

# Human Factors in Four Cases of E-Collaboration in Biomedical Research: A Qualitative Study

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## ABSTRACT

*There are compelling arguments for using internet technologies to facilitate research in the biomedical sciences. This project sought to fill a gap in empirical studies of e-collaboration use by biomedical research teams through a study of four cases, based in the research precinct associated with one Australian university, collaborating with international researchers. Researchers were found to hold mixed beliefs and show varying degrees of systematic thinking about how, when and why e-collaboration supported their activities. It appears that researchers need assistance to conceptualise and articulate what works in order to transform their e-collaboration practices to yield increased scientific efficiency and productivity.*

*Keywords: Biomedicine, Collaboration, Cyberinfrastructure, E-Collaboration, Human Factors, Researchers*

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## INTRODUCTION

There are compelling arguments for using internet and web technologies to facilitate research in health and biomedical sciences in ways that improve processes and outcomes.

Major public and private investment programs (see for example, Alving, 2008) are driving health and biomedical sciences research of a kind that cannot be done without facilitative technologies. This research is characterised by

multidisciplinary teams from multiple organisations across the globe, working with very large and multi-dimensional data sets. The data may include imaging, genomic, and geospatial data. These data sets may be drawn from distributed sources, in real-time and over long time periods. They may require highly specialised instrumentation and supercomputing power to analyse. This research may come with new sorts of human research ethics concerns. It has high stakes in terms of accuracy and integrity and occasionally it has critical timelines (see for example, the account by Fowler et al., 2010,

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of research into the potential H1N1 influenza pandemic).

The assumed information technology infrastructure needs of such research have stimulated development of sophisticated tools for facilitating collaboration (see for example, Makedon et al., 2003). However, in actuality, many conventional biomedical research practices still rely on communication methods that the printer of the Gutenberg Bible would recognise. They are far removed from the ideal of “a virtual web of interconnected data, individuals, and organizations that redefines how research is conducted, care is provided, and patients/participants interact with the biomedical research enterprise” (p. 9), as Buetow (2008) has noted.

Within and beyond biomedicine, Elgort and Wilson (2008) used the term e-collaboration to describe the application of a range of electronic information and communication tools to facilitate a variety of collaborative functions in distributed teams. Kock’s (2005) definition of e-collaboration as “collaboration among different individuals to accomplish a common task using electronic technologies” (p. 3) encompasses computer mediated communication, computer supported cooperative work and even systems that pull together different pieces of information from different individuals without person-to-person interactions between them. According to Kock (2005), the study of e-collaboration entails six key concepts: the task, the technology, the individuals, the mental schemas of the individuals, the physical environment of the individuals, and the social environment of the individuals. He argues that e-mail’s success in the 1970s as the first real e-collaboration technology has not yet been matched in most organisational environments. Furthermore, Myneni and Patel (2009) noted that one of the most frequent issues collaborators within or in different fields had was the “representation and communication of context” (p. 258). Within an interdisciplinary collaborative team, individuals were coming to the information from different points of view and current data sharing and communication

tools often limited their ability to share their diverse perspectives.

## LITERATURE REVIEW

Research into e-collaboration in health and biomedical science research falls within a small, but growing, body of research in “the human infrastructure of cyberinfrastructure” (Lee, Dourish, & Mark, 2006). Despite its growing importance to the future of research practices, e-collaboration in this environment is not often described. In contrast to research in commercial environments, there has been little consideration given to e-collaboration in health and biomedical research endeavours.

There has been important qualitative research into e-collaboration undertaken, such as the study of the management of virtual projects by Khazanchi and Zigurs (2006), but the data gathered through questionnaires and focus groups was from business people. This qualitative research is supplemented with behavioural studies such as the Wickham and Walther (2007) study of undergraduate students undertaking computer-mediated decision-making. The sociolinguistic research by Gefen, Geri, and Paravastu (2007) shows that the gender is a factor in how individuals interact in an e-collaboration environment, though data was from text-only postings in an online discussion.

Predictably the literature contains a range of tool-focused articles such as Hesse’s overview (2008) of grid computing, data mining, visualisation, data linking, and decision support and Schleyer et al.’s (2008) prototype of a social network for prospective collaborators to find each other. However, as Buetow (2005) puts it, “it is one thing to suggest that cyberinfrastructure could transform biomedicine and quite another thing to achieve this transformation ... The biology end user really doesn’t care what technologies underlie cyberinfrastructure” (p. 822).

Buetow’s (2005) is an extreme view of human factors. Others have developed multifaceted conceptual models of human factors

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