Chapter 3
Interactive Sociotechnical Analysis:
Identifying and Coping with Unintended Consequences of IT Implementation

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ABSTRACT

Many unintended and undesired consequences of healthcare information technologies (HIT) are generated by interactions between newly introduced HIT and the existing healthcare organization's sociotechnical system--its workflows, culture, social interactions, physical environment, and technologies. This chapter presents and illustrates a model of these interactions that we call interactive sociotechnical analysis (ISTA). ISTA places special emphasis on recursive processes (i.e., feedback loops that alter the uses of the newly introduced HIT) promote second-level changes in the social system, and sometimes lead to changes in the new HIT systems themselves. We discuss ISTA's implications for improving HIT implementation practices and suggest how clinicians, IT specialists, and managers can better anticipate likely consequences of introducing HIT; more effectively diagnose unforeseeable consequences which emerge during implementation; and better respond to these emerging consequences.

INTRODUCTION

Electronic Health Records (EMR), Computerized Physician Order Entry (CPOE), and Decision Support Systems (DSS) promise to contribute substantially to the quality of care (Bates, 2005; Chaudhry et al., 2006; Shamliyan, 2007). Nonetheless, implementation of these types of Health Information Technology (HIT) in the United States has fallen far short of this promise and has often produced disappointing results (Blumenthal & Glaser, 2007; Crosson et al., 2007; Fitzhenry et al., 2007; Grossman, Gerland, Reed, & Fahlman, 2007; Linder, Ma, Bates, Middleton, & Stafford, 2007; Chaudhry et al., 2006; Sidorov, 2006). Some HIT projects have been scaled back or abandoned altogether (Conn, 2007).

Many of these disappointments reflect undesired and unanticipated consequences that emerge during the HIT's implementation (Ash, Sittig, Poon et al., 2007). In an earlier paper we traced common, unanticipated consequences to five types of sociotechnical interactions among new HIT and the provider organization's existing social and technical systems -- including workflows, culture, social interactions, physical infrastructure, and technologies (Harrison, Koppel, & Bar-Lev, 2007). In that paper we presented the main types of interactions in a conceptual framework (or model) we call Interactive Sociotechnical Analysis (ISTA),

This chapter starts with a review of ISTA's background and its main features. Then, drawing on published studies and on our and others' observations, we provide an array of illustrations of unintended consequences that arose from the processes depicted in the ISTA model. There follows a discussion of ISTA's implications for improving HIT implementation practices. In particular we suggest ways in which clinicians (i.e., physicians and nurses), IT specialists, and managers can better anticipate the likely consequences of HIT implementation; more effectively diagnose unforeseeable consequences which emerge during implementation; and better respond to these emerging consequences.

BACKGROUND

Studies of Unintended Consequences

A growing body of research and user reports reveals many unanticipated and undesired consequences of implementation (Aarts, Ash, & Berg, 2007; Ash, Berg, & Coiera, 2004; Campbell, Sittig, Ash, Guappone, & Dykstra, 2006; Han et al., 2005; Koppel et al., 2005; Rosenbloom et al., 2006; Schneider & Schneider, 2006; Silverstein, 2006; Wachter, 2004, 2006; Wears & Berg, 2005). Un-

anticipated and undesirable consequences, which are usually just called unintended consequences (Ash, Sittig, Dykstra et al., 2007), often undermine patient safety practices and occasionally harm patients (Weiner, Kfuri, Chan, & Fowles, 2007; Campbell, Sittig, Ash, Guappone, & Dykstra, 2007; McAlearney, Vrontos, Schneider, Christine R. Curran, & Pedersen, 2007). Unintended consequences also lead to cost escalations, resistance to implementation, and sometimes to failures of HIT projects (Silverstein, 2006).

The literature on HIT's unintended consequences documents these interactions and contains several typologies and conceptual frameworks that help guide research and practice (Ash, et al., 2004; Ash, Sittig, Dykstra et al., 2007; Campbell et al., 2006). Our previous paper (Harrison, Koppel, & Bar-Lev, 2007) provides a detailed comparison of the ISTA model to the best-known typologies (Ash, et al., 2004; Campbell et al., 2006). One of the most important differences concerns the typologies' usability. Conceptual frameworks are usually more helpful when they represent important empirical variations through just a few distinctive types.

To enhance ISTA's usability we sought to encompass the diverse sociotechnical sources of unintended consequences within just five types, and we characterized these types in terms of a very limited set of concepts. Moreover, we placed greater emphasis than previous studies did on consequences resulting from emergent interactions and containing recursive feedback loops among elements of the sociotechnical system – for example, effects of HIT on clinical practices and relations, which in turn shape the way that HIT is used.

Research Foundations

ISTA draws on five distinct bodies of research. First, traditional sociotechnical systems (STS) research documents dynamic, mutual influences among the social subsystem (people, tasks, rela-

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