



An Investigation of Collaboration between Internal and External Groups within e-Science

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Fall, 2015; Chapman University; Orange, CA



Introduction

As the practice of virtual organizing becomes more prevalent, there is an urgent need to understand the processes that are required for successful virtual communication. Grand challenges in science today require diverse expertise, but diverse expertise is often not collocated. Therefore, e-science projects often require dispersed professionals to coordinate and collaborate in order to maximize their success.

Literature Review

The distinction between the implementation of a technology and organizing has been widely disputed (Leonardi, 2009). Leonardi (2009) posits that there is no distinct implementation line, rather that the two processes are uniquely intertwined. Throughout implementation of a technology, involved collaborators are faced with the task of defining appropriate channels and routines of organizing in order to maximize the outcomes of their interactions. Media richness, as manifested in different mediums of communication, can engender differences in quality and type of communication (Godar & Ferris, 2004). Positive working relationships within big data science projects should be formed and maintained through a diverse range of media-rich channels in order to promote collaboration and maximize organizational capacity.

Past literature of face-to-face (FTF) collaborations demonstrates the benefit of maintaining integrity (Mahoney, 2007) as well as establishing emotional energy and group cohesion (Hackett, Parker, Conz, Rhoten, & Parker, 2008; Yuhyung & Kyojik, 2011). Modern-day collaborations rely on computer-mediated communication (CMC), which also present a variety of benefits, such as overcoming geographical and time barriers, increasing participation, and pulling upon expertise from various disciplines (Godar & Ferris, 2004). In order to facilitate productive and successful collaborations, groups may implement a hybrid model of communication that balances both FTF and CMC. We ask the research question, "How these different mediums are utilized in a variety of contexts (i.e., internal, external, hybrid)?"

Methodology

This poster employed the grounded theory approach (Corbin & Strauss, 1990), analyzing 133 interviews conducted with domain scientists (e.g., informatics researchers, computational chemists, theoretical physicists) and computational technologists. Thirty-five of these interviews were member check interviews conducted in the final phase of the investigation. Participants were from across the US (including CA, IL, IN, SC, MI, TX, etc.) and a small portion was from the UK (Scotland). Interviews were conducted either in person or by telephone. Following the grounded theory coding techniques, we performed multiple iterations of data analysis and literature integration, yielding preliminary findings presented in this poster.

Findings

	Internal	External
Computer Mediated Communication (CMC)	<p><i>In-House Individualist Collaborations</i></p> <p>"You need to get the idea that it is just a single entity; otherwise, the part of implementing a tool won't work at all, everybody's going to sit in their office, do their own thing in their own country, and you're not going to end up with a tool that will be useable." (Administrator, Scotland, 11-18-13)</p> <p>"So, what we're seeing now is research groups are a little bit more comfortable putting stuff out there because when you mentioned virtual organizations, that's a big part of it, is you've got formal boundaries in the institutions that you're homed in, but you've got collaborators that are part of another institution." (Administrator, CA, 11-21-13)</p>	<p><i>Community Engagement</i></p> <p>"Groups really have to be proactive about going out and engaging the community in recruiting people to try things out... it's certainly a different ballgame in that you really have to explicitly engage your users in order for the products to be successful" (Technologist, IL, 12-18-14)</p> <p>"I think developers should be completely open about what's going on with their tool and then allow users to have the flexibility to communicate entirely with them... An issue tracker allows the user communities to put in requests to say 'This doesn't work' or 'This would be cool if it did this new functionality' and then a way for the developers to get back in touch with those users." (Administrator, Scotland, 11-18-13)</p>
Hybrid	<p><i>Dispersed but Cohesive Collaborations</i></p> <p>"I have had some experiences with researchers who have come for a workshop, I have met with them in person, I have understood their problems face-to-face, and then it's much easier to get things going after that, after you can sit down and figure out exactly what the problem is or what you need to do and you can make sure you are on the same page and then continue via email." (Computational Chemist, TX, 4-23-14)</p> <p>"For something that might be a little more specialized, like software in a particular domain, I think face-to-face interaction every now and then is good. Some of these projects will have what they call code-athons or hack-athons where they get these developers together and they might spend a really intense few days or a week working together on the software." (Administrator, CA, 11/13/14)</p>	<p><i>Networking Engagement</i></p> <p>"Persistence, perhaps, because you might tell someone one thing and it's like planting a seed, and then when they walk out of the conference, they forget completely. So you follow up with an email, or if you have that kind of relationship, you call them again and you share it with them." (Technologist, CA, 7-15-14)</p> <p>"It really helps if people know each other and they either know each other because they've worked together in the past. Or if you can have, for example, an annual user conference where people can meet or you can have some kind of kick-off meeting or workshop, so things that are face-to-face meetings, I think, are really great ways to form small teams. And after people meet in person, they're more likely to be able to go geographically distributed and work together." (Senior Research Scientist, IN, 12/4/14)</p>
Face-to-Face Communication (FTF)	<p><i>Traditional Collaborations</i></p> <p>"I will be in there interacting with the students, instructing them how to do it... And so, the human interaction is very important, especially for this project" (Student, CA, 11-21-13)</p> <p>"We would try to co-locate and then... work together, for a few days... And we find opportunities to do that... as often as possible, because the physical presence matters quite a lot" (Computational Scientist, Illinois, 11/20/13)</p>	<p><i>External Networking</i></p> <p>"User community groups like when you have face-to-face communication, I think that's a really effective way of dealing with getting developers and users together" (Administrator, Scotland, 11-18-13)</p>

Conclusion

CMC communication presents a variety of benefits for both internal and external groups in that it allows for internal collaborators to productively coordinate and progress, while also providing them an outlet to connect with external audiences. Internal groups may benefit from FTF interactions that foster positive relationships and create cohesion within the groups. Furthermore, such FTF interactions may also initiate relationships with external audiences (e.g., conferences, networking events). Internal collaborators who may be geographically dispersed can continue their involvement and efforts, while maintaining connectedness via a hybrid model that blends both CMC and FTF. A hybrid model allows for the internal group to continue relationships with external audiences through a variety of mediums. Communication channels and routines are determined by the specific needs of each organization; therefore, this model presents a general framework that describes a variety of possibilities in which communication styles may be implemented by different audiences.

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