Analyzing Key Decision-Points: Problem Partitioning in the Analysis of Tightly-Coupled, Distributed Work-Systems

Susan Gasson, Drexel University, USA

ABSTRACT

This study explores innovative approach to early requirements analysis for boundary-spanning organizational information systems. It is argued that software engineering methods, focus on reductionist problem-definitions, while participatory design methods hinge on the unrealistic expectation that users have the time and interest to engage in design. Neither approach analyzes the relationship between formal decision-support and the informal knowledge and interaction processes that coordinate tightly-coupled, distributed systems of work. The author focuses their analysis on key decision-points as these embody the coordination-points of distributed work-systems, combining informational and processual knowledge. The method is developed and validated by means of an action research study of the Trauma care processes of a hospital emergency department – an environment characterized by highly-regulated, formal reporting requirements, with rapid-response decision-making that relies on the coordination of distributed knowledge across a variety of actors and work-roles.

Keywords: Boundary-Spanning Systems, Early Requirements Analysis, Information Systems, Key Decision-Points, Problem Partitioning, Soft Systems Methodology, Tightly-Coupled Systems

INTRODUCTION

In rapid response contexts such as healthcare systems, where expertise is distributed across multiple specialisms, information systems (IS) support requires analysis techniques that surface tacit and informal understandings of how work-practices are coordinated. Knowledge about information requirements and criteria for monitoring the effectiveness of these complex systems of work are often distributed across a fluid set of organizational actors, each of whom only understands the decision as it relates to their domain of expertise. In such distributed, tightly-coupled work-systems participants lack a shared understanding of their IS support needs (Faraj & Xiao, 2007; Ren et al., 2008). Current or potential IS users are bound by time-constraints or too absorbed by their specialist domains to commit to participative design (Isomäki & Pekkola, 2005). The increasing use of software packages and outsourcing to provide IT systems support in environments where the IS function is not seen as central to the operational mission, means that organizational actors lack the opportunity to engage in user-centered design and so must participate in analyst-led requirements investigation (Iivari & Iivari, 2011).

In these circumstances, IS analysts need to enable workgroup-participants to assemble...
a diverse set of individual, partial perspectives into a coherent whole (Gasson, 2007). They must use methods that allow participants to relate their own practices and purposes to a wider system of work that embodies the multiple perspectives and purposes of other participants (Checkland, 1999; Stowell, 2008). Finally, they must partition and structure a complex, subjective organizational problem into actionable sub-problems that provide the basis for improvement to work processes and information systems (Lehaney et al., 1997; Winter, 2006). Change must be undertaken in a spirit of inquiry, exploring changes iteratively until consensus is reached in an acceptable information technology (IT) systems for work support and monitoring. Each wave of changes will introduce new requirements that will be resolved partly through the adaptive design of supporting IT systems and partly through user improvisation (Balogun & Jenkins, 2003; Markus et al., 2002).

This paper explores effective mechanisms for organizational problem-partitioning in IS change initiatives, by means of an exploratory, interpretive action research study. The research objective was to develop and test a method for early requirements analysis, which is suitable for tightly-coupled, distributed work-systems whose participants are unable to engage in user-centered group design. By understanding the ways in which key decisions – both formal and informal – coordinate complex, interdependent work-systems, we develop ways to support and monitor the effectiveness of such systems. This compares starkly with the single-criteria “performance” measures that are used in formal information systems to monitor the efficiency of elements which do not reflect the system’s embedded purposes, but merely those aspects that are easiest to measure.

CONCEPTUAL UNDERPINNINGS

Decision-Making in Tightly-Coupled Systems of Work

An organizational information system (IS) encompasses both a system of interrelated work practices and the information technology (IT) required to supply its information inputs and recording needs. IS change therefore requires the simultaneous exploration and design of work processes and IT systems support (Checkland, 1999; Stowell, 2008). People who collaborate across knowledge domain boundaries usually evolve polycontextual frameworks for action that interpret the work performed by people from other domains and provide meaning for distributed activities and decisions (Balogun & Jenkins, 2003; Engeström et al., 1995). But in medical environments, the strict role-definition and status distinctions between participants in joint systems of work problematize the development of boundary-spanning expertise (Faraj & Xiao, 2007; Ren et al., 2008). Change agents from the IS function must develop the polycontextual knowledge that is required to analyze and intervene in tightly-coupled, role-based systems of work. They must relate or translate local, workgroup-based knowledge to the type of formal, global rules and decision-criteria used in the design and configuration of IT systems.

When people collaborate closely, they shift seamlessly between individual and shared work, coordinating what they do through an interpretation of situated work-roles and awareness of other group members’ activities (Dourish & Bellotti, 1992; Gutwin & Greenberg, 2004). In the rapid-response, distributed work system presented by a hospital emergency department, boundary-spanning groups of carers – nurses,
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