

## Chapter 6

# E–Collaboration in Biomedical Research: Human Factors and Social Media

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### ABSTRACT

*There are compelling arguments for using emerging Web technologies to facilitate research in the biomedical sciences. This chapter reviews current research and current technologies for e-collaboration in biomedical research. This chapter presents four case studies examining the use of Web-based tools to support the teamwork of geographically distributed biomedical researchers. It then reviews case study findings in light of the Web 2.0 e-collaboration enablers that are available. It concludes with surprising and concerning reflections about current practices in biomedical research collaboration as well as some promising future directions through the use of biomedical informatics to advance these practices by addressing human factors.*

### INTRODUCTION

There are compelling arguments for using 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 so-called “big

science” research is characterised by multidisciplinary teams from multiple organisations across the globe, working continuously with very large and multi-dimensional data sets. High profile initiatives include the Human Genome Project and the discovery of the multifactorial causes of cancer (genetic, environmental).

The data may include data types one would expect – epidemiological data, clinical data, pathology data, imaging data; increasingly however

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they also include new data types – geospatial data, genomic and epigenomic data, and bio-psycho-social data collected by citizens themselves using self-quantification tools. 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. They are undoubtedly “big data” (Asakiewicz, 2013).

The use of these data for biomedical research comes with new sorts of human research ethics concerns, too. There are high stakes in terms of purpose, accuracy and integrity (Riley et al., 2013) and increasingly there are critical timelines for population health (see for example, the account by Fowler et al., 2010, 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 would be recognizable to a member of the Royal Society in the 18<sup>th</sup> Century. 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 between 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.

In this chapter we reflect on an empirical study that was conducted in order to learn more about aspects of e-collaboration by biomedical research teams, specifically the effective use of web-based tools to support the teamwork of geographically distributed researchers. This chapter summarises the findings from the four ensuing case studies of e-collaboration in the era of web 2.0, and then discusses these findings in the light of the new information and communication enablers that this era has produced. The chapter concludes with some surprising and concerning reflections as well as some promising future directions, for those seeking to advance the practice of biomedical research by addressing human factors in e-collaboration.

### **HUMAN FACTORS IN E-COLLABORATION IN BIOMEDICINE**

This part of the chapter reviews the literature on human factors in e-collaboration in health and biomedical science research. Research into e-collaboration in this field falls within a small, but growing, body of research in “the human in-

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