

# One University, Two Campuses: Initiating and Sustaining Research Collaborations Between Two Campuses of a Single Institution

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## ABSTRACT

Collaboration has many benefits, but can also be difficult due to increased coordination, incompatible work styles or research approaches, and difficulty in communication. These problems are often exacerbated by distance, which can make collaboration between departments on a single campus more attractive; particularly as universities invest in interdisciplinary facilities. At some universities, however, some departments may be located on a separate campus, hundreds of miles away. This creates unique challenges for these universities in encouraging and supporting collaboration. There have been few systematic studies, however, of collaborations between campuses of a single institution. We report on a qualitative study of collaborations between the medical college and other departments of our university, located 230 miles apart. Results suggest that participants felt it was very important to build social ties or draw on existing experience with potential collaborators prior to starting a project. Participants also identified unexpected institutional obstacles to working effectively.

## Categories and Subject Descriptors

H.5.3 [Information Interfaces and Presentation] – Group and Organization Interfaces.

## General Terms

Design, Human Factors.

## Keywords

Collaboration, cyberinfrastructure, virtual organizations.

## 1. INTRODUCTION

Collaboration offers many benefits to researchers, and is an increasingly common phenomenon in knowledge production [30]. It enables novel and important questions to be addressed [12], allows researchers to work with others who have complementary expertise [11], and facilitates pooling of resources to obtain more sophisticated apparatus [17]. At the same time, however, several

studies over the past two decades have shown that collaborators often face obstacles in working together successfully [7, 16, 28, 29]. Difficulties in collaboration can be exacerbated by barriers such as distance between research sites [7], differences between disciplines in which collaborators were trained [15], and the readiness of individual collaborators to work together [25] [2].

To help better understand and mitigate these difficulties, there has been substantial interest in developing a more systematic understanding of both how collaboration works (e.g., [10]) and how we might better support it using cyberinfrastructure and e-science technologies [22]. Much of this work has focused on support for geographically distributed collaborations across multiple institutions. There has been less work examining collaboration across multiple campuses of a single institution. While many of the difficulties listed above – such as distance and differences between disciplines -- still apply, a single university is uniquely situated to encourage and support collaboration via communication infrastructure, seed grants and other financial incentives, social opportunities for like-minded researchers to connect with each other, and administrative structures that can simplify coordination across sites and units.

Indeed, there have been substantial efforts to encourage collaboration within universities. Stanford University, for example, moved its medical school from San Francisco to Palo Alto in 1959 in part to encourage novel collaboration opportunities [5]. More recently, universities have built multi-disciplinary institutes (e.g., [18]) and centers such as the Life Sciences Institute at the University of Michigan (<http://www.lsi.umich.edu/>) to encourage researchers to collaborate in addressing important problems.

At universities such as Cornell and Indiana, however, certain units -- often the medical school-- are located on a separate campus, often in another city. This distance increases the challenge these universities face when trying to encourage collaboration between medical and other researchers on critical problems in the life sciences. As contrasted with universities that can build new, state-of-the-art facilities to lure faculty from different departments to work together, these universities face the added challenges that potential collaborators often do not know each other, and that the work culture on the two campuses may differ substantially [24]. Indeed, the benefits of collaboration are not automatic, and

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problems caused by a lack of sensitivity to others' practices and working styles can be amplified by distance.

By examining collaboration across two campuses of a single institution, we can better understand how a shared institutional context can affect researchers' attitudes toward collaboration generally and toward specific collaborators or projects. We can also better understand how this shared context affects the ability of collaborators to carry out their projects.

Understanding how to effectively support collaboration across their campuses is critical both for universities wishing to strategically invest scarce resources in ways that are likely to yield novel and effective results; and for cyberinfrastructure/virtual organization researchers aiming to more systematically understand how to support collaboration in different settings. In this paper, we present results from a qualitative interview study that focuses on how researchers on two campuses of a large university locate collaborators, initiate collaborations, and the unique challenges they face in carrying out these collaborations.

## **2. BACKGROUND/LITERATURE REVIEW**

We focus in this section on how researchers identify potential collaborators (i.e., how collaborations start) and how they continue to work together and coordinate.

### **2.1 Locating and Assessing Collaborators**

Much early research on scientific collaboration focused on locating needed expertise and resources (e.g., [11] others). Collaboration was seen as a way to tap the expertise or resources of others and address new problems or old problems in new ways [3, 4, 12].

Geographically distributed collaboration was seen as a way to reach out further – expanding the availability of expertise and resources to all, and offering potentially significant benefits to those on the periphery of the research community [13, 23].

Increasingly, however, experience has made clear that collaboration is difficult and that researchers are often reluctant to work together. There is significant effort underway to develop a more systematic understanding of the conditions under which collaboration (or team science, as it is referred to by some e.g., [10]) seems to be most effective. One clear trend in this work, and research on knowledge sharing more broadly, however, is that social ties matter. That is, people tend to collaborate with and share knowledge with those to whom they have existing social ties.

This is evident both in early observations that researchers tend to collaborate and do research in “invisible colleges” of researchers [6, 9], as well as in more recent work highlighting the importance of social ties in gaining access to needed expertise using knowledge sharing systems in organizations [31]. Some recent systems to encourage collaboration, such as the Nanohub (nanohub.org) have also relied on rendering social ties explicit to encourage collaboration. Beyond social ties, individuals selecting collaborators on a project have been observed to rely on such factors as individual reputation and work style [14]. It has also been suggested that prior experience can help reduce barriers to collaboration [8]. What all of this suggests is that fostering collaboration is about more than just creating awareness of expertise. It also requires building and exploiting social ties; and drawing on researchers' prior experience in working together.

In many ways, universities are in a unique position to help create the social ties between researchers that are needed for effective

collaboration. Universities bring researchers from a range of disciplines together under the auspices of a single institution. The bounded nature of this collection of individuals can facilitate efforts to foster awareness of colleagues' research expertise and the development of social ties [31], and spatial propinquity makes it relatively easy to arrange face-to-face meetings. The shared institutional context can also result in a shared identity, which can create common ground, as well as foster serendipitous meetings when faculty serve on committees together and interact in other contexts.

One challenge, though, is that many of these advantages enjoyed by universities begin to disappear when potential collaborators are split across two campuses. Distance may impede both awareness of collaborators' expertise and the ease with which informal meetings can be arranged or will occur serendipitously. While a shared institutional context may span the two campuses, this may not result in shared identity [27].

Nonetheless, we have observed several instances of effective collaboration across two campuses of our university. The first research question we explore in this study, therefore, is how these collaborations started. In particular, we paid attention to how people located collaborators and built social relationships with them.

### **2.2 Coordinating on Collaboration**

One common difficulty in geographically distributed collaboration is coordination of efforts and communication among collaborators [7]. As discussed above, when collaborators are far from each other, there are fewer opportunities for opportunistic interactions, it can be more difficult to maintain awareness of what others are doing [1, 21], and researchers may simply pay less attention to their distant projects sometimes [24].

In addition to all of these issues, crossing boundaries even within an institution can result in bureaucratic obstacles, certain colleagues being perceived differently than others, or cultural conflicts between institutions or individuals with different working styles or environments. From a bureaucratic standpoint, there may be conflicts around issues such as intellectual property [26], or variation in procedures for the treatment of human or animal subjects. And cultural differences may result when researchers from fields with different publication timelines or working styles come together [12].

Again, it seems on the surface as if a single university is in a unique position to help facilitate collaboration. While distance creates communication and coordination barriers across campuses, a single institutional context could help address these potential obstacles. A shared administrative context, for example, could reduce conflicts between sites and make it easier to coordinate the logistics of shared efforts. And a shared institutional context could result in more shared work practices/culture and a desire to make the shared identity more salient.

In addition, institutions can provide shared infrastructure for communicating and collaborating between the two campuses. Such infrastructure can be targeted to specific communication problems related to the split-campus situation, include physical transportation between the two campuses, and may be uniquely suited to help overcome the barriers presented by distance in these cases.

At the same time, however, these advantages may not be as salient as with same-campus collaboration. Research on organizational identity suggests that remote/satellite locations can evolve their own identity [27], which may become more salient than the shared identity. This could work against the shared identity that would seem to be an aid in bridging the two campuses of an institution. Depending on how much coordination there has been historically between the two campuses, it is also possible that different administrative procedures may have evolved in parallel at the two campuses. This could create unforeseen obstacles in doing work between the two.

Given all of this, we wondered whether being part of the same institution helped collaborators working across the campuses of the university we studied. We investigated participants' experience, asking them what challenges they faced and what seemed to work well, and what aspects of the institution seemed to help or hinder this.

### 3. METHODS & CONTEXT

This research is part of a large, comparative multi-case study of geographically distributed multi-disciplinary research collaborations. Thirty-nine of these collaborations have been identified that span two campuses of our university. To better understand how research collaborations are initiated and sustained, we conducted a field study using both interview and observation methods. From the total set of 39 collaborations, we identified projects at various points in their life cycles; and projects that ranged from successful to unsuccessful, as indicated both by participants themselves and our own analysis of publication histories and research funding.

Over a period of five months, between March and July 2010, we conducted interviews and ethnographic observations of collaborations between two campuses of a large academic research university in North America. At this university, the Medical College is located on a separate campus, 230 miles from the main campus.

#### 3.1 Participant Recruitment

Participants were identified with assistance from the Office of Intercampus Initiatives at our university. Participants all met at least one of these criteria: they were known to be involved in a currently funded cross-campus project, they attended one of several inter-campus retreats organized by the university to foster collaborations, or they were explicitly mentioned by another participant as a good candidate for our study. We interviewed and observed participants in 12 intercampus projects.

#### 3.2 Interviews

We conducted 31 30-minute interviews with doctors, researchers and staff members at the two campuses. The interviews were conducted by phone and, when possible, face-to-face. The interviews were audio recorded and fully transcribed. Seventeen interviews were with doctors and staff at the Medical College while the remaining 14 were with researchers at the Colleges of Engineering, Veterinary Medicine and Agriculture and Life Sciences. Twelve of them (10 from the Medical College and 2 from the main campus) collaborate on a research project on obesity. The remaining 19 participants work on one or more of 11 other intercampus collaborations on a wide-range of topics.

Interviews focused on the initiation of collaborations, problems and challenges experienced along the way, coordination within the collaboration, competing priorities, and the extent to which

participants feel their projects are successful so far. The interviews helped us gain a better understanding of how participants felt about the collaboration as well as how they initiated projects and collaborated with other team members [19, 20].

### 3.3 Data Analysis

All interviews were fully transcribed, anonymized, and assigned pseudonyms. Analysis first consisted of a careful reading of all transcripts by four of the authors, followed by a discussion of key themes that led to an initial coding scheme. The hierarchical coding scheme included three main themes reflecting our interests in studying how awareness of expertise influences the initiation and sustenance of collaboration. Additional secondary and tertiary sub-themes were added to the scheme as they were identified in the data in the coding process, which was iterative. In the end, there were three primary themes, 16 secondary themes and 8 tertiary themes. Altogether we identified and coded 619 text fragments relevant to these themes. Text was coded with multiple codes if appropriate, resulting in 958 coded items. The frequency of the key themes ranged from only three for one theme to over 120 for another theme. Two research assistants coded data. They worked in the same room, coding concurrently, talking frequently to resolve discrepancies, and reviewing each other's coding to maintain consistency throughout the process.

## 4. Results

### 4.1 Locating and Assessing Collaborators

We were first interested in how researchers chose collaborators and initiated projects together between the two campuses. As we will show here, participants tended to be very apprehensive about starting new collaborations; even though they were part of the same institution and had some opportunities to meet each other. They viewed them as significant commitments and relied heavily on past experience or signs that the collaboration experience would be positive. Often this proved more important to them than the topic itself.

#### 4.1.1 Apprehension and Assessment

Most participants reported some apprehension around the initiation of new collaborations, often stemming from their own or others' negative past experiences. They wanted to know that they could trust and rely on their collaborators. According to a virology researcher on the main campus, "60% of people just don't want to collaborate under any circumstances...that's not something you can really do anything about" (Lucas).

Many noted that the likelihood of a positive collaboration experience could be even more important than the topic of collaboration. Andrew said that it would be ideal to read all of the available literature and choose a collaborator whose work is best, but a shared location and good interpersonal relationship often take precedence. Another participant, Ian, said, "I pick collaborators, not projects," and that:

I would be willing to become more interested in something new...I would rather work with a specific person than work on a specific project. So you have to meet the person and decide whether or not they're somebody that you want to work with, in addition to whether or not the topic is interesting (Ian).

In choosing collaborators, Eric said that he tries to avoid people with whom he might have a conflict, and work instead with people he has some motivation to work with:

personalities always matter, but to be honest, in cases where there might be somebody who you have some clash with because they might be working in the same field but with some different results or some different ideas that might not fit with yours, usually you choose to keep your distance, basically. It's not worth the trouble to try to interact if you don't have an initial sort of motivation for that, either because you personally like each other and you want to do something together or you have the same sort of experimental goal (Eric H).

Participants described many strategies for assessment of potential collaborators. A common one was past experience. As Reuben said, "If you know somebody a long time...then you feel like you can trust them and things will work out well." Another participant asserted that:

Of course, if you've worked with people on previous projects and you've already built a rapport, you've established that relationship. You can pick up on things much more quickly than with someone that you've never worked with before and everybody is trying to feel their way through (Dawn).

This raises the question, though, of how to assess a new collaborator. Arnold, a doctor at the Medical College, relied on a shared past military experience. His description is interesting because he does not rely on a shared research experience or even a past social relationship with the collaborator. Rather, he drew on knowledge of an experience they had both had separately, and used this to infer that they might work well together:

I think the factor that went into it was Aaron was in the Marines before he got his PhD. I was in the Army before I came to [the Medical College] and I think that kind of sparked kind of a mutual admiration and respect. And then, you know, we also realized that we could do some interesting work together...I would say that the military connection was a big thing for us, at least because once you've kind of been in—both of us have been in combat, so I think that once you know that experience you kind of quickly can size up people that have been involved in this kind of situation.

Arnold's example is interesting, but anomalous. Most participants did not have common histories to fall back on.

#### *4.1.2 Meeting New Collaborators*

Most participants reported that their knowledge of others' research interests stemmed largely from prior social contact, particularly for collaborators on the same campus. Examples included being students together, working together, serving on college- or university-level committees together (e.g., the IRB), friendships, sharing common interests, having a history of collaboration with an individual or institution, and having common collaborators or contacts.

This stood in stark contrast to their reported knowledge of potential collaborators at the other campus, where lack of spatial propinquity meant there were far fewer opportunities for serendipitous relationships. As Steven told us, "We don't really know what the people on the other campus are doing."

With this in mind, the university recognizes that it is difficult for collaborators to identify each other across the two campuses. It has organized a series of periodic retreats focused on a particular research topic (e.g., biomembranes, lung cancer, etc.) over the

past six years to bring researchers from the two campuses together around certain key problems. Having resources to organize such periodic retreats is a unique advantage that one-university-multiple-campus collaboration can have in comparison to many other distributed collaborative projects. Retreats typically consist of a series of research presentations and many opportunities for researchers to interact informally. Careful attention has been paid to the location of these retreats, with some held on the main campus, others on the Medical Campus, and some approximately halfway in between. This is intended to avoid the perception that one campus is being favored over the other.

Many participants felt these retreats were helpful in building ties that led to eventual collaboration. Researchers studying biomembranes, for example, found that a problem-focused retreat was helpful in "getting to know those professors, know their group, know their students, know their projects" (Andrew). Dale said further that he, "thought people were very nice and motivated and it would make you want to seek out the collaborators. The couple that I went to; I think that they were very positive."

Nevertheless, some participants were quite sensitive to details such as who was asked to speak or present. As Charline told us:

I found it frustrating because I think that [my department] is sort of a little stepsister on campus and wasn't invited to present anything, as far as I can tell, wasn't invited to the dinner, specifically wasn't invited to some of the events associated with it. And I thought that was a little telling in terms of how people view...and perhaps other people were in the college that didn't go, but in general I didn't find it that useful (Charline).

The larger point here is that perceptions and details can have significant consequences for how collaborators are perceived and assessed, and the likelihood that collaboration will result. In general – even within a single institution – we found that collaborators were apprehensive about engaging in new collaborations and tried to rely on past experience to find collaborators with whom they were likely to work well. At the same time, many were willing to meet new collaborators in environments where they could discuss research and also attempt to decide whether they were likely to work well together or not.

## **4.2 Sustaining Collaboration**

We were also interested in the challenges that participants faced in keeping their collaborations going. We wondered in particular if a shared institutional context helped overcome any of the coordination and logistical difficulties experienced by multi-site, multi-institution collaborations.

### *4.2.1 Intra-Institutional Differences*

Participants reported that many of their coordination problems stemmed directly from differences between the two campuses that were not anticipated. Often these had to do with institutional constraints, rules or budgeting practices that had developed separately on the two campuses with little historic need for reconciliation.

Ian, for example, described trying to move genetically modified mice from one campus to the other for some experimental work. They assumed this would not be a problem because it was all occurring within the same university. In practice, however, the two campuses had very different policies and procedures, and it was difficult to get them to agree on whether or not the

environment at the other campus was suitable for the mice in question:

The mice might as well be coming from a totally different planet or something. There's no level of coordination or communication between the sort of support level facilities there. So we ended up actually not being able to use the mice.

Similarly, the Institutional Review Boards (IRBs) of the two campuses of the university are operated as institutionally separate entities that have distinct requirements, procedures and approval processes. As we learned in carrying out this project and as participants reported to us, doing research on both campuses required completing two distinct application forms, and using two distinct informed consent documents. Participants often reported difficulty moving data and materials across the two campuses. Ian said:

if we want to have collaborations that involve more than just having a good person to talk to, if you want to actually share reagents, you want to share animals, you want to share data, you want to move people, you want to do experiments together, then some of the things that you normally encounter have to be made easier.

There were also administrative differences between the campuses that could make understanding budgets and planning difficult. Dawn is an administrator on the medical campus, and she described the difficulties of working with faculty at the other campus in understanding a budget spreadsheet, due to differences in whether personnel are funded for nine, twelve or eleven months of the year. These differences create misunderstandings, and helping to resolve these misunderstandings is made more difficult by the distance between the two campuses:

You're saying, "No, no, no. That's not it. Look at the bottom, and here's what you're talking about." You have to go back to the, "You're looking at the personnel column. You're looking at the non-personnel, and here's what the difference of the nine months versus the 12 months are." And then, it's sort of go back to, "Remember, I told you we're not funded for 12 months. We're funded for 11 months." I found that it is much, much easier and faster when you have the faculty member sitting in front of you to literally point out the different budgets and numbers. I think they get it much more quickly when you're doing it in person than when you're trying to have a phone conversation (Dawn).

The difficulties revealed above show that benefits from a single university should not be assumed. Integrative efforts to coordinate administrative and logistical procedures are needed to provide better support collaborations within one institution.

#### *4.2.2 Style and Cultural Differences*

Participants also reported many cases where differences in work styles or disciplines were exacerbated by the distance between the campuses, despite the shared institutional identity. Dale, a physician and professor on the medical campus expressed his frustration with email response from his collaborators on the main campus:

Frequently we'll send emails and you don't hear anything for a couple days. Because maybe they're in classes, maybe they're busy. It's different, I think. That's my

impression. I think the biggest problem I've had in general is it is a different culture.

Many participants expressed frustration with past collaborators, such as Lucas, a virology researcher on the main campus who said, "We would discuss doing one experiment, they would do a different experiment...and then when we compared the data it turned out it wasn't quite right."

In another example Jennifer, a social scientist at the main campus, had medical collaborators who thought they were being supportive by gathering data and providing detailed documentation of their work procedure, but she said that:

The data that they [her doctor collaborators] collected...it was collected very systematically, very time intensively, but it wasn't collected with any sort of theory in mind so it was not useful. ... They hadn't analyzed them so we suggested modifying their intake questionnaire with some ways that were in keeping with some prominent theories in our field and they were reluctant to change because they'd already collected so much data using this other questionnaire. And I can understand that. On our side we were kind of like, "well you aren't even using that data so why not change it to something now? Especially since you have thousands of people coming in, you can..." But I don't think they were necessarily...they were hesitant to make that leap of faith in us and if I was in their shoes I would understand.

Others noted that researchers at the Medical College tended to place a higher value on results from clinical studies, while basic scientists from the main campus valued results from laboratory bench science. Charline, a clinical lecturer, noted her frustration that bench scientists "don't see the value in the [clinical] knowledge base that we can provide to them."

Participants also reported that disagreements and differences in research style were sometimes affected by researchers' perceptions about their own discipline and their collaborators. Some scientists from the main campus, for example, reported that it seemed like doctors felt they were superior because they worked on biomedical and clinical problems not studied at the main campus.

We also observed many cases where communication highlighted confusion or conflicts between collaborators. Often participants reported that, even though they knew their collaborators were working hard, they felt the collaborators did not have a good understanding of what others felt were important parts of the shared project. For instance, Andre, a professor at the Medical College said that:

I think the frustrations sometimes come as a result of the fact that when you have physical science there is very minimal knowledge of medicine working with physicians who have minimal knowledge of physical sciences. That's brings some confusion into the collaboration.

One common occurrence was that, when there was not communication about the details of a project, participants would take actions they assumed to be reasonable, but these would ultimately turn out to be problematic for reasons stemming either from differences between the campuses or differences between the research approaches of collaborators.

### 4.2.3 Communication Infrastructure

Our final question was whether a shared institutional communication infrastructure could help overcome the barriers presented by distance. In general, this did not seem to be the case. While the university provides specialized videoconferencing facilities and a dedicated shuttle bus between the two campuses, our participants reported that it was difficult to talk to their collaborators on the other campus as much as they wished they could. Sometimes this stemmed from lack of available communication infrastructure, and other times simply from differences in scheduling and working styles. Alan said:

The distance between your campus and this campus is a big, big problem. Because a lot of postdocs don't want to go to [the main campus] and vice versa. So this is a big problem. How to solve this problem? You have a bus that goes back and forth but that's not convenient. There is many, many good lectures at [the medical school] that these students or post docs want to go [to]. In [the main campus] there is much less. So when they are in [the main campus] they feel isolated.

Harvey added that "I think it would help if it was easier to interact. I don't know how to do it." John also said that he was frequently frustrated by the lack of availability of colleagues:

Yeah, the most frustrating are obviously the—I mean personally, for example, one of the—for me, because of my personality, when I need to talk to someone, I need to talk to someone right away. And I don't like to leave messages and have them call me back and that kind of stuff. The ease of communication is very important. That can be a big obstacle, if you cannot get a hold of a person.

There were several reasons why it was difficult for participants to interact across the two campuses. One is that scheduling synchronous conversations with collaborators was difficult, both because of different schedules and work styles, and because of the lack of effective infrastructure for supporting meetings across the two campuses.

When it came to scheduling meetings, one major problem stemmed from a difference in how medical and academic researchers schedule and perceive their time. Doctors at the Medical College, for example, perceived the pace of work at the main campus to be slower with more down time. For example, a cancer researcher at the Medical College said, "There's no up or down time, it's always up time, we're always working hard, especially if you're seeing patients and trying to do research" (Dale). As such, doctors often only had time for their research work in the evenings or on weekends, which are times when their collaborators on the main campus were often not available. This led many of them to shift to email (in some cases accompanying emails with Powerpoint slides to illustrate) and other asynchronous modes of conversation, but also meant that time for synchronous discussion was limited.

Another effect of this was that doctors felt an increased sense of urgency about their work because they are in frequent contact with patients who are suffering. "I'm dealing with patients and there is a rush to help and you know, get your work done and help patients if you can," Dale said. This meant that they might see it as more important to proceed with the work than to check with a collaborator to be sure everything was being done in exactly the way it had been agreed upon or in ways that were likely to result in gains for basic (i.e., non-clinical) researchers as well.

These types of misalignments in priorities could also lead to perceptions about not caring about a project, as when collaborators did not respond right away or perform a task as quickly as expected. Repeated failure to meet expectations and also the failure to communicate frequently to update project progress were frequently cited causes of projects that ultimately did not succeed as when "one side just doesn't live up to the expectations in terms of deliverables" (Steven).

A second reason that synchronous meetings were not reported to be common was that infrastructure for such meetings was not readily accessible. Group video conferencing, for example, was reported by many participants, to be useful; but was not easy to use or access. While the University has provided large video conferencing facilities to encourage cross-campus collaboration, these are not convenient. A conference room must be scheduled in advance, and this may be a few buildings away. Joel, in describing video conferencing, said "that's 10 times more complicated. Complicated on this side, and also complicated on the other side." Reuben said:

It usually turns out to be more of a pain in the neck than anything else. People want us to be in their office where they have their computers and information and sometimes—if it's two groups, you know, there's 6 people around the table there, and there's 6 people around the table here, you don't want to bother shuffling the cameras around and it's just a pain in the neck. And we could share screens by whatever method.

Videoconferencing facilities also can be inconvenient because research groups want to be in their own offices or laboratories where they have access to their computers, papers and materials during discussion. While Skype and other desktop tools were observed to be in occasional use by some participants, this does not work as well for group meetings and was not widely adopted. As Andre said:

I think multiple users will be nice and we're not talking about anything more than, let's say, three users. Because sometimes if the collaboration may involve [people who are] here [in] [the university] and in other institutions. We personally haven't had much luck in being able to do any kind of interaction with more than two people.

This suggests that the communication infrastructure provided by the institution helps with cross-campus collaboration, but that the communication troubles commonly experienced by distant collaborators are alive and well here.

## 5. DISCUSSION

We began this paper with a desire to understand the unique challenges associated with initiating and sustaining collaborations between multiple campuses of a single institution.

### 5.1 Implications for Meeting Collaborators

We found first that participants were generally enthusiastic about collaborating, but extremely apprehensive about starting new collaborative projects. They were reluctant to engage with new collaborators unless they felt that the experience was likely to be a positive one. Indeed, the immediate relevance of topics and expertise often took a back seat to compatibility in work styles and approaches. They tended to be most interested in working with people with whom they had shared past experience, but also sought to assess whether new potential collaborators were likely to be good or not.

In some ways this reinforces prior findings on the importance of social ties in seeking expertise in organizations [32], the factors that students relied on in picking project team members [14], and the importance of compatible approaches to research [6]. At the same time, our findings offer several unique contributions in this area.

First, our findings highlight that participants bring a range of information and experience to the task of assessing the likely quality of a collaborator. Our participants relied on existing social ties some of the time, but also built new ties at retreats, and used common past experiences (such as military experience) to assess the likelihood of success. That is, common experiences or histories may sometimes serve as substitutes for social ties in the traditional sense. Participants adapted to the information they had available.

Second, our findings do suggest some advantage to a single institution in fostering collaboration. Participants valued the retreats and other programs set up by the institution in that many felt these helped them develop ties to individuals and meet them, without committing to a shared project. At the same time, however, a shared institutional identity did not always emerge as salient in participants' perceptions of others at these retreats. They often referred to differences between themselves and those from the other campus, and some were very sensitive to perceived differences in how certain researchers were treated at the retreats.

What both of these findings suggest is that our participants were interested in collaborating, but that they wanted to have positive experiences. Those interested in supporting the initiation of collaboration within a single institution (or beyond) should think about how to provide researchers with opportunities to get to know each other and build on the shared identity that comes with a single institution, but also each other's research and working styles.

Importantly, this also has implications for systems such as the NIH VIVO project and others currently being developed to help foster new collaboration between researchers. Focusing these systems merely on the identification of those with similar research interests may be insufficient. This should be supplemented with opportunities for developing new social ties or exploiting existing shared experiences. This could involve identifying common contacts (as when shared "friends" are listed on social networking sites), encouraging people to share information about personal interests or priorities, and asking people to complete assessments of their "collaboration readiness (e.g., [25]).

## 5.2 Implications for Coordination

A second key theme in our findings was that, while being part of the same institution may have helped some collaborators meet each other and develop trust, this did not have a positive effect on carrying out these projects. There were several reasons for this.

First, being part of the same institution often created expectations that it would be easy to move materials, data, protocols and people between the two campuses. As our participants' experiences showed, however, the two campuses had parallel administrative structures with variations in rules and procedures that often made these activities extremely difficult if not impossible. In some ways, the fact that these expectations often stemmed from being part of the same institution suggests that this actually made collaboration more difficult some of the time. More generally this suggests that being part of the same institution can blind collaborators to potential trouble spots arising from

differences between the campuses. It also suggests that institutions wishing to encourage collaboration need to pay attention not just to bringing researchers together, but also to reducing administrative hurdles to working together.

To be sure, this problem is not unique to universities with multiple campuses. Many universities, for example, have separate IRBs or animal care facilities for their medical schools. When these are on a single campus, however, it is far easier to solve this problem by having the researchers move back and forth between departments, or even to build institutes that allow the researchers to work in a collaborative space (see examples cited above). This is more difficult in our case, when the departments are 230 miles apart.

Another key finding is that obstacles to frequent and easy communication, such as scheduling, different work styles and priorities, and lack of infrastructure for easy shared meetings, often meant that there was less communication, even in situations where more communication would have been particularly useful. Participants reported many situations where colleagues proceeded with work that was not fully understood or agreed upon, and this resulted in data that were not as useful as they could have been or sometimes not useful at all. Sometimes this happened because simply moving forward at all was viewed as more important than getting the details exactly right.

This is not a problem that is likely unique to collaboration across two campuses of a single institution, but it does highlight that the coordination problems described by prior work on distributed collaboration may sometimes stem from different perceptions of when communication is necessary, and not just the difficulty of regular meetings, coordination and informal interaction.

## 5.3 Limitations and Future Work

This study has several limitations that should be considered in interpreting the results. First, our sample consisted of people willing to participate in an interview on collaboration, so their views and attitudes toward collaboration may not reflect those of the broader population of researchers. At the same time, they did describe apprehension about collaboration and means for assessing collaborators that likely have some more common elements.

Second, interview data are inherently limited in that they rely on individual participant perceptions and memory. These may be inaccurate or biased, but we did not see any evidence of systematic bias in our findings. Moreover, this limitation is common to all studies of this nature.

These limitations open up a number of interesting opportunities and research questions to pursue in related papers and future work. Specifically, what artifacts and communication technologies play a role in maintaining collaboration networks? How do individual personalities, skills and expertise influence the roles that people play to enhance the success of distributed collaborations?

Gathering artifacts such as e-mails, instant messaging chat session logs, Skype audio and video transcripts and other materials for discourse analysis would be useful in contextualizing the nature of the content as well as the communication patterns that occur within collaboration. It would be beneficial to follow one of the larger intercampus collaborations in depth over the course of a year or several years to track the development and evolution of participants' collaboration networks.

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