Virtual Scientific Teams: Life-Cycle Formation and Long-Term Scientific Collaboration

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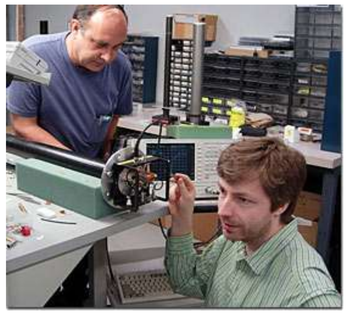
Research Design

Data will be collected through descriptive multiple-case studies, and will include a wide variety of documentary artifacts. Over the next few months, we will begin with a convenience sample of artifacts representative of interactions of teams who completed projects in 2009. Collection and analysis of this sample will provide an opportunity to test assumptions about the nature and purpose of interaction and to develop preliminary classifications along several dimensions. Direct observations of multidisciplinary teams selected for the multiple-case study will begin in late spring. Observations will occur at the Magnet Lab while teams are conducting their experiments, typically over the course of one week. Members of each scientific team will be interviewed following the completion of their experiments and researchers' analysis of the documentary artifacts and observation reports. Factual incidents will be collected from the documentary artifacts and direct observations. Themes will be identified, the incidents will be sorted into categories, and questions developed.

Introduction

There are increasing efforts to build an advanced infrastructure for e-science, including high performance computing centers, connected through high speed networks, to facilitate the sharing of both instruments and datasets, and to enable more effective scientific collaborations, learning and professional development (Atkins, Droegemeier, Feldman, Garcia-Molina, Klein, Messerschmitt, Messina, Ostriker, & Wright, 2003). However, neither infrastructure nor applications guarantee that scientists will use the technology, establish successful collaborations, or share data. Cultural and social factors may either constrain or encourage the adoption and use of technology or data. Similarly, the technology may influence social structures and enable or constrain social interaction, data sharing, and collaboration (Birnholtz & Bietz, 2003; Orlikowski, 1992; Stvilia, Twidale, Smith, & Gasser, 2008). What social and organizational factors best support the transition of short-term experiment-focused multidisciplinary virtual scientific collaborations to long-term productive and innovative programs of scientific research? The goal is to develop and validate a lifecycle model to support distributed scientific teams through the transition from discrete experiment-focused projects to long-term distributed collaborations, thereby advancing innovation and increasing productivity.

The project draws its framework from the theory of information worlds Burnett, & Jaeger, 2008; Jaeger & Burnett, in press), which seeks to describe intertwined information exchange and social interaction in a variety of settings. The information worlds of the short-term scientific teams under investigation are intrinsically transient, with pre-defined ending points, after which they will cease to exist; thus, they exhibit distinct lifecycles (including specific beginning and ending points). The nature and specifics of the teams' lifecycles have important implications for their interactions, for how they exchange information, and for their success or failure.



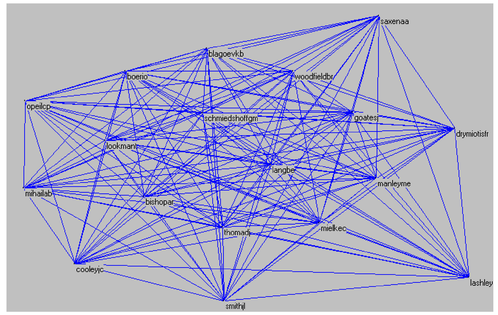
Research Questions

1.Is there evidence that the lifecycle of a virtual team influences the willingness of individual team members to work together again? How does this compare with their willingness to work together again with co-located team members?

2.Is there evidence that the lifecycle of a virtual team influences the willingness of individual team members to work in virtual teams again? How does this compare with their willingness to work in co-located teams again?

3.Do virtual teams generate output as measured by patents, journal articles, and presentations comparable to the output of co-located teams working on similar projects? Is there a difference in the amount of time required to generate such outputs?

4.Is there evidence to suggest that the degree of multi- or interdisciplinarity within a team influences its lifecycle or its outcomes?



5.Do collaborating groups share a definable set of norms and expectations regarding how CMC-based interactions are supposed to function in order to ensure successful collaborations?

6.If there are such norms, do they appear to be established ad-hoc by the collaborating groups, or are they established (formally or informally) externally to the groups, and adopted as part of the working strategies of the groups?

7.Is there evidence of conflicting norms, or of multiple "information worlds" coming into contact or conflict during collaborations?

8.Is there evidence of different types of virtual teams and projects in the research sample, particularly in terms of the different external worlds represented by team members, and are such differences linked to team outcomes or to team members' willingness to work in virtual teams again?

Life Cycle Models

The lifecycle model(s) developed in the research will enable multidisciplinary virtual scientific teams to better exploit computer-mediated communication technologies to extend their lifecycles from discrete projects to the long-term programs of research required to solve complex scientific problems. Every effort, including external evaluation, will be made to ensure that the model may be generalizable to other federally funded national laboratories, as well as to private sector scientific collaborations, thus enhancing national scientific productivity and global competitiveness.

The model(s) are expected to contribute to the advancement of both practical and theoretical knowledge: 1) within the domain of collaborative scientific inquiry, the model(s) will enable virtual multidisciplinary scientific teams to better exploit computer-mediated communication technologies to extend their lifecycles from discrete projects to the long-term programs of research required to solve complex scientific problems; 2) within the domains of social informatics and the science & technology studies, the model(s) will provide a framework for implementing theoretically-informed future research on virtual organizations and sociotechnical systems.