THE INFLUENCE OF IS AFFORDANCES ON WORK PRACTICES IN HEALTH CARE: A RELATIONAL COORDINATION APPROACH

Research-in-Progress

Ina M. Sebastian
University of Hawaii
Shidler College of Business
2404 Maile Way, E303
Honolulu, HI 96822
isebasti@hawaii.edu

Tung X. Bui
University of Hawaii
Shidler College of Business
2404 Maile Way, E303
Honolulu, HI 96822
tunbg@hawaii.edu

Abstract

High-reliability healthcare organizations, such as Intensive Care Units, operate in challenging high-velocity environments regarding decision-making, uncertainty, and time constraints. Further, these organizations are multidisciplinary, professionally driven, and characterized by a strong hierarchical structure. Given such conditions, effective cross-functional communication is critical for ensuring successful work practices. We propose a theoretical model of IS affordances and Relational Coordination in the presence of functional status differences. We establish a set of propositions regarding how use patterns and types of IS affordances enable or constrain potential effects on Relational Coordination. We are currently conducting a case study of an ICU in a major University hospital, with the goal to iteratively refine our theory and propositions. We hope that this research will offer an in-depth understanding of the types of opportunities related to information systems, and the role of individual-level interpretations and actions across functional groups for these opportunities.

Keywords: Information Systems affordances, Relational Coordination, communication, high-reliability organizations, high velocity environments, Health Care Information Systems, case study, Intensive Care Units
**Introduction**

Health Information Technology (HIT) is viewed as an increasingly important market and research area for Information Systems scholars. Existing HIT research has focused on two broad areas: HIT adoption issues, and impact of HIT on health care performance (Fichman et al., 2011). However, evidence of HIT’s impacts on clinical quality and efficiency is still equivocal in broad, large-scale studies, and influence mechanisms are not well understood (Agarwal et al., 2010; Pinsonneault et al., 2012). Researchers have recently argued that studies of HIT impact on performance should assess relationships at a deeper level, considering functionality and multiple components of HIT systems and differences in health care settings (Agarwal et al., 2010; Fichman et al., 2011). In order to understand how HIT affects performance in health care organizations, we have to determine which characteristics of the health care context are most critical for effective work practices.

Current trends in health care include increasing medical knowledge, specialization, and interdependence (Nembhard and Edmondson, 2006). Health care organizations are examples of high-reliability organizations (HRO’s), which operate in environments with high levels of uncertainty and high stakes of decision making (Roberts, 1993). High-velocity health care settings like Intensive Care or Trauma Units additionally require rapid decision making and adaptive coordination in daily work practices (Faraj and Xiao, 2006; Yun et al., 2005). Further, health care organizations are highly multidisciplinary, professionally driven, and characterized by a strong hierarchical structure (Fichman et al., 2011). Due to the high-reliability nature of health care organizations, hierarchy is critically important for safe and effective operations. However, a challenge is that hierarchy must also allow for flexibility and teamwork based on the problems encountered (Klein et al., 2006; Roberts et al., 2005; Roberts and Tadmor, 2002). These characteristics suggest that cross-functional communication is critical for effective work practices and performance in health care organizations. Cross-functional communication is therefore the focus of this research.

In order to examine how HIT influences cross-functional communication, this research utilizes Relational Coordination Theory, which identifies specific dimensions of relationships that are required for effective role-based coordination through communication in complex knowledge processes (Gittell et al., 2010). Empirical studies have linked Relational Coordination to performance in high-reliability organizations, including various health care organizations (e.g., Gittell et al., 2010). Moreover, performance effects of Relational Coordination are expected to be highest in high-velocity settings with increased uncertainty, time constraints, and reciprocal task interdependence (Gittell et al., 2010). In the order to account for the hierarchical structure of health care organizations, this study also considers the role of status differences in the relationship between HIT and Relational Coordination.

In this research, we use a Relational Coordination approach to examine how Information Systems use affects work practices and performance of multidisciplinary groups with status differences in health care settings. In particular, we want to understand how HIT can support Relational Coordination and mitigate negative effects of status differences, with focus on high-velocity settings. We propose a theoretical model and establish a set of propositions, which we will iteratively refine in a qualitative case study of an Intensive Care Unit in a Level Two Trauma Center.
Relational Coordination and IT Use

Relational Coordination Theory represents one of the recent approaches to coordination, which are increasingly recognized as valuable perspectives for explaining complex work processes and knowledge work (e.g., Gittell et al., 2010). ‘Conventional’ workflow-based approaches to coordination focus on interdependencies among resources and activities, and tend to assume that predefined mechanisms can be specified (e.g., Malone et al., 1999). Relational approaches to coordination argue that coordination of knowledge work and complex processes should focus more on interdependencies of people, distributed specialized skills, and content and circumstances of coordination. Relational approaches to coordination in the literature include Relational Coordination Theory (Gittell, 2011), expertise coordination (Faraj and Sproull, 2000), Transactive Memory Systems (e.g., Brandon and Hollingshead, 2004), and sensemaking (Weick, 2009).

Relational Coordination Theory (RCT) argues that coordination of knowledge work in high-reliability settings is carried out in the context of relationships with other group members and occurs through a mutually reinforcing circle of relational ties and communication ties (Gittell, 2011). In particular, participants must be connected by relationships of shared knowledge, shared goals and mutual respect for effective coordination, which is represented by frequent, timely, accurate, and problem-solving communication (Gittell et al., 2010). Table 1 provides a short summary of the Relational Coordination dimensions based on Gittell (2006) and Gittell et al. (2010). Relationships provide additional capacity for coordinating work (Gittell, 2006). In this empirical study, we plan to consider trust as a distinctive dimension of Relational Coordination, because mutual respect and trust are distinctive components of relational capital, a dimension of social capital (Kankanhalli et al., 2005).

<table>
<thead>
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<th>Table 1. Relational Coordination Dimensions</th>
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<td><strong>Relational Dimensions</strong></td>
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<td>Shared Knowledge</td>
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<td>Shared Goals</td>
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<td>Mutual Respect</td>
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<td><strong>Communication Dimensions</strong></td>
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<td>Frequency</td>
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<td>Timeliness</td>
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<td>Problem Solving</td>
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Several empirical studies on Relational Coordination in high-reliability organizations have considered Information Systems as one cross-functional coordination mechanism with potential effects on Relational Coordination. These studies focused on large scale quantitative models, with a composite index for Relational Coordination and lean measures for Information Systems (e.g., ‘number of cross-functional interfaces mediated primarily by IT’, ‘perceived frequency of IS use’) (Gittell, 2000; Hagigi, 2008). While there is increasing evidence for a positive association between information systems use and the level of Relational Coordination, there are also negative examples. For example, inclusiveness of Information Systems (i.e., number of features) was associated with a higher level of Relational Coordination in hospitals (Gittell, 2009). However, the number of cross-functional interfaces primarily mediated by IT
was negatively associated with the level of Relational Coordination in a case study of flight departure processes (Gittell and Weiss, 2000).

Information Systems Affordances

In order to capture the complexity of the health care context and HIT implementations, this research utilizes the concept of IS affordances to examine potential effects on Relational Coordination. IS affordances can be defined as “...the possibilities for goal-oriented action afforded to specified user groups by technical objects” (Markus and Silver, 2008, p.622) in a seminal paper, or more simply as “...what the user can do with the technology” (Goh et al., 2011, p.568) in a recent health care study. These researchers view affordances not as properties of objects, but as relations between objects and users. Therefore, this concept offers a rich approach to study effects of information systems in health care contexts, as it allows us to conceptualize different perceptions and use patterns of information systems based on how information systems features relate to goals and capabilities of specific users and user groups (Markus and Silver, 2008). The non-deterministic relationship of IS affordances and organizational dynamics is anchored in the structurational view of agency and structure as mutually constitutive (Markus and Silver, 2008; Zammuto et al., 2007). When clinicians engage with information systems to perform their work tasks, they perceive IS affordances (e.g., enhanced computer supported communication) and adjust their work practices accordingly. “As people attempt to reconcile their own goals with the materiality of a technology, they actively construct perceptual affordances and constraints” (Leonardi, 2011, p.154).

Because goals and capabilities differ according to functional roles and status of clinicians, interpretations and actions regarding IS affordances may also differ, with potential consequences for the capacity of IS affordances to influence Relational Coordination. Drawing on the definition of IS affordances as relations between IS features and goals and capabilities of specific users (Markus and Silver, 2008) as well as observations in a recent health care study (Strong et al., 2009), we therefore consider the consistency of interpretations and actions regarding IS affordances as a potentially critical factor for how information systems use can affect coordination in cross-functional health care teams.

Looking at IS affordances further allows us to differentiate between different affordance types in health care settings, which may affect Relational Coordination differently. Recent exploratory empirical studies have identified specific IS affordances associated with HIT in two health care settings: a Computerized Documentation System in an Intensive Care Unit (Goh et al., 2011), and an Electronic Health Record System in a multi-site clinic (Strong et al., 2009). Due to the similarities of the identified IS affordances in both settings, we use these examples to guide the creation of initial IS affordance types for this research: communication, decision support, accountability, and compliance (see Table 2).

<table>
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<tr>
<th>IS Affordance Types</th>
<th>IS Affordances</th>
<th>ICU</th>
<th>Clinic</th>
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<tr>
<td>Communication</td>
<td>Facilitate communication</td>
<td>Facilitate prompt communication</td>
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<td></td>
<td>Provide specialized note templates</td>
<td>Enhance substitutability</td>
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<tr>
<td>Decision Support</td>
<td>Provide clinical decision support</td>
<td>Provide patient knowledge management</td>
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<td></td>
<td>Support enhanced teaching</td>
<td>Provide decision making</td>
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<td>Accountability</td>
<td>Provide accountability</td>
<td>Provide accountability</td>
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<tr>
<td>Compliance</td>
<td>Ensure full compliance on information completeness</td>
<td>Provide standardization</td>
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<td></td>
<td>Support coding and billing</td>
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Table 2. IS Affordance Types
By conducting an in-depth case study of an Intensive Care Unit, we will span the conceptual abstraction of IS affordance types, but also investigate context-specific aspects of IS affordances in detail. For example, within the IS affordance type ‘communication’, we will examine different communication affordances, based on relations between technical objects (e.g., progress note) and user groups (e.g., physicians).

**Role of Status Differences**

Many research studies have noted that status hierarchy is strong in health care (e.g., Nembhard and Edmondson, 2006). While positive effects on team learning were observed with certain leadership characteristics (Rose, 2011; Van der Vegt et al., 2010), reports of negative effects dominate in the organization science literature. Research of organizational and group learning has increasingly challenged rational models of expertise collaboration and learning and advocated the importance of status and power (e.g., Bunderson and Reagans, 2011). The findings of these studies suggest that status differences might have strong negative effects on all Relational Coordination dimensions. For example, status differences inhibit anchoring on shared goals, as well as communication across boundaries, such as knowledge sharing, helping and help seeking behavior, and consideration of insights of lower-status individuals (Bunderson and Reagans, 2011; Nembhard and Edmondson, 2006; Van der Vegt et al., 2010).

Information Systems may mitigate impacts of status differences on Relational Coordination. Technical objects can serve as boundary objects, which are necessary to facilitate collaborative knowledge processes in the presence of different interests and novel situations (Carlile, 2004; Markus and Silver, 2008). Further, IS studies have shown that implementations of new technologies were associated with emergent work practices, which led to a restructuring of role relations in health care settings (Barley, 1986; Leonardi and Barley, 2010). However, existing role relations and status differences may also influence the perception of opportunities associated with information systems. Strong et al. (2009) observed differences of individuals’ interpretations of IS affordances across functional groups in a multi-clinic health care setting.

Therefore, we believe that status differences could play two important roles in the study of how IS affordances affect Relational Coordination in health care. Status differences negatively affect Relational Coordination, which may be mitigated by IS affordances. Further, status differences may inhibit the extent to which IS affordances affect Relational Coordination, due to differing goals and capabilities of individuals.

**Research Model and Propositions**

We consider three questions of how information systems affect Relational Coordination:

1) How does the consistency of perceptions and enactments of IS affordances across functions influence potential effects on Relational Coordination?

2) How do perceptions of different types of IS affordances (i.e., communication, decision support, accountability, compliance) affect Relational Coordination?

3) Can IS affordances mitigate negative effects of status differences on Relational Coordination?
Figure 1 shows our theory-guided research model.

**Use Patterns of IS Affordances and Relational Coordination**

Users ‘appropriate’ (Leonardi, 2007) or ‘actualize’ (Strong et al., 2009) IS affordances when they use information systems in performing their tasks. They develop new goals and adapt organizational routines in response to perceived IS affordances during interaction with the system (Leonardi, 2011). In this process, a range of outcomes is possible. In order to achieve benefits associated with IS affordances on a group or organizational level, compatible interpretations and converged use of IS affordances are necessary (Leonardi, 2011b; Strong et al., 2009). Therefore we propose:

**Proposition 1a:** Consistency and high extent of individual actions associated with IS affordances across functional groups are necessary for positive effects on Relational Coordination.

However, functional groups in health care teams are strongly attached to their professional Communities of Practice regarding training, knowledge, and work practices (e.g., Faraj and Xiao, 2006). Further, team dynamics strongly depend on how hierarchy is enacted in the workplace (e.g., Bunderson and Reagans, 2011). Therefore we propose:

**Proposition 1b:** Status differences promote inconsistent interpretations of IS affordances across functions, which may undermine positive effects on Relational Coordination.

**IS Affordance Types and Relational Coordination**

A review of findings from the research streams on Knowledge Management Systems (KMS), social capital, Transactive Memory Systems (TMS) and collaboration suggests that IS affordances can affect all dimensions of Relational Coordination in health care, if positive, compatible use patterns enable enacted IS affordances according to Proposition 1a. Further, different IS affordance types (i.e., communication, decision support, accountability and compliance) may affect the Relational Coordination dimensions differently.

For example, researchers have linked IS affordances associated with KMS to the development of social capital and TMS, which are concepts related to Shared Knowledge (Choi et al., 2010; Sherif et al., 2006).
Therefore, this research suggests that IS affordances can influence the awareness of the overall process and the roles and information needs of different functional groups in the process (i.e., Shared Knowledge).

Our literature review further suggests that different IS affordance types may affect Relational Coordination differently. For example, IS affordances of communication and decision support may facilitate Shared Knowledge based on real-time information on patients, team members and central knowledge. In contrast, IS affordances of compliance and accountability may facilitate Shared Knowledge by promoting shared cross-functional interpretations based on standardized forms and methods. Therefore, we propose:

**Proposition 2:** Each IS affordance type (i.e., communication, decision support, accountability and compliance) may have a distinct effect on the Relational Coordination dimensions.

Proposition 2 is exploratory and will be refined iteratively with a grounded empirical approach, with the goals to establish a detailed proposition and identify specific dimensions of IS affordance types, which emerge as particularly relevant for effects on Relational Coordination.

### IS Affordances and Effects of Status Differences on Relational Coordination

The concept of pragmatic boundaries is one way to view negative effects of status differences (i.e., different interests impede the ability to share and assess knowledge) (Carlile, 2004). Research has argued that pragmatic boundary objects are needed to facilitate joint knowledge in these types of situations (Carlile, 2004). In this context, we argue that IS affordances may help bridge pragmatic boundaries in cross-functional conflicts. Certain IS affordance types may be more relevant than others.

**Proposition 3a:** IS affordances mitigate negative effects of status differences by providing objective input in conflict situations.

High-status individuals with collective orientation engage team members of different professional groups and status in shared practices (Van der Vegt et al., 2010). Researchers in the field of organizational and group learning have argued that such individuals play a key role for group processes in the presence of status differences (e.g., team learning) (Van der Vegt et al., 2010). Levina and Vaast (2008) recommended that future IS research should focus on how specific managerial practices and particularly the use of IS can help mitigate negative effects of status differences and create joint fields of practices. However, existing case studies in health care settings suggest a variety of collective orientations of high-status individuals and responses to IS affordances (Anderson, 2011; Strong et al., 2009). Therefore, we propose:

**Proposition 3b:** IS affordances support activities of high-status individuals, who seek to mitigate negative effects of status differences on Relational Coordination. However, IS affordances have limited capacities to increase collective orientation of high-status individuals.

### Research Design and Methods

This research utilizes a case study methodology, due to its suitability to examine the complexity of high-velocity/high-reliability environments. The case study method is rich and flexible, and therefore considered as particularly appropriate to explain complex interactions among IS users, organizations and technology (Dubé and Paré, 2003; Myers, 1997).

Using the theory-guided research model, we will iteratively refine the propositions with our case study of an Intensive Care Unit. ICU’s meet the requirements of high-velocity/high-reliability settings. Further, ICU’s are environments with status differences and need for Relational Coordination. Recent research has identified interprofessional collaboration, which includes the elements shared goals, mutual respect and power sharing, as important for performance in ICU’s (Rose, 2011). Hospitals and ICU’s in particular operate in complex, dynamic, time-constrained, and stressful environments, with continuously changing composition of teams due to large staff numbers, rotation and shift work (Piquette et al., 2009; Rose, 2011). These dynamics can present challenges to collaboration and therefore Relational Coordination. Barriers to collaboration in ICU’s identified in existing literature include limited understanding of roles and responsibilities, specialized knowledge and clinical territory, status barriers, organizational culture.
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and communication patterns (Rose, 2011). The context of a high-reliability/high-velocity setting will further provide insights on potential changes of Relational Coordination at the instance level. A recent case study in an ICU found that cross-functional perceptions of interactions, respect and shared goals changed in routine and crisis situations (Piquette et al., 2009).

We utilize semi-structured interviews as the primary data collection method. Figure 2 outlines our theoretical sampling strategy, according to typical work processes and primary role relationships in Intensive Care Units. Major work processes include rounds, handoff, orders, and consults. We also consider the process of creating and sharing progress notes, based on the importance of the topic in preliminary interviews, as well as emergencies. The involvement of clinicians from functional groups, which we differentiate according to professional discipline and status, differs in these work process. For example, the primary role relationship of interest in the order practice is that of physicians, nurses, and pharmacists, who belong to different professional disciplines with different status. Therefore we are interested in how IS affordances affect Relational Coordination between these three functional groups in the presence of status differences. In contrast, nurses with predominantly similar status comprise the primary role relationship in the handoff process. Further, all functional roles participate in multidisciplinary rounds. In summary, we will consider effects of IS affordances on Relational Coordination according to ICU work process and associated primary role relationships.

![Figure 2. Theoretical Sampling](image)

We will interview multiple individuals within different functional groups. We will analytically induce consistency of their interpretations of IS affordances from responses to interview questions related to how they and others in their functional role use the system to accomplish daily tasks. In preliminary interviews, we found that clinicians are very aware of how their professional groups and others use the information system.
Expected Contributions to the MIS Field

This study will improve our understanding of how information systems affect work practices and performance in health care settings with the combined approach of Information Systems affordances and Relational Coordination.

Relational Coordination Theory offers a new lens for the MIS field and is particularly valuable for the study of information systems effects in high-velocity health care, because cross-functional communication is critical for effective multidisciplinary work practices in such organizations. Relational Coordination has been linked to performance in several large-scale empirical health care studies, including high-velocity contexts. The theory further focuses on role relationships, which aligns with the study of highly cross-functional, ad-hoc, or fragmented teams.

An IS affordance lens is particularly valuable to capture the complex dynamics of the health care context and HIT implementations, which is necessary for a better understanding of potential effects on work practices and performance. HIT can make an important contribution to performance, but there is much evidence that this is difficult to accomplish. Therefore, we must understand when and why HIT supports effective work practices in different current health care settings. We believe that a detailed understanding with the concept of IS affordances is a critical factor in this process. This concept enables us to look beyond IS features and analyze how and why different users and user groups interpret and enact features, based on their goals, capabilities, and motivations. Moreover, we will contribute to the IS affordances literature with the study of IS affordance types and cross-functional interpretations and use patterns.

References


