

# Chapter 12

## The Value of Sociotechnical Theories for Implementation of Clinical Information Systems

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### ABSTRACT

*The following chapter provides an overview of sociotechnical theories that can be used to understand, design, implement, and evaluate clinical information systems in health care settings. The sociotechnical approach is one that seeks to identify the dynamics between technology and the social, professional, and cultural environment in which it is used. Theories and models covered include: the technology and information technology acceptance models; a multi-level integration framework approach; social cognition theory; theories that propose a fit between individuals, tasks and the technology; diffusion of innovation theory, and a contextual implementation model. The frameworks presented in this chapter are not exhaustive but are most relevant to the complexity of information and communication technology use in health care settings.*

### INTRODUCTION

Socio-technical theories of organizational life were first derived from studies conducted in the 1950s (Trist & Bamforth, 1951). In essence these theories espoused the view that to improve organisational

performance consideration needs to be given to optimizing both technical work processes and the social systems within the work environment.

This chapter presents an overview of sociotechnical theories which are applicable to understanding, designing and evaluating the implementation processes of clinical information systems in health care settings. Contemporary health organisations

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are complex, composed of deeply interdependent and interrelated social and technical elements where changes to one aspect will affect the other (Wears & Berg, 2005). The introduction of any new technology into a complex organisational setting will entail innovation in clinical roles, work processes, and culture change (Ash, et al., 2003; Ash, Sittig, Campbell, Guappone, & Dykstra, 2006; Ash, Sittig, Dykstra, Campbell, & Guappone, 2009; Berg, 1998; Callen, Braithwaite, & Westbrook, 2007; Callen, Braithwaite, Westbrook, Callen, & Westbrook, 2009; Coiera, 2004; Gosling, Westbrook, & Coiera, 2003; Kaplan, 1997; Massaro, 1993) whilst the attitudes and utility of technology is simultaneously socially shaped (Coiera, 2004). Implementation of information systems in any environment must take account of the users of the system and the organizational context to ensure the technology fits and works within this framework

The sociotechnical approach to clinical information systems implementation is one which seeks to identify the dynamics between technology and the social, professional, and cultural environment in which it is used (Berg, 1999). The limitations of a purely technocentric approach to implementation became apparent when early projects were less than successful and purported benefits of Information and Communication Technology (ICT) rarely realised (Berg, 2004; Littlejohns, Wyatt, & Garvican, 2003; Whetton, 2005). Causes of implementation failure extend beyond poor system design to the erroneous perceptions and theories about how medical work is conducted (Aarts, Ash, & Berg, 2007; Aarts & Gorman, 2007; Wears & Berg, 2005). Clashes between the model of health care work inscribed in these tools with the actual nature of work has resulted in staff resistance and decreased organisational uptake of ICT, as well as the facilitation of some unexpected and negative effects in efficiency and patient safety (Ash, et al., 2009; Berg, 2004; Han, et al., 2005; Koppel, et al., 2005). It has been advanced that ICT in health care is being used to address the ‘wicked prob-

lem’, of how to deliver sustainable health delivery systems facilitated by information technologies (Westbrook, et al., 2007). Wicked problems are dynamic with multiple sets of complex, interacting issues that evolve in an emergent social context and solutions applied will often contain within them other wicked problems, and will generate new wicked problems (Ritchey, 2005; Rittel & Webber, 1973). Sociotechnical theories provide a useful paradigm within which to appreciate and explain the magnitude and complexity of the task of implementing clinical information systems.

The theories and models presented in this chapter are not exhaustive. Some frameworks are presented as models which represent an abstract view of a complex reality whereas some are described as theories which attempt to explain a group of facts or phenomenon. There are many valuable theories and models which can inform IT implementation. However those presented in this chapter are most relevant for the implementation of clinical information systems.

## **MODELS**

### **Technology Acceptance Model (TAM) and Information Technology Acceptance Model (ITAM)**

Two early information system evaluation models which have utilized attitude theory from psychology are the technology acceptance model (TAM) (Davis, 1989, 1993) and the information technology adoption model (ITAM) (Dixon, 1999). Davis (Davis, 1989) developed a validated measure which can be used to predict perceived usefulness and perceived ease of use of the technology, which he theorized were fundamental determinants of whether the system would be used. The TAM (Figure 1) proposes that a users’ attitude to the system will have a major impact on how the system is viewed. The attitude towards using the system is dependent upon the perceived usefulness

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