

Negotiation and conflict in large scale collaboration: a preliminary field study

Yan Xiao · Sara Kiesler · Colin F. Mackenzie ·
Marina Kobayashi · Cheryl Plasters ·
F. Jacob Seagull · Susan Fussell

Received: 1 October 2005 / Accepted: 1 October 2006
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Abstract Coordinating activities in many settings can require people to manage conflict, potential and actual. Conflict arises from resource limitations, high-stakes consequences, uncertainty, goal conflict among stakeholders and hierarchical organizational structures. To understand coordination in such systems, we conducted a field study of management of surgical oper-

ating rooms. While coordinating interdependencies, such as progress monitoring, scheduling and rescheduling, and prodding, coordinators managed a set of complicated conflicts. They did so opportunistically, to resolve and to prevent conflict. Additionally, coordinators were concerned with perceived fairness. These findings indicate that, in the design of ICT to support coordination, we should examine not only the mechanical articulation of activities and efficient prioritization of resources, but also means to support companion social processes.

Keywords Coordination · Computer supported cooperative work · Conflict · Healthcare

Y. Xiao (✉)
Program in Trauma and Department of Anesthesiology,
University of Maryland School of Medicine,
685 W. Baltimore Street, MSTF-534,
Baltimore, MD 21201, USA
e-mail: yxiao@umaryland.edu

S. Kiesler · S. Fussell
Human Computer Interaction Institute,
Carnegie Mellon University,
Pittsburg, PA 15213-3891, USA

C. F. Mackenzie
National Study Center for Trauma & EMS,
University of Maryland School of Medicine,
685 W. Baltimore Street, MSTF-534,
Baltimore, MD 21201, USA

M. Kobayashi
Carnegie Mellon University Human Computer Interaction,
Pittsburg, PA 15213-3891, USA

C. Plasters
University of Maryland School of Medicine,
685 W. Baltimore Street, MSTF-534,
Baltimore, MD 21201, USA

F. J. Seagull
Department of Surgery,
University of Maryland School of Medicine,
685 W. Baltimore Street, MSTF-534,
Baltimore, MD 21201, USA

1 Introduction

Coordination is often characterized by multiple stakeholders who need to work together but also have some competing interests. Competing interests—motives, perspectives, customers—in organizations are perhaps more common than not (Bannon and Schmidt 1991). Consequently, the design of information and communication technology (ICT) to support coordination requires that we understand how coordination occurs not just to manage interdependencies (Malone and Crowston 1990), but also to manage competing interests. In healthcare, the introduction of large-scale ICT has met with resistance and failures (Aarts et al. 2004). Such failures remind us of the intricate nature of inserting ICT, as coordination in work settings is achieved by more than the mechanical articulation of individual activities; it also involves other social processes that interact with ICT.

Previous field studies on coordination in medical settings (Seagull et al. 2003; Plasters et al. 2003; Symon et al. 1996) have already described conflict and how people negotiate conflict to achieve coordination. In hospitals, especially those facing constant changes in their workload and medical crises, many details surrounding work processes are negotiated in the moment, such as when surgeries are started, which surgeon goes first or second, which equipment resource goes to which room, and whose patient waits. To reduce negotiation and variation, hospitals and professions have developed elaborate roles, procedures, technologies, and rules governing the work process. Scheduling today involves the routinization of priorities. However, workers often have to adjust schedules and resources, and collaborate in the moment. For example, nurses have to interrupt their own work to address an emergency and to reciprocate a coworker's help in the past. Surgeons have to trade operating times to accommodate an unusually long surgery. There are several potential sources of conflict in these negotiations. Structurally, medical personnel in different roles have different interests. For example, surgeons may be paid by surgical cases whereas nurses may be paid by the hour, with different implications for scheduling decisions. Since typically in-the-moment collaboration involves discussion, misunderstanding and miscommunication can spark conflict. People are likely to be biased in their own interest, and their limited resources, different perspectives, "turf" and control, prestige, and incompatible personalities can exacerbate conflict. Managing conflict, then, is an important feature of coordination in hospitals and has direct implications on design and deployment of ICT.

In this paper, we report a preliminary field study on coordination work involved in the management of surgical operating rooms in a trauma center. Our focus was on strategies used to manage conflict. Based on the findings, we then draw preliminary implications for use of ICT in coordinating work in such settings.

2 Methods

2.1 The domain

Surgical suites in large hospitals consist of several to a few dozens of individual operating rooms (OR). In each OR, more than one surgical case is usually carried out each day. Successful surgery depends on a team of highly specialized care providers working effectively together: physicians from different subspecialties (e.g., neurosurgery, orthopedics, anesthesiology), OR nur-

ses, technicians, and housekeepers. Often specialized equipment and supplies are needed as well. Personal and financial stakes are high for the patients, the care providers, and the hospital. Needed expertise and resources have to be carefully coordinated to ensure safety and operational efficiency.

Intricate dependencies exist among the cases scheduled for a given day, among care providers, and among resources. Extensive long-term planning and scheduling efforts are designed to maximize efficiency and to determine staffing requirements and capacity levels, which are expressed as OR times: how many ORs are staffed for how many hours each day. Individual cases are scheduled according to available OR times.

Despite these planning and scheduling efforts, much coordination effort is needed on the day of surgery. New cases may be added as a matter of medical emergency or as patients' conditions change. Scheduled cases may be canceled or delayed because patients or staff are not ready at the scheduled time. Scheduled surgery may turn out to be much longer or shorter than anticipated [coefficients of variation of 25% (Strum et al. 2000)]. Hence, a dedicated role, usually called the charge nurse, is employed to "run" the ORs: coordinating tasks, resources and staff. An attending level physician anesthesiologist (called the "charge anesthesiologist" or "floor runner") coordinates medical decisions (e.g. whether more investigations or blood tests need to be performed to determine if the patient is fit for surgery) and has senior rank over junior surgical personnel who schedule the patient for surgery. These two roles will be referred to as coordinators.

2.2 Data collection

The study site was a 6-room trauma surgical suite as part of a busy trauma hospital. About 100 cases were performed each week, two-thirds of which were scheduled before the day of surgery, and the remaining were either emergency or add-on cases. All cases on a day's schedule were handwritten on a large whiteboard ("OR board") centrally located (a description of which can be found in (Xiao et al. 2001)). The three groups of stakeholders (surgeons, nurses, and anesthesiologists) were organized by their profession and were in charge of their own staff scheduling. To capture a wide variety of data, we planned an intensive two week study with three data collection methods (described below): shadowing with active observations, interviewing, and examinations of documents and artifacts. Data collection methods were approved by the Institutional Review Board. Although the duration was relatively

short for the preliminary study, previous studies of coordination in the setting had provided familiarity with the context and coordination challenges in general (e.g., Seagull et al. 2003). Data collection efforts were guided by the following questions:

1. What are the sources and types of conflict that coordinators have to manage?
2. How does consideration of fairness impact decision making?
3. What are institutionalized procedures, practices, and traditions for avoiding and resolving conflict?
4. How are presentation and communication of information influenced by consideration of fairness and conflict management?

2.2.1 Shadowing with active observation

Coordinators were followed from 6:15 to 9:30AM, and 1:00 to 3:00PM. The first period was to capture activities required to get cases started and lined up for all ORs, and the second to close down ORs towards the end of the day. When an assignment of cases, rooms, and staff was made (observable when changes were made to the OR board), the coordinators were asked for their explanation of how the assignment came about. The coordinators were also encouraged to think aloud about their coordination activities. Verbal permission was obtained for all audio recording of shadowing sessions.

2.2.2 Interviewing

We sampled nurses, surgeons, and anesthesiologists. The interviews were guided by open questions such as: “What does it take to be a charge nurse/charge anesthesiologist? What are the most challenging aspects of the responsibility? Can you provide examples of issues you find yourself troubleshooting on a daily basis? What negotiations do you find yourself employing daily in order to complete the cases scheduled for the day?”

2.2.3 Examining documents and artifacts

The coordinators were asked for samples of documents that they considered critical for their roles. Photographs of the OR board were taken periodically (about 20 each day) to document how scheduling information was presented in a shared information space.

2.2.4 Data analysis

Observational notes and transcripts from audio recordings were made. At the end of each day's data

collection, major themes were identified through a group discussion among data collectors, as guided by the grounded theory approach (Strauss and Corbin 1990).

3 Results

Over the study period, three charge nurses and four anesthesiologists were shadowed. Five attending surgeons were interviewed. Data collectors spent an estimated 60 h in observations and interviews. The preliminary results of the field study will be reported in two areas: sources of conflict and strategies of managing conflict. We will then synthesize a set of tentative constructs from the field data.

3.1 Sources of conflict

It was very clear from the field data that management of conflict was an important part of being a coordinator. One document, prominently displayed, carried the title of “Rule of Engagement” (Table 1 for excerpts). The document was an official memo from the medical director of the OR and reflected the results of experience in managing conflict over the years and was intended to specify institutional rules to avoid conflict. According to one charge nurse, the document was so displayed because when a surgeon questioned her decision making, she could refer to the document. Note the words “honestly” and “deceptive” in the document. Reported potential or actual conflicts were in following categories.

3.1.1 Emergency cases

When emergency cases were requested, the coordinators had to “bump” other scheduled cases to vacate limited OR capacity. Essentially the interest of one patient was balanced against the interest of other patients and care providers. Since the concerned patients were often cared for by different groups of workers (indeed from different subspecialties, such as neurosurgery versus orthopedics), sometimes it was difficult for the coordinators to placate the surgeons whose cases were bumped. They may have promised their patients a specified time of surgery, and their staff had spent effort in getting the cases scheduled and prepared. Compounding the situation was the possibility that a surgeon might have declared a medical emergency when the patient's condition did not seem to warrant this status in the eyes of other care providers. Inserting emergency cases was in contrast

Table 1 Posted procedure for resolution of conflict

Sample Rules of Engagement—Year 2002

1. *Authority*—The OR Charge Nurse is responsible for applying these rules, and for JUDGMENT necessary to manage effectively in a rapidly changing environment. The Charge Nurse should seek assistance in resolving scheduling conflicts from (in order) The Anesthesia Charge Physician, The Trauma Team Attending, The OR Medical Director, and the Physician-in-Chief.
5. *Bumps*—When selecting a case to be bumped, the Charge Nurse should begin with the bumping surgeon's own cases, followed by any other cases belonging to that surgeon's service, followed by (in order) add-on University cases, add-on Trauma cases, scheduled inpatient cases, and scheduled outpatient cases. A case which is bumped out of a room has priority over other cases in the same category when a room again becomes available.
6. *Communication*—If a case is assigned to a room but is not actually ready to go (surgeon unavailable, patient not cleared by Team, awaiting a test, in dialysis, etc.), another case will be assigned in its place. The original case will then “go to the bottom of the list” and will have the lowest priority in its category. To prevent this from happening the posting physician must honestly acknowledge any such constraints at the time the case is scheduled.
7. *Swapping cases*—Case order and priority can be rearranged at any time if both of the attending surgeons involved agree to the switch. This also means that a single surgeon can rearrange his or her own scheduled and unscheduled cases as needed, among the priority slots assigned. (Example: a surgeon has 3 scheduled cases assigned to one room, and an add-on case that is third on the add-on list. He may switch the add-on to his second scheduled slot if desired, and move the last scheduled case to the third add-on slot.)
8. *Cloning*—No surgeon can be assigned a second room (either for simultaneous surgery or a “flip-flop”) unless there are no other available cases.
12. *Ethics*—Repeated attending surgeon unavailability or other deceptive scheduling practices (such as posting a “phantom” to allow a later switch with a low-priority add-on) will be punished with loss of scheduling privileges, at the discretion of the OR Committee.

with canceling cases. When cases were canceled, the coordinators were then able to accommodate last minute requests for OR time, which reduced the chance of conflict.

3.1.2 Staff shortage

Staff shortages occurred two times in a three day period of observation when a worker was ill or had a personal emergency. The surgeons were unhappy about the delays caused by staff shortages, especially when they had scheduled other activities after finishing their cases.

3.1.3 Staggering rooms

As suggested by the term “cloning” in Table 1, one coordinator mentioned that surgeons liked to finish their cases efficiently to the point of wanting two ORs at the same time. When possible, surgeons sometimes would like to work on one case while another case was being prepared. One surgeon used the term “staggering” cases to describe this behavior. On the surface there would be no conflict as cases would be finished earlier. However, such arrangements might result in an appearance of favoritism and complaints from other surgeons. There might be implications for patient

safety and efficiency for other clinicians, as two “sets” of resources would be used.

3.1.4 Turf wars

Some surgeons' contractual privileges allowed them to take patients from a nearby hospital to the studied OR suite. Such arrangements increased competition for the limited OR times during day time. Surgeons would like access to OR at times of their choice. One nurse coordinator complained several times about the fact that they had to be the messenger for “turf wars.” One surgeon complained that there was favoritism in allocating OR times, not based on patient's welfare or OR efficiency, but on “who you are or who you know.”

3.2 Strategies of managing conflict

Coordinators described themselves variably as negotiators, ambassadors, and communicators, an indication of how much (or little) power they had to resolve conflict. Because they did not have total authority, they deployed a number of behavioral strategies to avoid and minimize conflict. The document in Table 1 was an example of the institution's attempt to manage conflict. Coordinators also were extremely concerned about “fairness.” They sometimes articulated the patient's

welfare as “making surgeons happy,” and hospital’s goal of efficiency as “making [OR director] happy.” Thus their strategies had to balance various interests in ways others though to be fair.

3.2.1 *Stocking up favors*

Since it was inevitable for coordinators to bear the bad news (e.g., “your case has been delayed”) and to ask for flexibility (e.g., “could you do your case tomorrow”), coordinators reported ways to please others. One coordinator articulated the strategy as “stocking up favors.” Another coordinator even offered a surgeon an earlier start, knowing in advance that that surgeon was not able to perform the surgery earlier, just to accrue a favor.

3.2.2 *Keeping score*

Opposite to favors were perceived infractions accumulated by surgeons. The institution intentionally limited the number of nurses who could function as charge nurses as a method of insuring a consistent “institutional memory” of which surgeons broke rules. Infractions included manipulative requests, delays in performing their cases, and overly optimistic estimations of case durations or their ability to arrive at scheduled times.

3.2.3 *Management of expectations*

Although the “Rules of Engagement” document contained the specific disclaimer that a particular OR start time is not guaranteed for a scheduled case, surgeons nevertheless frequently expressed expectations, based on how their cases were placed on the OR board. One coordinator mentioned that she kept a mental order of cases to be carried out without putting the cases down in a definitive order, to avoid the perception of commitment of certain case orders.

3.2.4 *Key cognitive constructs guiding conflict management*

Three categories of cognitive constructs emerged through analysis of the field data on managing conflict. The first is fairness, as expressed by terms such as “equity,” “priorities,” “rules,” “scores,” “cheating,” and “gaming.” The second is negotiation, as expressed by the terms of “give and take,” “favors,” and “appeasement.” The third is commitment, as expressed by terms of “expectation,” “trust,” and “entitlement.”

4 Discussion

Although a major component of the tasks of the OR coordinators is to implement planned surgical schedules, much of the coordinators’ activities was to achieve the perception of fairness, to negotiate solutions, and to attain a degree of organizational stability over time. Rather than being unique, we believe that the domain of day-of-surgery management is a model to understand coordination in a complex organizational context. If Strauss’ conception of “articulation work” (1984) advanced our understanding of collaborative work, appreciation of conflict may be another step in the same direction.

There are several implications for ICT system design in light of conflict. Implicit if not explicit conflict is nearly always present when people have interdependencies, and collaboration in large socio-technical systems must include coping processes for resolving conflict. For example, when two surgeons compete for the same operating room slot, at the end only one of them will use the slot. Temporary working documents (such as the case assignments on the OR board, annotated printouts of schedules, and staffing plans) are used in coordination. These documents often have the function of representing working solutions to conflict. These temporary documents do not have officiating identity but facilitate communication, workflow, and temporary arrangement. They are de facto resolutions of conflict yet do not carry the connotation of consent or agreement by all parties, and are not archived for future reference. They have a short working life and have a controlled audience. In contrast, data in information systems usually have a long working life and have multiple uses, including auditing and accounting. As a result, data appearing on computer documents may give the impression of having official sanctioned status.

There has been much previous research on the topics of justice and fairness in the organizational behavior and human resources literature. Although the phenomena may be similar, fairness issues as associated with coordination are much about “lateral” social influences (as opposed to supervisor-subordinate types). Ambrose and Harland (1995) have reviewed the literature on a set of influence tactics used to achieve what social psychologists call procedural justice. In particular, “exchange/bargaining,” “ingratiate/friendliness,” and “deceit” are tactics that mirror findings in our studies. Further exploration of the body of literature on procedural justice will likely produce insights into understanding large scale collaboration and how to build ICTs to aid this collaboration.

The results of the preliminary study suggest several additional interesting research topics. Since negotiation was found to be a part of coordination, implementation of ICT may take away the ability of the coordinators in controlling and influencing how information is presented. Bannon and Schmidt (1991) described such consideration as “bounded transparency,” as opposed to the general accepted ideal of maximum transparency and awareness. When there is an inherent conflict of interests, it would be important to recognize the importance of controlling of information (Bannon and Schmidt 1991, p. 12): “A worker engaged in cooperative decision making must be able to control the dissemination of information pertaining to his or her work: what is to be revealed, when, to whom, in which form?”

Similarly, in collaborative work settings workers often share information displays. One may study how such displays are manipulated to express commitment and expectation, and indeed how displays should be designed to accommodate subtle expressing needs (cf. Xiao and Seagull 2005). ICT to support coordination may improve information access, but may also bring the issue of trust about an institution’s expressed intention in implementing ICT. Will the technology provide unfair advantages to certain stakeholders?

The current preliminary study was limited because of our focus on a single study setting. Further analysis is needed to appreciate different types of conflict and how they are managed. For example, day to day operational conflict is of different nature in comparison to those more structural, such as inter-disciplinary differences and organizational policies. Further studies are needed as well to appreciate in detail the strategies used by coordinators, such as in managing expectations.

In summary, coordinators observed in the preliminary field study spent much effort to ensure organizational members perceived there to be fairness in the ways they managed “conflictful” situations. Their efforts included managing expectations, anticipating potential conflict, controlling information access and presentation, and negotiating solutions. In the design of ICT to support coordination, we should examine not only the mechanical articulation of activities and effi-

cient prioritization of resources, but also their companion social processes.

Acknowledgments The study was funded in part by a grant from National Science Foundation (IIS-0325087). The opinions expressed here are those of the authors and do not necessarily reflect the official position of the funding agency. We thank the nurses, physicians, and technicians for their time and insights.

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