

Coordination by Avoidance: Bringing Things Together and Keeping Them Apart Across Hospital Departments

Naja Holten Møller
IT University of Copenhagen
Rued Langgaards Vej 7
2300-Copenhagen
Denmark
nhmo@itu.dk

Paul Dourish
University of California, Irvine
Donald Bren School of Information and Computer
Sciences
CA 92697-3440, USA
jpd@ics.uci.edu

ABSTRACT

Coordination is central in CSCW systems design, where it is often considered as a process of bringing artifacts and activities together and making them part of a larger system. In this paper, we argue that existing conceptualizations of coordination in CSCW can be successfully extended with the notion of *coordination by avoidance*. We introduce this notion to describe particular coordination mechanisms whereby actors avoid routines or routes of actions when it conflicts with those of other actors. In a study of pre-diagnostic work, we found that actors coordinate by avoidance when they realize alternative routes of action or that a routine has to be set to a halt to ensure that practices stay coordinated. Routines in diagnostic work are for instance the rescheduling of patients and requesting of relevant patient records that are mundane practices, however, necessary when responsibility is shared or shifts between various actors collaborating to diagnose a patient. Thus, the contribution of this paper lies in empirically identifying practices of avoidance and extending dominant conceptualizations of coordination through the notion of avoidance. We identify four ways that actors coordinate their practices by avoidance; by *demarcating*, *procrastinating*, *delegating* and *accommodating* routines or routes of action. Furthermore, we conceptualize coordination by avoidance as a distinct type of coordination mechanism to be taken into consideration in CSCW information systems design.

Categories and Subject Descriptors

J.3 [Computer Applications]: Life and Medical Science – Medical Information Systems

General Terms

Management, Design.

Keywords

Medical information systems, coordination mechanisms.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

GROUP'10, November 7–10, 2010, Sanibel Island, Florida, USA.
Copyright 2010 ACM 978-1-4503-0387-3/10/11...\$10.00.

1. INTRODUCTION

In writings on healthcare policy, as in other areas of collaboration, “coordination” emerges as a central concern. Where multiple actors come together to collaborate in complex work settings, we are generally concerned with how their actions can be coordinated. Continuous and smoother collaboration is generally argued to result from more frequent and more careful coordination, i.e. in cancer diagnostics [12], [18], [29]. Unsurprisingly, then, when information systems are incorporated into healthcare settings, they are often called upon to solve what is described as the “problem of missing coordination” [22], [30]. For serious illnesses like cancer diagnosis, which is the focus of the study we report here, these problems are especially acute as patients move between different healthcare providers and different sectors of the healthcare system [9].

To support coordination practices, we need to understand the different aspects of coordination. Coordination is often thought of as *bringing things together* and making sure that they come together effectively; however, our investigations of coordination practice suggest that coordination is also often about *keeping things apart*. Hence, the aim of this paper is to investigate coordination in its own right and to extend ways to think through practice with the notion of coordination in CSCW systems design.

Coordination is central in CSCW where it has been discussed in terms of coordination mechanisms [26], [27], informal coordination [7], temporal coordination [2], [21] and coordination of reach [11]. Previous studies have explored how coordination mechanisms stipulate the activities that are linked through them [4]. This way coordination mechanisms bring artifacts and activities together and make them a part of a larger system, although, they may keep them apart too [8], [11], [31].

Taking this latter perspective, we argue in this paper that existing conceptualizations in CSCW can successfully be extended with the notion of *coordination by avoidance* to describe the type of coordination mechanisms where activities are avoided or brought to a temporarily halt. With this approach, we foreground practices of avoidance that often remain in the background in healthcare policy writing, and instead suggest that they actually play an important role in achieving effective collaboration.

Coordination by avoidance involves actors’ recognition of alternatives to a given routine or route of action. In figuring out when to avoid certain routines and routes of actions, the actors make sure that their specific actions are adequate to the particular patients’ situation. The research question is: What forms does avoidance take in coordination practices and what role does it play

for the overall coordination across the organization? Exploring this question empirically the paper points to how coordination by avoidance can take on different forms, including practices of *demarcating*, *procrastinating*, *delegating* and *accommodating* to ensure coordination.

The paper is structured as follows. First, we begin by sketching an outline of existing conceptualizations of coordination in the CSCW literature. We contrast the prior work with the analytically distinct conceptualization of coordination by avoidance. Second, we present the research method and then go on to present examples from our empirical data of mundane coordination practices from an ethnographic study in a mid-size Danish radiology department and clinical departments in so far their collaboration. In particular we focus on avoidance in coordination practices and what role it plays in these four examples. Third, the discussion section investigates the way coordination by avoidance can help us to understand coordination practices in extension of the existing concepts of coordination in CSCW. Finally the paper concludes by conceptualizing coordination by avoidance in relation to healthcare and more broadly in relation to CSCW systems design.

2. The Concept of Coordination

Coordination, as a general topic, has received considerable attention in prior research, not only in CSCW but also in related fields such as organizational studies as well as in the particular domain of healthcare. Similarly, the concept of avoidance is comparable to, but distinct from, ideas that have been employed by previous researchers. We will discuss several of these here.

2.1 Concepts of Coordination in CSCW

The literature on coordination in CSCW draws attention to the way that coordination mechanisms not only structure actors' collaborative activities, but also support actors' articulation of those activities for them to come together [5], [8], [24], [25], [26], [27], [28]. Articulation – both in the sense of the breaking down activities, and in the sense of the formulating or expressing them – can itself be conducted as a collaborative activity. Therefore, articulation conducted as a collaborative activity and making sure that things come together in turn also needs to be articulated [26]. Blumer and others have pointed to how social components influence actors' articulation of collaborative activities [5]. Shaping articulation social components gives it a shared meaning within a certain context or community and it is suggested that social components should be taken into account when we think through collaborative technologies [21].

One strand of research has focused on the way in which coordination mechanisms take on material form and how those material objects in turn shape coordination practice [4], [6], [26], [27]. The artifacts and procedures that form a coordination mechanism might be analytically distinct, though in practice they are seamlessly interwoven. Agreed-to procedures make sense to actors within a certain context or community, where they have a shared meaning. They are shaped by social components. This way, coordinative mechanisms shape the decisions and arguments of actors as they go about their work [4]. And therefore while activities that unfold in real-time cannot be undone or replayed [21], the incorporation of social components in coordination mechanisms becomes even more important to support shared meaning in the particular context or community.

Other strands of research have sought to understand coordination practice by paying attention to the way that spatial and temporal scope shapes the articulation of collaborative activities [2], [11], [19], [21]. For instance, Bardram's concept of timely coordination is defined as “an activity with the objective to ensure that the distributed actions realizing a collaborative activity takes place at an appropriate time, both in relation to the activity's others actions and in relation to other relevant sets of neighbour activities” [2 p. 163]. Gerson, relatedly, addresses articulation work from the perspective of “reach” that draws attention to the scope of the activities that bring things together [11]. Both of these conceptualizations point to the articulation of coordination as a collaborative activity, which in turn may also need to be articulated to carry out any particular activity. Informal ways of articulating or organizing activities forms an alternative to the merely formal articulation whenever time pressure requires this [7], though, scope influences the premises of actors' coordination of these activities too [11].

An overall characteristic of a coordination mechanism is therefore that it helps to reduce the complexity of articulation work by rationalizing it through segregation, standardization or coordination [11], [25]. The focus on the *material artifacts* that structure coordination tends to emphasize the ways that different people and different processes come together – around objects, records, reports, information structures, places, etc. However, a focus on coordination in action reveals that coordination mechanisms may also be concerned with segregation and separation as a strategy to reduce the complexity of articulation work. Separation and segregation may be features of formal processes and standards; our empirical investigations focus on actor's practices of avoidance in healthcare.

2.2 Related Concepts of Actors' Coordination by Avoidance

A distinctive feature of coordination by avoidance is that actors' recognition of potential alternative courses of action takes place *in advance* rather than *after* a problem has occurred. Avoidance in this respect is different from repair work, which takes place after a problem has occurred [10], [28]. The question here is not what qualifies as routine (or repair work), but whether actors are able to realize alternatives to routines in advance and thereby adjust or temporarily avoid them. Thus, Feldman and others point out that what counts as routine and what count as alternatives to routine or adjustments are not clear-cut [10], [20]. Accordingly, “routines” are sets of possible patterns, rather than a single pattern, which are effortful and emergent through actors' practice [10].

An important consideration in healthcare is that routines should always be performed in ways that are appropriate to the particular patient's situation [9]. Clearly, this will vary from one patient to another depending on whether the patient has other diagnosis to give an example of complicating factors and therefore requires adjustments one way or the other. Berg points to the ad hoc and messy nature of medical work [3] that makes actors' reflections on how to adjust or avoid some routines temporarily even more pertinent in the case of patients with complicated diagnosis.

Thus, when looking at how people employ information systems designed to support organizational work in these sorts of settings, we need to attend not only to the actions that they take but also to the actions that they avoid, as adequate to the situations in which they find themselves.

The type of coordination where actors rely on avoidance has been conceptualized in institutional theory as the act of “negative coordination” [17], [23]. Negative coordination denotes a strategy where actors, in choosing their own courses of action, avoid inflicting damages to the protected interests of other actors. Negative coordination is one strategy that actors may legitimately deploy to achieve coordination by searching for solutions that do not collide with other actors' interests. In contrast, positive coordination describes a strategy whereby actors coordinate actively to search for new ways of moving forward even though it may challenge the interests of the involved actors.

Negative coordination may result from a need to escape what Lea refers to as the “paradox of coordination” [14]. The paradox arises where a perceived lack of coordination structures gives rise to an organizational response – the circulation of a newsletter, the institution of a new meeting, or the development of a new process – which itself functions as “ever-renewing points of connection” that in turn also need to be coordinated. To the actors involved, this means that there are new points of connections to be taken into consideration that extends the effort it takes to coordinate. This cycle or paradox draws attention to the legitimacy of coordination by avoidance. We argue that avoidance is not a problem, but rather just part and parcel of organizational work; our goal here is to bring it within the scope of CSCW analysis as a distinct coordination mechanism.

2.3 Extending Conceptualizations in CSCW

In terms of CSCW, an effective coordination mechanism helps to rationalize articulation work where segregation, standardization and coordination are different strategies that actors might employ [11], [25]. Gerson writes of this: “One kind of rationalization is segregation. This makes things independent of one another, removing the connections or contingencies among them wherever possible. Complex tasks are broken into multiple independent tasks. Similar things are grouped, and dissimilar things are segregated” [11 p. 198]. Similarly, negative coordination is a strategy that implies some form of segregation. Taking seriously that coordination mechanisms imply *both* bringing things together *and* keeping them apart, we propose a definition of an analytically distinct type of coordination mechanism that we describe here as coordination by avoidance:

Coordination by avoidance describes a mechanism whereby actors avoid moving into other actors' legitimate field of interest. In this sense coordination by avoidance helps actors to coordinate responsibility of distributed tasks realizing alternatives or setting routines to a halt in order to coordinate practices in a way that is adequate with the particular situation.

Taking a closer look at the definition, coordination by avoidance is divided into two parts.

First, coordination by avoidance is defined by a mechanism used to pursue coordination by avoiding the actions that may collide with other actors performance of routines or routes of action. Avoidance implies that coordination is two-sided and is not only achieved by bringing things together, but also by keeping them apart.

Second, coordination by avoidance is defined by the coordination of responsibility when it would otherwise be unclear.

Coordination of responsibility is ongoing at all times, and this implies that it also comprises decisions to coordinate by avoidance. By suggesting this definition we also suggest that coordination by avoidance occurs as a just part and parcel of organizational work.

Our research question here, then, is: What forms does avoidance take in coordination practices and what role does it play for the overall coordination across the organization?

3. RESEARCH METHOD

The research question is investigated in the paper focusing on aspects of coordination in four cases of everyday work in a radiology department and in clinical departments in so far their collaboration. These four examples are part of an overall study of the pre-diagnostic process when patients have potential symptoms of cancer where coordination is one particular concern of many.

The study was designed as an exploratory, ethnographically-inspired study [15], [16] guided by the research sites to point out those aspects of the practices that are profound in this diagnostic work. The investigations later became more focused on the particular aspects that had emerged from the first part of the study and led us to focus on the aspect of coordination by avoidance amongst others.

Empirical data reported here focus especially on the radiology department that takes on a central role in much diagnostic work. Data was collected over a period of 11 month in 2009 where the first author visited and re-visited the various sites that also included clinical departments and general practitioners – all central actors in diagnostic work. In total, the first author spent 100 hours observing practices and conducting in situ and semi-structured interviews at the main sites. Prior to this 14 hours of preliminary studies were conducted in sites that are similar to the ones studied (amongst these a smaller radiology department), to get some idea of the setting.

Throughout observations, field notes were constructed, in situ interviews were transcribed, and semi-structured interviews were both tape recorded and transcribed and guided later analysis. Moreover, various documents were collected throughout the study period, as were various images (pictures, prints, video, etc.) of the observed practices. In situ interviews were prioritized where secretaries, radiologists and radiographers were asked to think-out loud during ongoing work practice.

This method allowed the healthcare professionals to talk about their work practices while they emerged. On the other hand, the method to some extent restricts the results too. This is especially evident in situations where there is a tight schedule, i.e. in the situation where a patient has to be taken care of in an acute manner that limits the time there is to talk about ongoing activities. However, the in situ interview, we found, all in all useful to study practices that sometimes come across as silent like avoidance.

3.1 The Site: Mid-Size Radiology Department

The radiology department where observations were conducted is located in a Danish mid-size hospital. It plays a central role in diagnostics of patients in its region. It has been modernized over the last couple of years; a new information system has been implemented and a technological upgrade with a new MR-scanner (also called an MRI-scanner) and CT-scanner (or CAT-scanner)

allow the department to process an increased number of diagnostic examinations and provide the department with new ways of diagnosing. In addition to these changes, the workflow of the department was analyzed and routines adjusted.

Approximately 60.000 diagnostic examinations are performed in the radiology department every year where the larger part of diagnostic examinations is X-rays (47.000) in addition to CT-scans (5.000), MR-scans (2.000) and ultrasound-scans (6.000). The healthcare professionals in the radiology department consist of secretaries, radiologists and radiographers who are organized in a hierarchy where they rank under the responsibility of a chief secretary, chief physician and chief radiographer. At the same time, this hierarchy reflects a set of shared responsibility for tasks that all feed into each other.

The secretaries manage incoming referrals and makes sure that they are sorted according to the referral, which states whether a patient is to be examined as an acute, sub-acute or as a planned case. A radiologist re-sorts referrals into acute, sub-acute and planned when assessing whether it is in fact the right diagnostic examinations that were ordered and describe the results of them (CT, MR, ultrasound etc.) after the scans have been performed. Radiographers are responsible for performing the examinations and assess whether slides and sequences are appropriate while the patient is being scanned. This is to some extent dependent on the scheduling of the secretary, too, grouping the patients to ensure that the slides and sequences will not have to be changed whenever there is a new patient in the scanner. Thus, representatives of all three groups (secretaries, radiographers, radiologists) are important actors in the diagnostic work and depend on each other.

The radiology department collaborates with a range of clinical departments that are both located at the hospital and at other hospitals in the region – as well as general practitioners and private practicing specialists that can also refer patients there. In particular the observations focused on collaboration with the medical department located at the same hospital as the radiology department. The Medical department is particular interesting here, being one of the departments with a formal agreement with the radiology department on scans. Thus, the medical department is one of three departments at the hospital with special access to scans if patients are suspected with cancer. Compared to other illnesses, cancer is considered to be particularly urgent and various initiatives have been taken to support better diagnosis for cancer patients.

A shared information system (OPUS) has recently been implemented across the various hospital departments that generally supports the registering, scheduling, communicating, coordinating, and managing of patients. In addition to this, the radiology department uses a radiology information system (RIS) and archive system (PACS) that other hospital departments may also enter to some extent to refer patients, retrieve images etc.

4. COORDINATION PRACTICES FROM THE PERSPECTIVE OF THE RADIOLOGY DEPARTMENT

In the following section the issue of coordination is explored in four different examples of everyday work practices observed in the radiology department and the clinical departments it collaborates with. The examples explore situations where more

than one department is involved in diagnostic examinations at a time and how avoidance is profound in their coordination practices. It is in these situations where more departments are involved that coordination is put at risk.

In this way, realizing when the practical responsibility of a patient is shared between hospital departments or when it shifts becomes an important part of the diagnostic work. This is a somewhat broader understanding of diagnostic work than what would typically count as work that contributes to the production of diagnosis in the eyes of healthcare professionals. However, whenever departments interpret their responsibility, this is deeply intertwined with the way that diagnostic examinations are performed.

In our perspective, diagnostic work is an organizational consideration, not purely the decision of physicians, as it is often seen. Thus, other healthcare professionals like secretaries are increasingly important with the growing coordination of patient trajectories within information systems (i.e. secretaries coordinate responsibility of patients while scheduling them) We will discuss the emergence of coordination by avoidance in our fieldwork setting through four forms of avoidance that arose in our fieldwork: demarcating, delegating, procrastinating and accommodating.

4.1 Demarcating Through Pre-booked Times for Particular Departments

We found work by secretaries to be particularly important for coordination of responsibility between hospital departments. In the radiology department, secretaries perform the scheduling of patients in the radiology information system (RIS) where time-slots are pre-booked for CT-scans, MR-scans, ultrasound scans and X-rays. The time-slots are organized after the urgency of patients' illnesses within two formal categories 'acute' or 'planned'.

The organization of scans is furthermore based on the part of the body that is being scanned (i.e. the brain). The secretary can then book scans by simply asking the information system to find the first available time for i.e. a MR-scan and preferably within a time-slot pre-booked for 'MR brain-scans' if this is the scan that is ordered. Organizing the scans in time-slot means that there are fewer adjustments to be done between each patient. Scheduling the scans this way: 'brains' with 'brains' and 'backs' with 'backs', allows the radiology department to scan more patients than if there was no demarcation.

To schedule a patient in RIS, the secretary asks the information system to find the first available times for a particular type of scan, i.e. MR brain scan. Secretaries' identification of available times for scans within the time-slots is fairly automated for the vast amount of scans. Though, there are a few departments (the medical department, the surgical department and head-and-neck surgical department) that have pre-booked times every week for their disposal that may not be booked for other departments. These times are pre-booked for the purpose of patients suspected with cancer and are for the disposal of the departments up till 36-hours before the scan is due.

The cancer times have to be annulled by the clinical department if not used and no later than 36 hours before the particular scan is due so that it can be booked for other groups of patients. This is stated in a formal letter from the management of the radiology

department with regard to national recommendations on cancer patient pathways. The national recommendations prescribe the pre-booking of times in the information system for patients suspected with cancer as one strategy to reduce wait time. To cancer patients it is crucial to be diagnosed and treated as quickly as possible to improve the prognosis.

Scheduling of cancer times is complicated by several factors, however. Secretaries and the other staff at the radiology department take very seriously a concern to reduce factors that might be slowing down the diagnostic process of clinical departments. At the same time, cancer times may be booked for other patient groups when released by the clinical department no later than 36 hours before the scan is due. As such, secretaries in the radiology department are under a lot of pressure whenever it seems that there is an available cancer time, though they also want to make sure that patients suspected with cancer can always be scheduled for a scan with short notice.

This means that not only staff at the radiology department (secretaries, radiologists, radiographers) are required to continuously coordinate to make sure that cancer times are scheduled accordingly, but the clinical departments that have cancer times for their disposal also have to be coordinated to make sure that they themselves request the times within the 36 hours if they want to be sure to have them for their disposal. The issue came up at the secretaries' weekly meeting, where they discussed how to handle the distribution of cancer times. The distribution of cancer times had been an issue since the secretaries had denied a cancer time for a clinical department that was located at another hospital in the region. Consequently, the hospital department filed a complaint to the management of the radiology department. At the weekly meeting, it was a relief for the secretaries when it was stated that the management found that the secretaries had been right in denying the other department the cancer time at that particular time.

The discussion picked up again when it was brought up that also some of the local departments at the hospital were asking to have some time-slots that would only be for their disposal. One secretary commented that the clinical departments might get fewer patients scanned if they were responsible for scheduling patients themselves instead of the secretaries of the radiology department. A huge difference of the times booked within the regular time-slots and the cancer times is that cancer times 'belongs' to the clinical department if not released 36 hours prior to the scan. Thus, 36 hours before the scan is due the secretaries at the radiology department actually have the possibility to book the cancer times for other patient groups. However, scheduling times for other patient groups is done with the risk of delaying the diagnostic process if a potential cancer patient suddenly needs a time for a scan after the 36-hour are due. Delay of the diagnostic process is something that all staff in the department try hard to avoid.

While the 36-hour rule gives the secretaries the authority to book cancer times for other patient groups, they agreed that they would continue to avoid scheduling cancer times at least if the requesting department was located off the hospital. This decision to some extent contradicted the secretaries' belief that the most effective way to book patients for scans is not to have the clinical departments book patients themselves but instead to pool the scans independent of the department.

To avoid a break-down of cancer times the secretaries preferred to attain some buffer by only releasing cancer times after 36 hours to departments that are located at the hospital. The secretaries felt that the radiology department would be held accountable if they were not able to provide scans for patients suspected with cancer – even if in principle the pre-booked time could be released for other patient groups. Here, demarcation helped the secretaries to avoid scheduling times in the information system that are pre-booked as a buffer for patients suspected with cancer. Rather than forcing secretaries to book all of their buffer, demarcation becomes a mechanism for secretaries to avoid certain times and search for others in the radiology information system as long as it did not concern the group of patients with potential symptoms of cancer.

4.2 Delegating the Re-scheduling of Orders From Other Departments

Avoidance is not always explicit as in the example above. Like the scheduling or booking of scans, re-scheduling or change of bookings is carried out within the radiology information system (RIS). At most, the times are organized in RIS in time-slots of 'brains', 'stomachs', 'backs' etc. that are not reserved for any particular departments. The clinical departments are responsible for the order of scans regardless of whether a patient is referred to them as an inpatient or outpatient. This also means that if a patient wants to change the date of a scheduled appointment the radiology department will not re-schedule it if the patient calls the radiology department to do this.

Instead re-scheduling is delegated to the department that ordered the scan in the first place that will also have to order the re-scheduling of it. Although it may seem like a lot of bureaucracy that the secretaries at the radiology department do not just do this on the spot, the reason becomes obvious when taking a closer look at the activities involved in re-scheduling of patients.

At the radiology department a secretary answers the phone daily between 09:00-12:00, where patients, general practitioners and others may phone in. Also on one particular morning when we were observing, a few patients called the secretary to reschedule their appointment. A patient had an appointment for a scan; however, he wanted to reschedule because the scan collided with his vacation that has already been planned. The secretary looked up the patient in the system. Here she can see all scheduled appointments for the patient at the hospital. The clinical department had already scheduled a follow-up appointment for him. The secretary checked the information in the system, then explained to the patient that he had to contact the clinical department to have them reschedule the scan.

The reason for this is that the appointment following the scan is typically scheduled a few days after the day of the scan. Here the clinical department gives the patient the result and they will agree on the next step depending on the results of the scan. The clinical departments have a limited access to the radiology information system, where they may order diagnostic examinations and later retrieve images and the results described by the radiologist. They cannot schedule the scans in the radiology system themselves – only order them – or they can cancel the scans that were already ordered. The secretary in the radiology department can tell from the information that she is guided to that the patient had already been scheduled in the clinical department for a follow-up appointment. And rather than rescheduling the appointment if

ordered in-house the secretary asks the patient to contact the clinical department to change his appointment. This is not to make things more complicated for the patient, but to ensure that another appointment that has been booked for the patients in the day clinic in his case will be moved accordingly. At the follow-up appointment the clinical department will communicate the results of the scan to the patient.

This is not explained to the patient in the phone, but if the secretary in the radiology department had simply rescheduled him before it was clear whether it was possible to reschedule the appointment in the day clinic accordingly, it would have complicated things risking the patient to fall between stools. The responsibility of coordinating the re-schedule of appointments is delegated to the clinical department by avoiding doing this from the radiology department. Thus, delegation helps the secretaries make sure that responsibility is clear rather than taking responsibility for part of the rescheduling that could actually be performed in the radiology department – and this would have complicated the coordination.

Through delegation of responsibility for coordination of the appointment of the scan and the following appointment for the result from the scan the delegation helps to keep responsibility clear when more than one department collaborate to diagnose the patient. The secretary at the radiology department at the same time accepts some slack in the real-time scheduling. This is to make sure that the rescheduling will be coordinated in both the radiology department and the clinical department. The avoidance through delegation in other words becomes a mechanism that helps the secretary in the radiology department, though, it means that she have to slack on the rescheduling in real-time in the radiology information system.

4.3 Procrastinating on Requests of Patient Records In Use in Other Departments

In diagnostic work, there is often more than one department involved at a time providing different types of diagnostic examinations. Delaying procedures like the request of paper records becomes important when in use in other departments collaborating to diagnose a patient. In the diagnostic process, several departments share the paper record, which is typically used alongside the electronic patient record. Like the paper record, it contains the patient's history, but the paper record is often a fast alternative close to hand compared to the electronic record and the departments therefore argue that they prefer to have both. In the medical day-clinic located at the hospital the shifts in responsibility of patients is realized in various ways. One way is the location of the paper record of the particular patient. Other ways include the patient's appointments registered in the information system that forms an electronic overview.

The paper records are kept in the hospitals archive when not in use in any of the hospitals departments or day clinics. While in use the patient record follows the patient meaning that the medical department, the radiology department etc. collaborating to diagnose the patient will typically only have the paper record while performing a certain procedure. The paper record helps the various departments and day clinics realize when the responsibility of the patient is shared or shifting, while remaining a fast alternative to hand. A concrete example of this is the secretaries' use of paper records in the medical day clinic.

The paper record helps the secretaries realize what will be the adequate routines or routes of action when preparing the records of patients where their appointment are coming up. An important part of the preparations of a patient's appointment is to make sure that the patient record is updated with the latest lab results for the use of the physician that will see the patient. The day clinic sometimes has a wait list up to 2 months depending on whether or not the patient needs to be seen by the specialist acute. And to keep track of the upcoming appointment the update of the patient record in advance is an important task. The secretaries use the paper records to keep track of appointments that are coming up and therefore require that specific things be brought together for the use of the appointment. Colorful post-its at the front page of the paper record are used to remind secretaries of things that they should make sure are updated – not only in the paper record but also in the electronic record. Whereas the paper record only has one front page where post-its can be placed (that is at the same time hard to miss), there are various “front pages” in the information system.

A week in advance of the patient's appointment in the day clinic the secretary requests the patient record to make sure that it is updated. However, before requesting the paper record, the secretary looks up the location of it in the hospitals information system OPUS where it is registered if the patient record is in use elsewhere. If not in use, the paper record is requested electronically and prepared both in terms of the routine update with the newest lab-results etc. and in terms of post-its that secretaries and physicians use to remind themselves if there are particular things that needs to be taken care of. However, the paper record is only requested if the secretary can tell from the information in OPUS that the patient has no other appointments in any of the other departments. This, she explains, is to avoid requesting the paper record if another department is still doing examinations assuming that it interfere if they not have the paper record at hand.

Instead, the secretary delays the request of the paper record a few days. At the time where the paper record is eventually requested, it is delivered in the postal routine where it goes directly to the secretaries' office space. The postal worker delivers paper records routinely every morning where the records are delivered in big brown envelopes. In case the patient record is needed urgently, the secretary may phone the postal workers and have the record sent up express, though it is underlined by the secretary that this is something that is kept count of. If possible, the paper record should always be requested at least a few days before an appointment if it is not required urgently. The secretary then registers the patient record in the information system so that it is clear to others that look it up that the record is now located in the medical day clinic. The day before the appointment the secretary again checks all the paper records that were prepared to make sure that last-minute results are included. The paper records are placed in order at the physician's desk and a copy of the electronic calendar put on top.

As such, the paper record serves as more than a fast alternative to hand for the physicians that are the ones to see the patient; it also serves as a way for secretaries to keep track of patients' appointment coming up. Secretaries at the same time are responsible for updating the record with the newest results that are crucial for the physician to be able to decide on the next medical step together with the patient. Therefore, request of a patient

record from another department before the diagnostic examination has been performed will not only interfere with their procedures, but, most likely the patient record will also not be updated. To the secretary, the avoidance when procrastinating on the request of a patient records if in use in another department makes sense as a mechanism to ensure coordination.

4.4 Accommodating Difference at Inter-departmental Conferences

To coordinate their findings with other departments, the radiology department every week hosts morning conferences according to a fixed schedule for the collaborating departments. The schedule is displayed on a whiteboard in the corridor with the names of radiologists responsible for morning conferences that week. A secretary in the radiology department updates the whiteboard on Fridays with information on physicians' responsibility for the following week as well as information on the radiologists that will be responsible for MR-scans, CT-scans etc.

The number of morning conferences listed on the whiteboard differ from one clinical department to another: the morning conferences with the surgical department are held every day where all patients that were examined by the radiology department the previous day(s) are run-through by a radiologist. The morning conferences with the medical department on the other hand are only held twice a week. Another difference is that the medical department will choose a number patients that they would like the radiologist to run-through rather than go over all patients.

As such, the number of conferences not just reflects the differences of the patients that are selected for presentation; it also reflects the type of information that is presented at the morning conferences. A radiologist who runs morning conferences on a regular basis explains that his presentations of the results of scans will differ from department to department ranging from a lot of short presentations to a few longer presentations. Short facts are presented for the many surgeons that will attend the morning conference whether they are surgeons or training to become surgeons, while more detailed descriptions are provided for the medical specialists.

At the morning conference the surgeons enter the room in a rush and leave the room the same way the minute that the morning conference is over and sometimes even before the radiologist has answered the last question. Approximately 1-2 minutes is used to run-through each patient. To some point the surgeons could just as well get the information from reading the description of the scan in the information system, the radiologist comments. In contrast it varies how many of the medical specialists that will attend their morning conferences and they will typically only attend when a patient of theirs is presented.

After the morning conference the radiologist usually has a smaller or larger stack of notes of things (re-examinations etc.) that came up at the morning conferences and has to be followed up. A few things are added to the descriptions of the scans as well. Only when the radiologist has released the description of the scan the clinical departments can retrieve the descriptions that they use to guide decisions on what will be the appropriate next step. Images, in contrast, can be retrieved by the clinical departments immediately after the scan.

Thus, the radiologist will to some extent avoid some information revealed from the scans on the morning conferences with the surgical department if he interpret it as non-important for the surgical procedure. The scans may reveal a lot of information that is on the other hand relevant to the medical department that has a broader interest in the way that the body works. The surgeons have an interest in fixing the parts of the body that is the focus of surgery and here it does not always matter whether the milt seems slightly bigger than what is considered normal to give a concrete example.

This way avoidance of some information becomes a mechanism that accommodates the different interests of clinical departments. The surgical department performs surgical procedures every day where they will use the 'fresh' scans of patients to guide the surgery. The medical department uses the scan to get a picture of patients' state of health as a supplement to other measures. And to present the same type of information at the different morning conferences would confuse the picture rather than accommodate the important differences in perspective. Thus, avoiding some information helps the radiologist accommodate the specialization of the clinical departments.

5. DISCUSSION: COORDINATION BY AVOIDANCE

Coordination by avoidance appears in a number of important ways to coordinate trajectories when departments collaborate to diagnose patients. The radiology department is one of the key actors in the diagnostic process. In turn, it is a huge concern to the radiology department not to slow down diagnostic examinations that are performed simultaneously in the collaborating, clinical departments. For this reason, the radiology department is an interesting starting point for investigations of coordination when more than one department collaborate to diagnose patients.

Coordination practices played out in the four examples of the radiology department and the clinical departments in so far their collaboration points to the legitimacy of avoidance. Here avoidance is a legitimate response when responsibility shifts or is shared across hospital departments. From Lea's perspective [14], coordination achieves its legitimacy by avoiding ever-multiplying points of coordination (with their associated overhead). In our perspective, though, it is more importantly about avoiding that points of coordination are ambiguous.

Avoidance helps actors to make good on their responsibility even though medical work may be messy and marked by ad hoc decisions [3]. Based on these findings, we argue that coordination by avoidance can in fact be conceptualized as a distinct coordination mechanism. As the examples illustrate demarcation, procrastination, delegation and accommodation all make legitimate ways for actors to make sure that responsibility is clear across hospital departments. Avoidance in these examples is a pertinent, just and parcel part of diagnostic work. Although avoidance is often not the first thing that comes to mind when setting healthcare policy, it comes across in our analysis as important to keep responsibility clear.

Actively coordinating [2], departments call the secretaries in the radiology department, to ensure that the departments' acute referrals are being handled as they should be. A shared understanding of how acute referrals should be handled means that secretaries all know that they have to prioritize acute referrals before other referrals. This way articulation of shared or shifting

responsibility of patients is conducted as a collaborative activity that in turn also needs to be articulated as pointed out by Schmidt and Simone [26]. However, the articulation of collaborative activities may also be performed by simply avoiding routines or setting routines to a temporarily halt as the examples illustrate.

Thus, actors demarcate, procrastinate, delegate and accommodate activities to make sure that others do not confuse the shared or shifting responsibility. The coordination mechanisms (i.e. information systems) are crucial in these situations to help actors realize when responsibility is shared and when it shifts. Here the information system helps the secretaries avoid the re-scheduling of patients that also has to be re-scheduled in another department to ensure that activities of the hospital departments remain coordinated. Leaving the re-scheduling to one department therefore is the effective way to make sure that it is coordinated in both hospital departments.

The coordination mechanisms in the examples of this paper play a different role than what Ash and others describe when they describe how workarounds [1], [13] becomes necessary for actors to get their work done. Where Ash et al. examine workarounds as “clever methods for getting done what the system does not let you do easily” [1 p. 195], we found with the perspective of avoidance that the opposite may also be true: The information system *helps actors* to get done what the routine otherwise not let them do easily when it helps actors realize in advance what may be the alternatives to routines or routes of action.

However, a question that remains is what makes the legitimacy of avoidance. The counterpart to *coordination by avoidance* is to actively coordinate as pointed to by Bardram’s concept of timely coordination [2]. Supported by the articulation that is in itself conducted as a collaborative activity between actors, timely coordination is concerned with the actively bringing together of things. Thus, the objective of timely coordination is to ensure that distributed actions realizing a collaborative activity take place at the appropriate time. Avoidance, then, gives a different focus where actors coordinate by demarcating, procrastinating, delegating and accommodating actions to make sure that activities take place at the appropriate time. This raises questions about the actors’ competencies with it requires especial skill and attentiveness to the broader organizational process.

In the examples we presented, avoidance make coordination less time demanding when the secretaries in the radiology department do not have to call the clinical departments to coordinate how to re-schedule a patients appointment, for instance, or when the secretaries do not have to coordinate with the clinical departments that have cancer times for their disposal when deciding whether they can give these to other patients, or when the radiologists do not have to work to align the needs of different clinical departments for their presentations.

Instead, the shared understanding of responsibilities permit and make it possible for these actors to make decisions, though, it presumes some understanding of the responsibilities of other departments. Actors’ competences may be stretched a little further than what would be the formal interpretation of these. However, the shared understanding of the distribution of responsibility in the organization means that these actors do not feel that it is stretching it too far when demarcating, procrastinating, delegating and accommodating actions.

While the actors could actively coordinate these things with each other, this would in some cases cause a slip in responsibility rather than ensuring that responsibility is always clear. In the same way, actors will adjust routines when realizing that the routines will otherwise not produce the intended outcome or that replacing the routine will produce new outcomes [10]. The actors’ demarcation, procrastination, delegation and accommodation allow the collaborating departments to maintain some form of stability or formal stringency. Thus, procrastinating on the request of the patient record the secretary to some extent knows the routines in the radiology department that makes her confident that the patient record can instead be requested a few days later. Routines are reified through their recurrent use in everyday life [20]. While avoidance of routines may be temporary, avoidance is important to ensure the effective coordination of responsibility when it shifts or is shared.

It is not least the way that coordination mechanisms take on a material form that is important in a double sense when actors coordinate by avoidance. The presence or the absence of the paper record guides the secretary’s actions. And, here avoidance not only plays an important role for the secretary to realize how far the performance of routines is other departments. It also plays an important role for the secretary to realize how far the performance of the department’s own routines is and to make sure that routines are performed adequate with the patient’s trajectory. The activities that unfold in real-time cannot be undone or replayed [21], but the coordination mechanism may help the secretary avoid routines in advance when realizing that it will conflict with other actors’ legitimate interests. Taking on a material form, the coordination mechanism reminds the secretary that she needs to request the paper record a few days later.

Though the purpose is slightly different, avoidance was also observed in physician’s coordination practices where avoidance is one way to accommodate the differences between the clinical departments. And, thus, to accommodate some difference this way supports the specializations of the clinical departments. The radiologist to some extent decides on what will be the relevant level of information to the different clinical departments. Like in the case of the secretaries the radiologist does not feel that this is stretching it too far due to the actors shared understanding of the distribution of responsibility. How the responsibility is distributed across the hospital departments at a day-to-day level in the overall organization is something that is sometimes difficult to trace - whether secretaries or physicians. In the examples of coordination practices, secretaries and physicians all rely on a shared understanding of how responsibility is distributed to coordinate their activities.

Thus, the distribution of responsibility is something that is typically not described in detail in formal protocols or procedures. The following remark from a surgeon in the co-located surgical department illustrates this. Here a patient came in with a boil. Two surgeons were deciding whether they would be the surgical department to perform surgery on this patient discussing whether the boil was in fact located inside or outside of what they talked of as the “swimsuit” (demarcating an area of the patient’s body). The swimsuit became their way to make decisions on the distribution of responsibility within these surgical sub-departments is not described in any protocols or procedures. As such, depending on whether the boil was located inside the swimsuit, this was the responsibility of the surgeons and they would avoid coordinating

with the orthopedic surgeons and perform the surgery themselves. In the opposite case they would have asked the orthopedic surgeons remove the boil. Avoidance is a just part and parcel of coordination practices, although, it can be discussed to what extent it always take on a material form as an actual coordination mechanism (or like in the example above where the surgeons coordinate by the imagined swimsuit that does not take on a material form as such, but still forms a coordination mechanism).

A last remark that remains clear throughout the discussion here is that in all of the examples coordination by avoidance depends on actors' understanding of the distribution of responsibility in the overall organization. Understanding this is time saving and can even strengthen the integration of practices and the information system. Acknowledging the existence of coordination by avoidance then draw attention to the importance of not only bringing things together, but also to keep them apart and can help us think through coordination practices.

6. CONCLUSION

Coordination is often thought of as *bringing things together*; however, our investigations of coordination practice suggest that coordination is also often about *keeping things apart*. And, thus arguing that avoidance is not a problem, but rather just part and parcel of organizational work; our goal with this paper has been to bring avoidance within the scope of CSCW analysis as a distinct coordination mechanism. Thus, we asked in the paper: "What forms does avoidance take in coordination practices and what role does it play for the overall coordination across the organization?"

The question we explored in the analysis of the various forms that avoidance takes on in everyday practices in a radiology department and clinical departments in so far their collaboration. The radiology department was chosen as an outset for investigations as one of the hospital departments most frequently involved in diagnostic work. Exploring the question empirically, we analyzed how coordination by avoidance takes on different forms, including practices of *demarcating*, *procrastinating*, *delegating* and *accommodating* that help actors ensure the effective coordination of the overall organization whenever responsibility shifts or is shared. These forms of avoidance helped actors to legitimately avoid routines or routes of action when colliding with those of other actors and thereby ensure the effective coordination across hospital departments.

In related studies, Feldman and others have found that actors will find ways to adjust routines when realizing that the routines will otherwise not produce the intended outcomes or that replacing the routine will produce new outcomes. Our study suggests that coordination by avoidance can take on the material form of a coordination mechanism that helps actors realize alternatives to routines in advance rather than after a problem has occurred. Furthermore, based on the examples of coordination mechanisms in the empirical examples, our study suggests that coordination by avoidance is a just part and parcel of diagnostic work. Coordination by avoidance can help us think through coordination practices to fully comprehend these.

We suggest a conceptualization of coordination by avoidance as a distinct type of coordination mechanism. Thus, coordination by avoidance describes a mechanism whereby actors avoid moving into other actors' legitimate field of interest. In this sense coordination by avoidance helps actors to coordinate responsibility of collaborative tasks realizing alternatives or

setting routines to a halt in order to coordinate practices in a way that is adequate with the particular situation.

The observation that avoidance often remains in the background in healthcare policy writing, as in other areas of collaboration, where coordination emerges as a central concern, was originally the motivation for this paper. Avoiding certain activities or setting them to a temporarily halt is not the same as *not coordinating* activities. Drawing attention to the legitimacy of avoidance is, therefore, important when we think through the information systems that are requested in policy writing. Acknowledging that avoidance may also be desirable in some situations, the question to be addressed is how we also incorporate avoidance when we think through information systems.

7. ACKNOWLEDGMENTS

Our thanks to all staff at Køge Hospital – the site of this study - where we were always received in a welcoming and heartfelt way and to our colleagues with whom we discussed the ideas in this paper in particular Pernille Bjørn, Elihu M. Gerson, Casper Bruun Jensen, Silvia Lindtner, Antonia Walford, and Brit Ross Winthereik as well as the reviewers. This work has been supported in part by the US National Science Foundation under awards 0712890, 0838601, 0838499, and 0917401.

8. REFERENCES

- [1] Ash, J. S., Berg, M., and Coiera, E. 2004. Some unintended consequences of information technology in health care: The nature of patient care information system-related errors. *Journal of the American Medical Informatics Association*. 11, 104–112.
- [2] Bardram, J.E. 2000. Temporal coordination. On time and coordination of collaborative activities at a surgical department. *Computer Supported Cooperative Work (CSCW): The Journal of Collaborative Computing*. 9, 157-187.
- [3] Berg, M. 1997. *Rationalizing Medical Work: Decision-Support Techniques and Medical Practices*. MIT Press.
- [4] Berg, M. 1999. Accumulating and coordinating: Occasions for information technologies in medical work. *Computer Supported Cooperative Work (CSCW): The Journal of Collaborative Computing*. 8, (4), 373-401.
- [5] Blumer, H. 1969. *Symbolic Interactionism. Perspective and Method*. University of California Press.
- [6] Bødker, S., and Bannon, L. 1997. Constructing common information spaces. In *proceedings of European Conference on Computer Supported Cooperative Work* (Lancaster, UK, September 07-11, 1997). ECSCW'97, Kluwer Academic Publishers, 81- 96.
- [7] Chisholm, D. 1989. *Coordination Without Hierarchy: Informal Structures In Multi-Organizational Systems*. University of California Press.
- [8] Clement, A., and Wagner, I. 1995. Fragmented Exchange: Disarticulation and the need for regionalized communication spaces. In *Proceedings of the Fourth European Conference on Computer Supported Cooperative Work*. (Stockholm, Sweden, September 10-14 1995) ECSCW '95. 33-49.

- [9] Committee on Quality of Health Care in America, Institute of Medicine. 2001. *Crossing the Quality Chasm: A New Health System for the 21st Century*. The National Academies Press.
- [10] Feldman, M.S. 2000. Organizational routines as a source of continuous change. *Organization Science*. 11, (6), 611-629.
- [11] Gerson, E.M. 2008. Reach, bracket, and the limits of rationalized coordination: Some challenges for CSCW. In *Resources, Co-Evolution and Artifacts. Theory in CSCW*, Ackerman, M.S., Halverson, C.A., Erickson, T., and Kellogg, W.A. (Ed), Springer, 193-220.
- [12] Helse og Omsorgsdepartementet. 2006. *Nasjonal Strategi for Kreftområdet 2006-2009* [National strategy for cancer 2006-2009]. Helse og Omsorgsdepartementet -The Norwegian Ministry of Health and Care Services. <http://www.regjeringen.no/upload/HOD/Sykehus/kreftstrategi%202006-2009.pdf>.
- [13] Kobayashi, M., Fussell, S.R., Xiao, Y., and Seagull, F.J. 2005. Work coordination, workflow, and workarounds in a medical context. In *CHI Late Breaking Results: Posters* (Portland, USA, April 02-07, 2005). CHI'05. ACM Press, 1561-1564.
- [14] Lea, T. 2008. *Bureaucrats and Bleeding Hearts: Indigenous Health in Northern Australia*. UNSW Press.
- [15] Lofland, J., Snow, D.A., Anderson, L., and Lofland, L.H. 2005. *Analyzing Social Settings: A Guide to Qualitative Observation and Analysis*. Wadsworth.
- [16] Luff, P., Jon, H., and Heath, C. 2000. *Workplace Studies: Recovering Work Practice and Informing System Design*. Cambridge University Press.
- [17] Mayntz, R., and Scharpf, F.W. 1975. *Policy-Making in the German Federal Bureaucracy*. Elsevier.
- [18] National Health Priority Action Council. 2006. *National Service Improvement Framework for Cancer*. The Australian Government Department of Health and Ageing. [http://www.health.gov.au/internet/main/publishing.nsf/Content/96C9CD63196A62ACCA25714100045165/\\$File/cancall.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/96C9CD63196A62ACCA25714100045165/$File/cancall.pdf).
- [19] Orlikowski, W.J. and Yates, J. 2002. It's about time: Temporal structuring in organizations. *Organization Science*. 13 (6), 684-700.
- [20] Pentland, B.T. and Feldman M.S. 2007. Narrative networks: Patterns of technology and organization. *Organization Science*. 18, (5), 781-795.
- [21] Reddy, M., Dourish, P., and Pratt, W. 2006. Temporality in medical work: Time also matters. *Computer Supported Cooperative Work (CSCW): The Journal of Collaborative Computing*. 15, 29-53.
- [22] Rushefsky, M.E. 1986. *Making Cancer Policy*. State University of New York Press.
- [23] Scharpf, F.W. 1997. *Games Real Actors Play. Actor-Centered Institutionalism in Policy-Research*. Westview Press.
- [24] Schmidt, K., and Bannon, L. 1989. CSCW: Four characters in search of a context. In *Proceedings of the First European Conference on Computer Supported Cooperative Work*. (Gatwick, UK, September 13-15 1989) ECSCW '89. 358-372.
- [25] Schmidt, K., and Bannon, L. 1992. Taking CSCW Seriously: Supporting Articulation Work. *Computer Supported Cooperative Work (CSCW): The Journal of Collaborative Computing*. 1, 7-40.
- [26] Schmidt, K., and Simone, C. 1996. Coordination mechanisms: Towards a conceptual foundation of CSCW system design. *Computer Supported Cooperative Work (CSCW): The Journal of Collaborative Computing*. 5, 155-200.
- [27] Simone, C., Divitini M. and Schmidt K. 1995. A notation for malleable and interoperable coordination mechanisms for CSCW systems. In *Proceedings of conference on Organizational computing system* (Milpitas, California, August 13-16 1995), COOCS'95. 44-54.
- [28] Strauss, A.L., Fagerhaugh, S., Suczek, B., and Wiener, C. 1985. *Social Organization of Medical Work*. The University of Chicago Press.
- [29] Sundhedsstyrelsen. 2005. *National Kræftplan II. Sundhedsstyrelsens Anbefalinger til Forbedringer af Indsatsen på Kræftområdet* [National Cancer Plan II. National Board of Health Recommendations for Improving Cancer Healthcare Services]. The Danish National Board of Health. <http://www.sst.dk/publ/publ2005/plan/kræftplan2/kræftplan2.pdf>.
- [30] Teknologirådet. 2010. Sammenhæng og Koordination i Sundhedsvæsenet - Kan IT Gøre en Forskel? [Connection and Coordination in the Healthcare Sector – Can IT Make a Difference?]. Teknologirådet - The Danish National Board on Technology. http://www.tekno.dk/pdf/projekter/p10_fremtidensundhed/p10_sundhedsvaesen_Debatoplæg.pdf.
- [31] Winthereik, B.R., and Vikkelsø, S. 2005. ICT and integrated care: Some dilemmas of standardising inter-organisational communication. *Computer Supported Cooperative Work (CSCW): The Journal of Collaborative Computing*. 14, 43-67.