones, which results in a small window of possible times to meet. When combined with other responsibilities – recognizing that INKE was "just one project" for many members (AL2) – the team found there was only one hour every two weeks free for scheduling. Consequently, the BofF gatherings are vital for long engaged discussion and planning over face-to-face meetings, creating "productive days" (AL2).

Incorporating graduate research assistants and postdoctoral fellows into INKE remains a challenge on several levels. First, while many INKE researchers are from English-oriented perspectives, the GRAs and postdoctoral fellows often come from other disciplinary backgrounds, including computer science, philosophy, book history, design, and others, and may lack an understanding of the digital humanities theoretical framework, associated collaborative work practices, and pre-existing relationships. One postdoctoral fellow (PD1) wondered about ways to be incorporated quickly while digesting the core INKE and digital humanities (DH) readings and knowledge necessary to become a functioning team member (PD1). One of the GRAs (GRA1) echoed this by questioning how they might fit into the larger project. Several administrative leaders noted this was a perennial issue due to high turnover among students, an anticipated occurrence.

The interviewees also noted that the long history between many of the INKE researchers, developed within INKE and through other projects, has resulted in both personal and professional relationships. As one administrative leader (AL4) noted, at times, it was important to separate these layers of relationships so that some important discussions can remain professional. In other words, the administrative leaders needed to be able to address issues when researcher(s) divert from the agreed upon work plan without the "risk of offending" (AL4).

Perhaps, in the category of positive problems, INKE may face a challenge of being too productive. One administrative leader (AL3) noted that a lag exists in their ability to produce articles for publication, in part because collaborative writing takes time. Further, there are only so many venues for these types of publications, and there is often some hesitation to send yet another article to the same venue. Another

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administrative leader (AL4) noted that the team must ensure it does not rest on its laurels after a successful midterm review and keeps the momentum going.

Discussion

As INKE moves into the latter years of funded research, its experience points to signs of a mature collaboration, rather than one in its starting stages. The networks of interactions and relationships are established and have become self-reinforcing within and across the various sub-research teams and into projects beyond INKE. The interviewed members see the varied benefits of collaboration, from both intellectual and productivity perspectives, and maintain a positive attitude, despite the associated challenges. Further, team members have found a way to incorporate and accommodate individual research interests into a targeted and goal-oriented research project such as this one (Murnighan & Conlon, 1991).
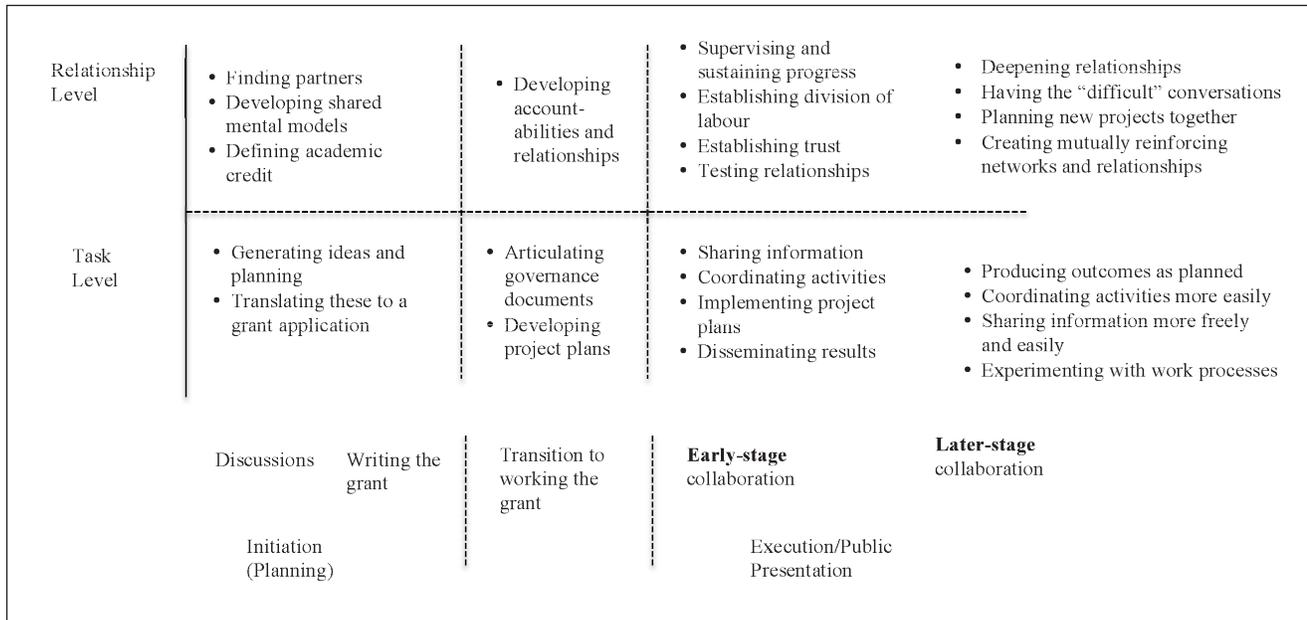
However, as highlighted in previous papers (Siemens, 2010a; Siemens & INKE Research Group, 2012a, 2013a, 2013b), reaching this stage takes time to both develop and be reinforced through experiences, something that is not guaranteed. Not all teams can move from grant development to an actual functioning collaboration (Pennington, 2011b). To achieve this mature state, INKE has drawn upon formal and informal face-to-face meetings, conference calls, online collaborative tools, and joint activities between the sub-research areas, including prototype development, articles, conference papers, and others. The midterm review also provided an important team development and confirmation exercise that allowed the team to reflect on both their accomplishments in terms of research outputs and also the value of governance documents that provided the important collaborative environment and ensured team work could occur relatively smoothly.

As can be seen in Figure 2, the INKE experience begins to suggest elements of a mature collaboration, combining important task and personal relationship considerations (Kraut et al., 1987). One of the first measures is a productive research team, as measured by standard academic criteria (Cantwell, 2011). As seen on the INKE publication page (2012b), the research output includes a long list of articles and book chapters, presentations, prototypes, and designs, much of which has received peer review from the digital humanities community, but also acceptance by traditional humanities disciplines, such as the Canadian Association for the Study of Book Culture and the Bibliographic Society of Canada (INKE, 2012b; Siemens & INKE Research Group, 2012a; Siemens, Dobson, Ruecker, Cunningham, Galey, Warwick, & Siemens, 2011). This measure of academic productivity was also acknowledged by the SSHRC midterm review report. It is a testament to the team relations that this ongoing productivity has been sustained through the change and transition experienced within INKE itself (Siemens & INKE Research Group, 2012a, 2013b), and the team members' other professional and personal obligations.

Building from task productivity, INKE as a mature collaboration also points to the mutually beneficial and reinforcing networks that have developed among team members. The sub-research areas are planning and collaborating together with joint outcomes and outputs and working together within with other obligations, reflecting the goodwill and trust among the participants (Bammer, 2008). An important part of

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these networks is the ability to have the often-difficult discussions about ways to work together and remaining accountable to each other and work plans without offending others (AL4). The team is demonstrating a confidence in their interactions that is allowing them to experiment with alternative work patterns, including the use and support of GRAs and postdoctoral fellows. Ultimately, INKE is demonstrating participants' ability to learn from each other, be in consistent communication with each other, and be flexible and adaptable, which helps reinforce common ground and a shared vision while working out the specifics of tasks and roles (Pennington, 2011b).

Figure 2: Relationship and task perspectives in a mature collaboration

Relationship Level	• Finding partners • Developing shared mental models • Defining academic credit	• Developing account-abilities and relationships	• Supervising and sustaining progress • Establishing division of labour • Establishing trust • Testing relationships	• Deepening relationships • Having the "difficult" conversations • Planning new projects together • Creating mutually reinforcing networks and relationships
Task Level	• Generating ideas and planning • Translating these to a grant application	• Articulating governance documents • Developing project plans	• Sharing information • Coordinating activities • Implementing project plans • Disseminating results	• Producing outcomes as planned • Coordinating activities more easily • Sharing information more freely and easily • Experimenting with work processes
	Discussions Writing the grant	Transition to working the grant	**Early-stage** collaboration	**Later-stage** collaboration
	Initiation (Planning)		Execution/Public Presentation	

Source: Adapted from Kraut et al., 1987; Lowry et al., 2004; Siemens & INKE Research Group, 2012b

As a reflection of these two points, INKE researchers clearly enjoy working with each other and can appreciate the strengths and skills that each participant brings to the collaboration. This is resulting in a variety of projects that build on INKE work but are beyond the scope of this project. Team members are also discussing next steps and projects when INKE ends in two years.

The final sign of a mature collaboration is the focus on a clearly defined and acknowledged team orientation among members. After six years of writing the grant and three and a half years of funded research, INKE has settled into work patterns that support and achieve directed research within the context of a specific grant application. While pure curiosity-driven research remains important, it takes place outside this project's context. As the interviewees suggest, the team has accepted the desire and need to work together to achieve this project's research objectives, and thus, achieve benefits for all in terms of research productivity (as evidenced in growing CV lines), ideas, support, and encouragement. Perhaps a good metaphor for this delicate balance between the individual and the team is the experience of string quartets, which are by definition both individualistic with different instruments playing a variety of parts, and yet highly interdependent with a need to "work together simultaneously" to create a "coordinated sound." These members work together to select the specific musical piece

to be played as well as the interpretation that they will bring to it. And in the act of playing, each member must listen to the each other and the audience's response and adjust accordingly (Murnighan & Conlon, 1991, pp. 165-166). Like productive research collaborations, there is little room for individually focused musicians in successful string quartets.

Implications for practice

This research suggests several recommendations for other teams. First, these results continue to reinforce the need for collaboration-ready individuals to participant in collaborations. These people are open to differences in cognitive frameworks, professional identities, and values, and are able to compromise (Bruhn, 1995; Gold & Gold, 1985; Olson & Olson, 2000) – characteristics that are supported through collaborative processes and facilitate the important relationships. Among these, formal and informal team meetings provide opportunities for key discussions on research tasks and supporting relationships (Kishchuk, 2005; Lawrence, 2006; Poole & Zhang, 2005). For teams such as this one that span geographical distances, these gatherings must also take place in person with time for informal conversations where innovation, creative breakthroughs, and problem solving can occur (Kraut & Galegher, 1990; Lawrence, 2006; Olson & Olson, 2000). Conference calls, emails, online project spaces, and governance documents can provide further support for these interactions (Handy, 1995; Lawrence, 2006).

Second, through the project development and early operational stages, teams must acknowledge the successes of their working together, as measured by traditional academic outputs but also by productive work relationships. By acknowledging what they have been able to achieve together, a foundation is created upon which future efforts can be built.

Lastly, above all, the creation of successful collaborations takes time through the project development and implementation stages. This does not just happen, instead it takes time and effort to develop the necessary relationships that sustain the actual research and create the successes that sustain further relationships and projects.

Note

1. Individuals will be identified by an abbreviation for the group they represent. For example, a graduate research assistant will be named as GRA1.

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