



Collective mindfulness in post-implementation IS adaptation processes



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ABSTRACT

The organizational consequences of implementing information systems (IS) in organizations have primarily been studied during the implementation or early post-implementation phase. We argue for the need to study the continuous organizational adaptation of evolving IS because of the challenges such processes pose for users, as well as the organizational capabilities they demand. We report from a qualitative study in a hospital setting in which a scanning project was initiated two years after the initial implementation of an Electronic Health Record system. The project was initially conceived to be minor, but led to thorough redesign of work processes and routines. We give a detailed account of the challenges encountered and the actions taken as part of the users' sensemaking in this project. By describing how the making, giving, demanding, specification, and breaking of sense were carried out, we identify the way in which the organizational capability we call "collective mindfulness" was achieved. Being aware of how to practically achieve collective mindfulness, managers may be able to better facilitate mindful handling of post-implementation IS adaptation processes.

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1. Introduction

Considerable work has been carried out on the implementation or early post-implementation phase of information systems (IS) in organization; however, there is still a dearth of knowledge informing managers how best to facilitate the continuous post-implementation adaptation of information systems (IS). Following an IS implementation, the organization works to adapt the acquired information system and the work processes to ensure realization of benefits. But over time the initial implementation of IS may be followed by additional changes; for example, users may gradually increase their exploitation of the system's functionalities, there may be system upgrades that bring new functionalities, or the system may get integrated into ever-evolving, organization-wide (as well as sector-wide) information infrastructures. Not only technological developments but also regulatory or market demands may induce system change or the implementation of new IS. Thus, the organization and users may be expected to deal with change processes on a nearly continuous basis. Compared with high-profiled IS implementation projects, these ongoing and often rather mundane change processes may or may not be organized as projects (depending on their perceived scale, significance, and complexity), and this organizing or the lack thereof can be reflected in better or more poorly managed projects.

A premise for this paper is that such change processes pose specific challenges, therefore requiring certain capabilities in organizations. For instance, lacking the cognitive support structure in project organization, such as deadlines and milestones, users are confronted with situations characterized by uncertainty and ambiguity. The change may require redesign of work processes, either trivial or more radical, implying again that there may be a need to coordinate users' responses to these processes,

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both along, and across, existing work processes. For example, users may be confronted with a set of undefined tasks, and their actions may be dependent on actors beyond the local setting, which is difficult to anticipate at an early stage. Furthermore, there may be a lack of resources for such change processes, and the competence to organize the processes may be minimal.

Current literature has not theorized in great detail about such processes of continuous, post-implementation, organizational adaptation of IS. The aim of this paper is to contribute to our understanding of these processes, their challenges, as well as the required organizational capability needed to deal with them. Our study focuses on the capability of remaining “aware of something that may be important” (Merriam Webster’s definition of mindful) in an open and undefined situation, where the organizational setting deems that this awareness goes beyond the individual to encompass the collective setting – a capability we name “collective mindfulness.” In our empirical study of a post-implementation adaptation process, we investigate the challenges that users encounter, as well as the actions they initiate when dealing with these challenges. This allows us to describe the nature of the capability of collective mindfulness, as well as theorize about how this capability may be generated in the organization. The overall aim is to inform managers and change agents on how to better facilitate ongoing post-implementation adaptation processes.

The rest of the paper is organized as follows. We present core insights from the IS literature on organizational adaptation of IS. Based on these insights, we introduce the notion of collective mindfulness and our theoretical lens based on sensemaking. We then present the empirical case from the healthcare sector and outline the research approach. The case reports the responses from users when the hospital management decided to extend their existing Electronic Health Record (EHR) system’s capability by scanning paper documents and importing the files into the EHR system. Initially viewed as a minor change, the digitizing of documents in actuality entailed a larger redesign of multiple work processes. We analyze how users made sense of the required changes, and how they responded to the challenges they encountered. This analysis reveals how collective mindfulness was organizationally achieved. We conclude by outlining the implications of our study for research and practice.

2. Related research on IS implementation

Our empirical case is from the healthcare sector, where significant investments in IS reflect expectations that technology will contribute to improving quality and efficiency (Jones, 2004; Currie & Guah, 2007; LeRouge, Mantzana, & Wilson, 2007). To date, one of the biggest priorities has been to replace paper-based patient records with Electronic Health Record (EHR) systems. However, EHR adoption rates have consistently been slower than expected (Ford, Menachemi, & Phillips, 2006; Ford, Menachemi, Peterson, & Huerta, 2009), some of the reasons being immature technologies, lack of standards, as well as limited evidence of economic return on investments. Other studies point to the lack of organizational readiness, resistance from health personnel, misalignment of incentives among the different stakeholders, and regulatory barriers (Wiley-Paton & Malloy, 2004; Ash & Bates, 2005; Middleton, Hammond, Brennan, & Cooper, 2005; Ford et al., 2006).

While there is certain recognition that the adoption of an EHR system implies significant changes to the work procedures, norms, and habits of healthcare professionals (Marcotte et al., 2012), the medical informatics or health policy literature has had little focus on the organizational transformation or practice change. This is a topic to which IS research can contribute with more theoretically nuanced and practically relevant insights (Sherer, 2014). Agarwal, Gao, DesRoches, and Jha (2010) argue that knowledge on how to manage implementation processes “is possibly one of the most pressing health policy issues facing the nation” (ibid. p. 801), and they recommend that IS researchers address organizational issues beyond initial implementation. The task of integrating IS into the daily workflow of healthcare practices and ensuring the ongoing, productive realization of the value of IS may benefit from insights from IS implementation research.

2.1. Understanding healthcare IS implementation

IS implementation has been conceptualized as a politicized process where different groups in the organization pursue different interests (Keen, 1981; Markus, 1983). This is also relevant for healthcare. Hospitals are complex organizations because they are knowledge intensive and disciplinary heterogeneous, with many concurrent and interdependent activities (Glouberman & Mintzberg, 2001; Davidson & Chiasson, 2005). Therefore, the implementation of IS healthcare will often be affected by multiple actors with different backgrounds, needs, and interests (Mantzana, Themistocleous, Irani, & Morabito, 2007). Furthermore, employees (especially physicians) possess a high degree of professional autonomy. Consequently, many healthcare IS implementation studies have focused on professionals’ acceptance of, or resistance to, a new technology (Kohli & Kettinger, 2004; Lapointe & Rivard, 2005, 2006). This acceptance/resistance lens on IS implementation has illuminated how technology impacts, challenges, and changes pre-existing structures, tasks, and identities.

IS implementation has also been conceptualized as a design or redesign process in which the technology needs to be appropriately designed to accommodate the organizational demands and new practices, and possibly new organizational structures need to be established (Vikkelsø, 2005). This is not a trivial task, and in these processes, the users’ interpretation and enactment play a central role for determining the outcome (Orlikowski, 2000; Lamb & Kling, 2003; Boudreau & Robey, 2005). Healthcare implementation studies often emphasize the inherent complexity of the health sector, and point to the too simplistic system designs, as well as too naïve or utopian implementation approaches that do not perform well, vis-à-vis the complexity of multifaceted coordinative arrangements (Lundberg & Tellioglu, 1999), the multidimensional nature of medical knowledge production (Berg, 1999; Ellingsen & Monteiro, 2003), or the potential side effects associated with standardization (Hanseth, Jacucci, Grisot, & Aanestad, 2006).

Other IS studies emphasize the need to learn about the system and its possibilities and limitations, as well as the processes of un-learning and reshaping work procedures (Edmondson, Bohmer, & Pisano, 2001a). Such learning processes often hinge on the users,

and the implementation outcome is somewhat indeterminate due to users' unintended learning being manifested in improvisations, re-inventions, and workarounds (Boudreau & Robey, 2005). This stream of literature also recognizes that IS implementation takes time and requires dedicated efforts (Robey, Ross, & Boudreau, 2002). Edmondson et al.'s implementation study (2001a) takes a learning perspective on the transformation of organizational routines at the work group level. The authors show that the development of new beliefs, skills, and collaborative routines are facilitated by certain conditions that encourage learning to happen: related to authority structures, psychological safety, and team stability (Edmondson, Bohmer, & Pisano, 2001b).

The current studies on IS implementations in healthcare point to a number of challenges related to conflicting user interests, complexity in redesign, as well as ongoing learning requirements. One way to better understand such challenges is to turn to the literature on the ongoing organizational adaptation of IS, which we discuss next.

2.2. IS implementation and continuous organizational adaptation

Building on a long research tradition (see e.g., Barley, 1986; Leonard-Barton, 1988; Orlikowski, 1993), IS researchers have extensively studied how organizational behaviors and routines are transformed during IS implementation. The introduction of new technology triggers a change process that continues for some time after implementation, and where attitudes, work routines, organizational structures, and the features of the technology itself can undergo changes. The analytic lenses employed in IS implementation research vary, each illuminating different aspects of such processes. In their extensive review of research on technology and organizing, Leonardi and Barley (2010) identify five streams that can be distinguished by asking different questions relevant to different phases of the implementation. One of these streams, the *perception* perspective, seeks to explain the choices made in the adoption phase, while the other four perspectives are interested in the use phase. The *interpretative* perspective characterizes research that focuses on cognitive aspects of users' reception of new technologies, while the *appropriation* perspective denotes research that describes how users conform with, or deviate from, the intended usages. The *enactment* perspective also addresses use, but is interested in the evolution of work practices over time, and the *alignment* perspective characterizes research that asks how the work structures and organizational patterns change.

The majority of the existing studies on IS tend to focus on the issues that emerge at an early stage of IS implementation, when users and organizations are in the process of adaptation. Although four of five streams in Leonardi and Barley's review (ibid.) deal with the use phase, the IS literature has tended to neglect the period after the initial implementation is over; i.e., the period when the dust has settled. Moreover, studies tend to subscribe implicitly or explicitly to linear stage models. For instance, Lapointe and Rivard (2007) employ the four-phase enterprise system, experience cycle of Markus, Tanis, and van Fenema (2000), consisting of 'project chartering,' 'configuration and roll out,' 'shake down,' and 'onward and upward.' Edmondson et al. (2001a) also explicitly introduce a model of 'initiation,' 'implementation,' 'full ramp-up,' and 'integration,' although they point out that in their experience the process was not simply linear, as steps were repeated and some activities spanned several phases.

More explicit attention to the post-implementation phenomena is seen in research addressing the "assimilation gap" (Fichman & Kemerer, 1999), pointing to what may occur when acquisition of an information system is not followed by proper integration into use practices, with the consequence that usage may be low or partial. This literature brings the post-implementation phase to the foreground; however, it tends to remain focused on the particular system that has been implemented. In reality, there could be a number of events and situations external to the system itself that trigger post-implementation change and learning. For instance, Jaspersen, Carter, and Zmud (2005), in their study of individuals' post-adoptive behavior, argue that users' reflective processing may occur: "as a result of three types of stimuli: when a situation is novel (i.e., the initial use of a technology feature), when an individual senses a discrepancy between reality and expectation, and when individuals are induced to deliberate regarding their behavior (i.e., an intervention is attended to)" (ibid. p. 543).

We believe there are good reasons to go beyond the predominant focus on implementation to encompass also the ongoing changes in the post-implementation phase. We focus on the desired organizational capability to encounter such an open and undefined situation with an awareness that encompasses larger parts of the organizational setting, a capability we call "collective mindfulness." The next section describes in greater detail what this notion entails and elucidates the concepts related to sensemaking activities, which constitute our analytic framework.

3. Collective mindfulness and sensemaking

3.1. Collective mindfulness

Collective mindfulness is seen in organizations that operate successfully in highly complex and time sensitive environments (Weick, 1998; Weick, Sutcliffe, & Obstfeld, 1999; Weick & Sutcliffe, 2006). This view builds on the assumption that any new situation contains novel elements and that taking anything for granted in a routine-like way is a risky endeavor (Weick et al., 1999). Mindful organizations perform well, both in anticipating, and in containing, the unexpected. One way to anticipate the unexpected is *preoccupation with failure*, which implies attention to the small and large failures that may appear in an organization. An increased attentiveness of possible failures ensures an ongoing sense of potential vulnerabilities in the technology, gaps in existing procedures, and sloppiness in operations (Weick & Sutcliffe, 2006), which in themselves may help prevent failures from happening.

A second approach to anticipating the unexpected is *reluctance to simplify* interpretations, explanations, and experiences of the organization (Swanson & Ramiller, 2004). In most cases, members of an organization tend to make sense of complex tasks by

simplifying their interpretations and worldviews. However, as we know, more is not always better, which is also true here: too much simplification limits not only the precautions previously taken but also the undesired consequences they envision (Weick et al., 1999). Reluctance to simplify is thus an important strategy to ensure that problems are evaluated from different perspectives, thereby increasing the organization's ability to notice, to be skeptic, and to crosscheck what happens (Butler & Gray, 2006). A diversity of viewpoints and negotiations becomes central as “it takes a complex system to sense a complex environment” (Weick et al., 1999, p. 82).

Mindfulness demands attention to the variability in organizations, although this may render certain standardization issues inflexible in different local contexts. Therefore, a mindful organization possesses situational awareness and is *sensitive to its current operations* (Weick et al., 1999). This implies creating a picture of the organization's overall situation and operational status; i.e., being aware of the relationships and dependencies that exist among the employees, the structure of the organization, and the management of the work performed. People who are sensitive to these situational facts see the interconnections in the organization and more easily comprehend the complexity that exists. The sensitivity is achieved through collective story building, knowledge of existing interconnections, diagnosis of limitations of planned procedures, and shared mental representations (Weick et al., 1999). In an IS context, such sensitivity is important when defining the mutual adjustments and the dependencies that exist between the system being implemented and the existing work system (Ciborra et al., 2000; Swanson & Ramiller, 2004).

In addition to anticipating the unexpected and preventing it from causing breakdown, mindfulness also implies containing or minimizing the unexpected when it does happen. One way is to create a *commitment to resilience*, which favors improvisation and adaptation over planning and routine. It relates to the tendency of coping with problems as they occur, and containing, not eliminating, surprises. Commitment to resilience implies opportunistic learning that arises from small mistakes and surprises. A way to commit to resilience is to build a capacity to cope with, and to absorb, change and then to utilize the change to move forward through improvisation (Butler & Gray, 2006).

Another way of containing the unexpected is *deference to expertise* (Weick et al., 1999) or *underspecification of structure* (Weick & Sutcliffe, 2006). The members who have the most expertise, while not necessarily having formal authority, should be allowed to make decisions. This means that hierarchical rank (i.e., organizational structure) is subordinated to experience and expertise. In organizations that enact flexibility, decisions are delegated to people at lower levels, who can immediately sense potential problems and thus make quick decisions to alleviate problems. In Table 1, the qualities of mindfulness are summarized (See Table 1.)

The post-implementation adaptation of information systems is different from the complex and time-sensitive activities that Weick and colleagues have typically studied in settings such as nuclear power plants, aircraft carriers, or fire fighter crews (Weick et al., 1999). While mindfulness has been applied to a healthcare context (e.g., see Issel & Narasimha, 2007), it has usually been with the argument that the core activities in hospitals are complex and critical activities (Butler & Gray, 2006). We take on a slightly different perspective, as we do not focus on these emergency, time-critical aspects of healthcare work, but rather on the ongoing organizational transformation of a more stretched-out and mundane nature.

To date, only a few IS researchers have studied mindfulness in an IS implementation context. For example, in Valorinta's (2009) study of Enterprise Resource Planning (ERP) system implementation in two retail companies, he redefines what mindful behavior means in an IS project context, arguing that: “the alertness and attentiveness inherent in mindfulness may have an important impact on the ability to conduct enduring changes in organizational routines and practices” (ibid., p. 993). The author moves from a focus on failure and error detection to a detection of constraints and interdependencies that appear when integrating IS into work procedures. Valorinta observed processes and practices associated with mindful IS implementation, such as *safeguarding* actions that are relevant for anticipating IT-related problems of planning, controlling, and checking. Management actively *explored options* and constructed visual models that acted as sensegiving measures towards the mobilization of users in the organization. Further, emphasis was on the *organization's active anticipation of change* in the form of roadmaps for regular updating and the choice of methods and tools to actively manage the change process. In terms of sensitivity to operations, Valorinta observed the *active exploration of options* in the form of learning through pilots and feasibility studies, as well as active information sharing. Additionally, he observed that activities to *ensure collective engagement* through cross-departmental meetings where IT professionals acted as boundary spanners were deemed vital.

More recently, Carlo, Lyytinen, and Boland (2012) have studied the coordination of multiple organizational actors that have collaborated to realize a complex physical building. Specifically, the authors emphasize the dialectic nature of what they name the *collective minding process*, building on Levinthal and Rerup's argument (2006) that both mindful and mindless (routine)

Table 1
Processes of collective mindfulness.

	Processes	Content
Anticipating the unexpected	Preoccupation with failure	Constant observation, tracking, and judgment of small failures, near misses, and indicators of trouble
	Reluctance to simplify	Taking nothing for granted, seeking disconfirmation before confirmation, seeking complexity rather than simplifying understandings
	Sensitivity to operations	Being aware of interdependencies by continuous communication and information exchange between various parties of the organization
Containing the unexpected	Commitment to resilience	Necessity to improvise routines
	Deference to expertise	Seek out appropriate expertise, override higher authorities if necessary

Table 2
Summary of data sources.

Data sources	Purpose	Outcome
Interviews	Gaining insights into individual participants' perception of, and response to, challenges.	7 targeted interviews totaling 7.5 h (in addition, 35 interviews as background on EHR implementation and use).
Observations	Observing work <i>without</i> scanners to learn about documents in use and current workflows. Observing work <i>with</i> scanners to learn about eliminated, changed, and novel work tasks, as well as issues with handling of paper documents, scanners, software, and hardware. Observing meetings to study the process of collective sensemaking.	15 h of observation of secretarial work. Output: time studies, flow charts, issue lists fed back to project team. 17 h of participant observation of meetings: 5 meetings with the researcher and IT team, 6 meetings with the IT team and internal teams, and 3 meetings with internal teams at Women's Clinic. Output: Minutes from meetings, and 45 pages of transcribed observation notes.
Documents	Gaining insights into the work practices. Following the decision-making related to the various stages of standardization and concretization of tasks. Following the management and coordination challenges (how the IT department team handled the project).	Work flow charts, sample documents, and lists of documents in use. Hospital procedures (draft and final form) (98 pages). Emails dealing with raising and resolving issues, revising plans, etc. Presentation material of scanning project to employees.

behaviors are crucial. Employing this more comprehensive notion leads them to redefine the terms used to characterize mindful behavior and the role of the information system in question, where each of the dimensions is seen to move between a mindful and a mindless pole;

- preoccupation with failure becomes *preoccupation with outcomes* related to “concern surfacing versus confidence building”;
- reluctance to simplify becomes *framing of interpretations* related to “perspective taking versus perspective making”;
- sensitivity to operations becomes *attention to operations* related to “global integration versus selective filtering”;
- commitment to resilience becomes *approach to generativity* related to “improvisation versus codification”;
- underspecification of structure becomes *level of structuring* related to “empowerment versus control.”

Our study represents a somewhat similar but also different case to these studies. In our case, the task implies organizing a process change with many dependencies, as well as the need to assist a collective handling of uncertain processes with unclear requirements. One major difference is, however, the organizational attention and resources allocated to this process. In our case, the responsibility for conducting the redesign process was largely delegated to the users, and there was, at least initially, little provision of structures and tools to support this. Thus, the empirical case in this paper complements existing studies with an examination of how users make sense of what a post-implementation IS adaptation entails, and how an emergent (not pre-planned) organizational response to these challenges may look like. We conceptualize and analyze these processes from a sensemaking perspective to capture the users' interpretations and actions when facing unexpected and confusing events.

3.2. Sensemaking processes

Weick, Sutcliffe, and Obstfeld (2005) define sensemaking as an ongoing activity in which organizational members rely on their awareness to understand “What is going on here?” and to determine “What do I do next?” A situation becomes comprehended through being explicated in words, which, in turn, serves as a springboard into action. Organizational members need to make sense in situations that either involve a dramatic loss of sense (in unfamiliar situations where sense is elusive) or where “the loss of sense is more mundane but no less troublesome” (Weick et al., 2005, p. 415). Sensemaking represents efforts to create order and make retrospective sense of what occurs (Weick, 1993, p. 635); it draws attention to how organizational members simultaneously shape and react to the environment they face (Weick et al., 2005). Zooming in on the process of sensemaking, the creation of meaning will unfold when people engage in the ongoing circumstances from which they extract cues and try to make plausible sense of what is going on (Weick et al., 2005). Through acts of noticing and bracketing, which are “relatively crude acts of categorization” (Weick et al., 2005, p. 414), the number of possible meanings become reduced. Organizational sensemaking is social, and through reciprocal interactions, the selected cues generate a locally plausible story that can be solidified by relating the story to past experience and current practices, or it can act as a guide for further action and interpretation.

Sensemaking processes can be influenced when members engage in acts of giving, demanding, specifying, and breaking sense (Vlaar, van Fenema, & Tiwari, 2008; Monin, Noorderhaven, Vaara, & Kroon, 2013; Maitlis & Christianson, 2014). *Sensegiving* consists of acts by which organizational members attempt to influence or change the way others think and act in a given situation. For example, managers or change agents can actively give sense to users of a new information system by providing user manuals, training sessions, or flow charts of work procedures. Such actions will help clarify the situation to those who struggle with meaning creation. Sensegiving is not simply a top-down process, as actors at any level of an organization may engage in sensegiving with others (Maitlis & Christianson, 2014). In addition, organizational members will not passively wait for information, but rather actively engage in *sensedemanding* processes to reduce uncertainty and ambiguity. For example, users may actively request additional information, ask for clarification, and solicit colleagues for confirmation. *Sense specification* is also considered an important act towards specifying and emphasizing explicit or implicit norms in an organization. When specifying sense, organizational members remind each other of current principles as well as exemplary decisions and actions (Monin et al., 2013). *Sensebreaking* is another approach to influencing meaning construction by questioning existing understandings. Acts of sensebreaking help people to experience their existing views of

reality as incoherent and untenable, thereby reframing previously held conceptions. For example, people may problematize understandings held by others in order to make them re-consider existing assumptions and beliefs as well as re-examine their course of action. However, challenging existing conceptions may not always be welcomed, and the organizational ability to do so may depend on the existence of an organizational culture that encourages it.

The sensemaking perspective has been used to analytically frame investigations of IS implementation. The implementation of a new information system may cause an immediate 'shock' in the organization and interrupt users' current way of working. This shock often triggers an intensified and ongoing period of sensemaking, in which meanings materialize to inform or constrain action (Anderson, 2006). In a study of the implementation of a group support system, Orlikowski and Gash (1994) suggest that "to interact with technology, people have to make sense of it; and in this sensemaking process, they develop particular assumptions, expectations, and knowledge of the technology, which then serve to shape subsequent actions toward it" (Orlikowski & Gash, 1994, p. 175). A number of studies have followed up on this insight by highlighting how technologies are enacted in specific organizational contexts through actors' continuous meaning production and actions (Henfridsson, 1999; Kohli & Kettinger, 2004; Jaspersen et al., 2005; Vaast & Walsham, 2005; Bansler & Havn, 2006; Hedström, 2007). Common to these studies is the argument that users' sensemaking is particularly relevant to study in an early phase of IS implementation, as this phase is characterized by a high degree of ambiguity and uncertainty, and since meaning creation about the technology is particularly intense in this period.

While we agree with these insights, we wish to take this argument further by investigating users' ongoing sensemaking processes at a later stage, namely in the IS post-implementation phase. In this phase, it is common that the sensemaking process is left to the users to manage. This sensemaking can happen in various ways: it can be arbitrary and suboptimal, swift and adequate, or something in between. By conceptualizing IS post-implementation as an ongoing sensemaking process, we will be able to gain insight into how users make sense of a current situation and how they use this sense as a springboard for action. The desired capability of collective mindfulness rests upon processes of sensemaking. Consequently, the first research question that we wish to pursue is: 1) *what characterizes the process of sensemaking in the post-implementation adaptation process of IS?*

If we understand better the nature of these sensemaking processes, there is a potential for managers and change agents to more actively support them. With this overall objective in mind, we pursue a second research question when analyzing our case: 2) *what specific measures can support the sensemaking process and thus the achievement of collective mindfulness as an organizational capability?*

4. Research approach

4.1. Introducing the case study

We gathered empirical material from a Norwegian hospital that had implemented an Electronic Health Record (EHR) system three years previous to this study. The early versions of the EHR system could not fully replace the paper-based record, since much of the information needed to remain in paper form or in specialized systems. Furthermore, the EHR system was under continuous development with releases of new and more comprehensive versions, which meant that the transition to a paperless hospital was slower than expected. The paper-based version of the patient record remained a legally binding document, and thus all entries in the EHR (and in the other clinical systems) were still printed on paper and archived with the corresponding paper patient record.

After some time, this situation was no longer sustainable, as it caused a critical space problem in the archive. Consequently, the hospital management decided to purchase scanners, since full-scale digitization could not be immediate. Initially, the scanning project was presented as a small-scale, short-term project entailing simple hardware purchase and installation. Large bulk scanners would be implemented to scan full paper records stored in the archive. Clinical departments would use less advanced hardware to scan local documents, such as incoming letters. The scanned documents would be imported into the EHR and would be visible to the clinical staff. Due to delays in getting the scanners to work in the archive department, scanners were installed in four pilot departments, one of which was the Women's clinic. We chose this department as the site of our study, since it is one of the largest departments at the hospital with a complex structure of subsections and smaller clinics. Furthermore, there is a high demand at the Women's clinic for the patient record archive services.

Early on, some of the secretaries at the department started testing the scanners, and throughout the next weeks bugs were identified and fixed. The pilot departments initiated discussions on how to best organize the scanning activities and adapt existing work processes to new procedures. Initially, the complexity of the required redesign was underestimated and little attention was devoted to the implementation strategy. The management of the hospital prioritized funding of other more strategically important IT projects, which meant that the scanning project had to operate at a low-cost mode. No resources were allocated to the clinical departments to relieve employees from their clinical duties, and the project had to fit in with the ongoing work practices at the departments. The overall schedule was delayed by almost two years. In the end, based on the experiences gathered in the pilot departments, procedures and organizational standards were developed, and the scanning solution was rolled out to all clinical departments, allowing gradual transition to a full digital solution in the hospital.

4.2. Data collection

The situation described above, in which responsibility was delegated to end-users without adequate planning, managerial support, and resources, was a good opportunity to study how end-users make sense of and attempt to organize such a change

process. The empirical study was a spin-off from a larger ongoing research project, where two professors and two PhD students studied the effects of the EHR implementation in nine different hospital departments. As the EHR study progressed, the scanning activities became a point of interest for one of the researchers (the first author of this paper), who continued with a more focused study. This meant that no new research protocol was defined in advance, and the access to the field site was rather informal through association with the project management team from the IT department. The scanning activities constituted the case for this paper, while the larger study of the EHR implementation served as a basic introduction to the organization and the clinical work practices.

The scanning project was closely followed by the first author for a period of more than two years (see Table 2). Drawing partly on the 35 formal interviews conducted within the larger EHR study, the researcher additionally conducted seven semi-structured interviews with the scanning project's management group and with staff from the IT and archive departments. These interviews focused on the progress of the project and the interviewees' perceptions of obstacles and opportunities. Open questions were asked about their perceptions of the historical as well as current situation and what they perceived to be challenging in the process. The interviews lasting 45–90 min were taped and transcribed. In addition, extensive field notes were taken from participant observation in various project activities during the two years of study. The first author participated in fourteen project meetings at the department during the study period, totaling 17 h. Five were coordination meetings between the EHR researchers' team and staff from the IT department, six were project meetings between the staff from the Women's clinic and IT staff, and another three were internal meetings with only staff from the Women's clinic. The researcher actively participated by taking notes, intervening in the discussions, and sometimes preparing the minutes for the group.

Apart from the meetings, the first author observed the secretaries' scanning work, documented bugs and problems, performed time studies, and assisted the personnel in compiling detailed information about document flows in the department. Notes from these observations were fed back to the department and the project management for validation and as input for further processes. Similarly, numerous informal conversations over lunch and coffee breaks added to the understanding of the scanning project. Various documents, such as procedures, guidelines, and process maps, were also collected during the process.

4.3. Data analysis

The analysis is based on both authors' reading and discussion of interview transcripts, field notes, and project documents. First a chronological storyline of the scanning project was created, emphasizing the main challenges encountered. Events and tasks that were perceived to be challenging in the observed meetings and discussions in the Women's clinic were examined more closely. For example, we coded and categorized 'scanning instructions and guidelines prepared by the staff in the archive department to the employees in the Women's clinic' as an attempt of 'sensegiving' by which individuals attempted to influence the sensemaking of others. Similarly, we coded and categorized 'the organization of workshops as a means of stimulating the clinical departments to question existing practices and to take on the required change of work practices' as act of 'sensebreaking.' In the next step we examined how the team members responded to the challenges. We also aimed at identifying whether any remedial action was taken by the overall project team, and whether these action points helped with the resolution of the challenges.

The account includes examples from the work in the local group as well as from the IT department and the Archive department's actions that targeted the scanning activities across the whole hospital. The protracted nature of the project offered a unique opportunity to analyze the challenges that were encountered during this time, a process that would not have been equally visible if the process had been swift and smooth. As a final step of analysis, we coded the data for practices that followed the suggestions in the literature regarding collective mindfulness. Specifically, we looked for segments in the dataset that would indicate if/when staff were sensitive to the daily operations, if/when they would seek out the appropriate expertise to solve an issue, as well as if/when they would need to improvise. Next, we present the findings from the data analysis.

5. Handling of post-implementation adaptation

In this section, we present events that illustrate the main sensemaking challenges encountered in the scanning project, as well as the organizational responses, both at the local and overall level.

5.1. Demanding "actionable sense"

Initially, the team members in the pilot departments were asked to specify how many scanners they needed, and in which room they should be placed. In the Women's clinic, this request could not be immediately, nor easily, answered, but triggered a process of sensemaking among the team members. A number of questions were asked: Who should scan which documents at what point in the work process? Should incoming mail be scanned by one person before distribution to the separate wards or by several persons, one in each ward? How could the workload that scanning would introduce be estimated? Which changes should be made to the workflow? How different were current work processes between the sub-sections, and how well justified were the differences?

The team members had to gather and pool their knowledge of how work was currently organized, to chart and assess which changes of the current organizing were desirable, and to prospectively design new work processes. Observations from the group meetings showed that the task ahead of them was vaguely defined; consequently, they sought assistance from the IT department in their search for "actionable sense" and were given the recommendation of following a phased process. In the first phase, only

referral letters were targeted, while in the second phase, all incoming mails that were related to patient treatment were scanned. In the third phase, the various paper documents that were produced during the patient's stay in the hospital were scanned, meaning that nothing would be sent to the archive. The fourth and last phase of the project aimed at scanning complete existing patient record files; e.g., for patients that were to be admitted to the hospital so that they were available in the EHR system when the patient arrived. This helped to delimit the task of responding to the impending changes and responding to requests for placement of scanners and allocation of staff.

5.2. Attempts at sensegiving

Once the scanners were installed, employees in the Women's clinic struggled with the question of 'how to' scan documents: which documents should be scanned and which not, as well as where documents should be stored (i.e., in which section of the EHR system). To help them make sense of this situation, staff in the archive department prepared scanning instructions in the form of a list of document categories and their appropriate location in the EHR structure. These guidelines were helpful, but there were also numerous documents specific to the Women's clinic that were not included in the list. This led to the decision of defining a hierarchy of procedures in which the list prepared by the archive department was defined as: a 'Level 1 Procedure' (i.e., to be applied across the hospital), after which the pilot departments were asked to develop 'Level 2 Procedures' that covered the documents specific to each department. In the Women's clinic, each subsection mapped its specific documents and created specific lists. The detailed mapping of the various documents helped each subsection to clarify the nature of the challenge and subsequently, to initiate collective discussions. The guidelines and the development of new procedures were used to reach a decision on which documents to scan, at what point in time (especially relevant for documents that accumulated information throughout a process, e.g., growth curves), as well as where to store them. These actions helped the team members make sense of the current situation and served to ensure that documents would be stored and retrievable in the EHR system.

5.3. Efforts to break existing understandings

The project team's preparation of the overview of documents was useful, but it was not enough to resolve the challenges of redesigning work and reframing the existing work procedures. The project manager mentioned:

During autumn I realized more and more that the project would not be a success if we didn't attend to the organizational development [...] We tried to tell the departments that they had to take ownership of this, not just the scanning, but also all the other digitization projects that would come. They had to discuss how each change would affect the organization, what it would entail, and how many resources this would take; our role would simply be to support them (Project manager).

The clinical departments were neither well-prepared nor equipped for the necessary redesign of their local work processes, and most importantly, many users were reluctant to change their existing work practices. The project management staff realized they had to take on a more active role and therefore conducted several workshops with the pilot departments, using simple graphical representations to map the work processes (see an example in Fig. 1).

The mapping was intended to serve as a point of departure for identifying important constraints as well as realizing the potential for redesign. These workshops were meant to stimulate the clinical departments to question existing practices and to encourage them to take on the required change of work practices. After a couple of mapping sessions with the IT department, the local team started its own detailed redesign of work practices in separate meetings. While the representations were simple, they served to inform the rest of the team (no one was familiar with all of the flows) and helped to avoid making decisions that would be infeasible with long lasting consequences. The next section illustrates that the collective attention was necessary in order to arrive at a doable plan, and that while these "as-is" descriptions were useful to establish a joint understanding, much effort was required for a careful delineation of the consequences of the modified plan.

5.4. Sorting out preconditions and making sense of changes

In the meetings at the Women's clinic, the handling, distribution, registration, and further processing of documents were discussed. Many of the discussions dealt with the necessary first steps after the documents arrived in the mail. The general request was that mail should be opened and scanned as quickly as possible upon arrival. Previously, mail had been distributed to the individual wards before it was opened and processed. Initially, the involved secretaries thought it would be straightforward to centralize mail handling and scanning. Later in the process, however, other secretaries became involved and they voiced objections to existing practices. One of the wards handled sensitive personal information, e.g., related to infertility, gender identity disorders, and anonymous semen donors, and they registered this information in a limited-access section of the EHR system that the other staff could not access. They wanted to continue to open the incoming mail themselves in order to maintain patient privacy based in legal regulations. In general, the redesign process was complicated by the need of detecting such typical constraints that would shape the available redesign space. This discussion was pursued through collective negotiation about the various possible procedure changes, with the collective aim of detecting and preventing adverse consequences of proposed changes.

According to the general guidelines, all incoming referral letters were to be scanned upon arrival, before evaluation. The excerpt below illustrates the discussion around a particular category of referral letters: applications from pregnant women to

be admitted to deliver their baby at this clinic. The clinic was popular and received more requests from pregnant women than it could admit. Therefore, unlike other referrals, which were generally accepted, around 50% of these applications were turned down and patients would be referred to other hospitals.

Brigitte [secretary, team leader]: *Let's proceed to discussing the evaluation of delivery admittances. Why can Ellen [secretary] not also use the electronic referral letter after it has been scanned?*

Susanne [secretary]: *But consider all of the [patients] who don't get admitted.*

Researcher: *Oh yes, because you have to create an EHR file for all those who are to be scanned, right?*

Brigitte [secretary]: *Yes... [pause] Well, it's true, we should not create routines that we have to reverse later. [pause]*

Susanne [secretary]: *But why do the papers continue to Anna and Ruth?*

Mary [secretary]: *They register them in the PAS [Patient Administrative System] and schedule the ultrasound examination.*

Ellen [secretary]: *But they could have been registered in PAS before I get them.*

Susanne [secretary]: *Are the rejected applications also registered in PAS?*

Ellen [secretary]: *Yes, the rejections are also there.*

Jointly discussing this category of referral letters helped the users realize that to scan them upon arrival would imply the creation of several thousand patient files in the EHR system for patients who, in the end, would not even be admitted to the clinic. This seemed insensible, and thus an exception was implemented locally for this particular category. The open discussion and questioning approach would be crucial in order to detect constraints on decisions in the form of “upstream” preconditions for the decision to succeed, as

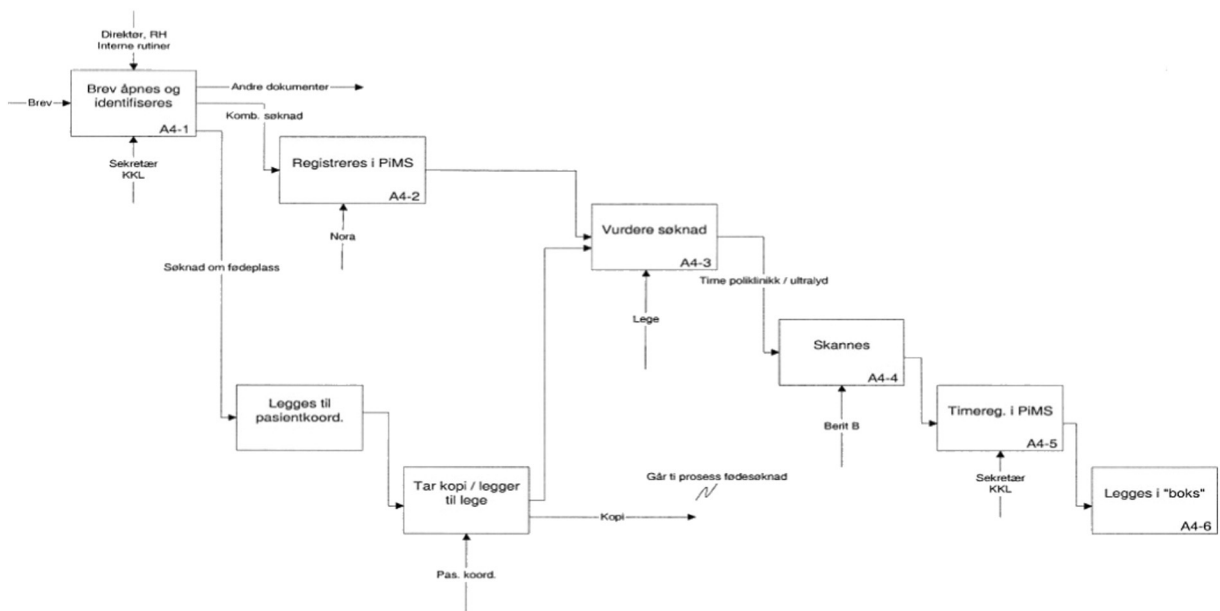


Fig. 1. One of the diagrams produced to map document flows.

well as for “downstream” consequences if the decision were to be implemented. This tentative questioning and probing characterized the collective sensemaking of options throughout the observation period.

5.5. External constraints and surprises trigger the need for new sensemaking

The expectation was that the scanning project would complete the transition to a digital information flow that had been initiated by the EHR implementation. However, external constraints introduced uncertainty about this assumption, and thus about the expected tasks to be accomplished in the project. For instance, the staff in the Women's clinic realized that they could not legally remove the paper and switch to just using the EHR system, since the current version of the EHR system did not comply with the National Archiving Authorities' standards for long-time storage of digital data. The current version also did not support notifications, meaning that the paper documents had to remain in the workflow. This came as a surprise to the staff, who turned to the IT department to know when a new and accredited version of the EHR systems could be expected. In the absence of concrete information from the vendor and the IT department, they did not expect a swift resolution and thus chose to proceed with a work redesign that would work for the near future.

The project thus developed solutions for continuing to work with paper while preparing for digital information flow. For instance, a temporary storage solution was made for those documents that had been scanned and should not be archived, but which still had to be kept for legal reasons. Another technical constraint for the redesign process was that the hospital was planning to upgrade its local area network. The scanners that were purchased were compatible with the new (planned) network, but since the switch had not been executed when they were installed, the scanners had to be linked to dedicated work stations running on a separate network segment. This implied that only the scanning activities could be accomplished on the scanning terminal, not the remaining secretarial work that would naturally be involved in the workflow before or after scanning. This constraint hindered an efficient redesign of the workflow and had to be endured until the whole hospital network was upgraded, which was accomplished one year later.

The disruption caused by the scanning project was followed by an additional “loss of sense” when the team learned that the expected task of switching to a fully digital workflow was not yet technically feasible. At the same time, learning that a new version of the EHR system was not immediate gave them some resolution, vis-à-vis an ill-defined task. These external constraints helped not only in reducing their current tasks (limit their search process) but also contributed to redefining the task into a less urgent challenge.

5.6. Technical constraints on ongoing sensemaking

Referral letters were documents that were sent by general practitioners, specialists, or other hospitals, requesting the transfer of one of their patients to the hospital. To target these in the first phase was generally perceived as a sensible choice of starting point, since referral letters represented an unambiguous category of documents with clear rules for when to scan (i.e., upon arrival in incoming mail) and where to store the file (i.e., in a given location in the EHR, organized after date of the letter).

The letters were usually one page, but could sometimes contain several pages, e.g., when test results were included. In some instances, the referral letter would state that additional examinations had been performed and that the results would be forwarded to the hospital when they were ready. In such cases, the forwarded documents would logically belong to the same referral letter, as they would provide additional information required for the doctor's evaluation and future treatment. However, it was not technically possible to append the after-sent documents to the previously scanned referral letter. The scanner software generated images using the TIFF file format, and in order to create one file, the different pages had to be scanned at the same time and joined before exporting it to the EHR system. Thus a new file had to be generated for the after-sent documents. In order to link these two separate documents in the EHR, the secretaries decided to store them using the same date (i.e., the date on the original referral letter). To do this systematically, the person who scanned the documents had to find out to which original referral letter the document belonged and then use the same date for storing it. The decision to organize it in this manner had to be agreed-upon by other users of the system, both those who scanned documents and those who were going to read them.

5.7. Formal, but flexible procedures to ensure continuous sense and action

The proposals were collected from the various departments and the project team tried to arrive at a sensible distinction between what should be included in general, hospital-wide procedures (level 1), and what should be specific to each local department (level 2). To push the action further, the project team asked the pilot departments to develop new local, level 2 procedures. These procedures were formally part of the organization's quality assurance system, and thus this request had some legitimacy and became a well-working way to get the departments to actually design and implement changes. The shift of mail handling procedures was seen to be so crucial that it also required a directive from the hospital director. For other procedures, partly filled templates were circulated and a deadline for returning the proposed procedure was set. The procedures were supposed to be discussed within the department and adapted as necessary. The process would typically take several months for each procedure, since it was necessary to allow for local variations in the procedures, but also to eliminate unnecessary variations that were considered to be counter-productive. This structure allowed for a standardized flexibility, since at each level, one could specify additional details or even deviate from the higher-level procedures.

The reason for imposing this structure was that the redesign of work could not happen freely at each department, but had to take into account interconnections with other departments. The project management sought to manage and coordinate these local redesign processes across the hospital, since several personnel groups and departments were linked in multiple and complex

ways within the hospital's work system. Local changes in the work processes thus had to be negotiated and coordinated with other processes. Earlier, shared representations of procedures and routines only existed to a limited degree, as ad hoc and idiosyncratic procedures had emerged through the past years with various paper forms and handling practices. The standardization was achieved through a lengthy process where numerous versions of multiple procedures (both at the departmental and hospital-wide level) were circulated and discussed so that local idiosyncrasies were exposed and adjusted.

5.8. Sense specification and collective deliberations

Since the current version of the EHR system did not allow digital notifications, the paper documents had to be kept in the workflow. For instance, the referral letter that had been scanned and could be found in the EHR system would still have to be put in a doctor's mail shelf as a signal that an assessment and decision was due. The scanning would thus not yield immediate and tangible simplification of the work processes as had been expected, but rather, the opposite. The collective sorting out of what would be feasible and desirable changes, given these and other constraints, happened in the project meetings. No one in the department knew all the workflows, as there were multiple sections with varying procedures. Mainly secretarial staff attended these meetings, since nurses and doctors rarely found time to attend, and the outcome of the discussions often hinged on who was present.

As mentioned above, a scanned referral letter could be found in the EHR system, but the doctor who needed to assess it would not automatically know about it or know the patient's name and ID number. A standard one-page evaluation form was thus appended to the referral letter when it was delivered to the doctor. This form contained the patient name and ID together with a text field for the doctor to write down the decision regarding admission and urgency. During one of the meetings, the researcher asked the secretaries whether it was possible to put only this form in the doctor's mail shelf instead of the whole letter, since the form alone would convey the message that there was a referral letter to be evaluated and also the information necessary to locate the patient's EHR file and the referral letter from the doctor's office computer. The participating secretaries agreed that this could be a possible way to proceed. However, the response was different when the issue was raised again in another meeting, when one of the doctors from the clinic, Jane, had found the time to participate (a rare occurrence, which happened only once, during the fieldwork period):

Researcher: I would like to ask Jane whether it would be possible to remove the referral letters from the workflow and only send the evaluation form to the doctors, so that they would be notified about it, but would have to open the referral letter in the EHR system.

Jane [doctor]: I believe there would be an outcry. They [doctors] find this in their mail shelf when they are on their way to the outpatient clinic or the ward round, and that would mean they could not finish it.

Researcher: Does this mean that doctors are evaluating all the referrals in the mail room at once so that they can put them back into the mail shelf?

Jane: Yes.

Karen [secretary]: We should have shared PC stations like those they have in the A ward. It's basically a work station where you just stand and don't sit. What about removing the TV in the mailroom and putting a PC there?

Susanne [secretary]: Yes... like the terminals that you find in shopping malls and similar places, where you have your own booth.

It was important not to disrupt the clinical workflow when exploring options in the redesign of work practices, and Jane's reservation was not questioned or challenged. Jane's input helped in specifying implicit norms and work procedures for doctors. There were occasions in other meetings where similar input from doctors was important, but since they were not present, the necessary questions were singled out and listed, and one of the team members would then approach the doctors after the meeting.

The redesigning of work routines continued as the pilot departments gradually expanded their scanning activities to encompass other documents. Eventually, the scanning took off, but the paper documents were still in use for a long time. A year beyond the intended deadline, the amount of paper sent to the archive was finally starting to decrease, and the work processes utilized primarily digital information.

6. Sensemaking processes and collective mindfulness

In the described case, a seemingly trivial change (the installation of scanners) triggered a larger organizational change process than what had initially been expected. This allows us to see a salient quality of post-implementation adaptation processes: they may be mundane and therefore sometimes ignored or neglected. Some of the issues might have been resolved had the organization invested resources for better planning, while other issues were not predictable. Consequently, the staff had to resolve a number of challenges while the project was underway. We believe that such sensemaking processes are crucial in post-implementation IS adaptation, and that the lack of attention to them is one significant reason why successful implementation of IS and benefits realization is complex.

6.1. Characteristics of sensemaking processes

The situation in the Women's clinic is different from classic sensemaking cases, be it detecting epidemics, medical diagnosing, firefighting, or airplane control. Therefore, the character of the sensemaking process and its challenges are different. In this case, the situation is not so much about noticing, bracketing, categorizing, and interpreting incoming “strange” cues in order to make sense of, and act upon, them. In other words, this was a more “action-oriented” type of sensemaking, seeking to define a plan of action rather than an explanation and “theory” of a phenomenon. A major challenge was how to grasp, or make actionable sense of, looming, but ill-defined tasks ahead. Moreover, rather than being restricted to a team or group, the tasks here involved changes that had to be coordinated across a whole organization, and these changes depended on external actors. Therefore, defining and outlining new work procedures hinged on the ability to detect preconditions and constraints for proposed changes, both in terms of organizational dependencies and external constraints. It was also crucial to avoid disruptions to the ordinary workflow. In the course of the two years, the organization's handling of the project became more deliberate and well-defined than it was initially. Through the lens of making, giving, demanding, and breaking sense as seen in [Table 3](#), we zoom in on the way the organization achieved a more collectively mindful approach:

Table 3
Characteristics of sensemaking processes.

Sensemaking activities	Activities in the case
Making sense	Collective discussions in cross-disciplinary and cross-sectional project teams in pilot departments; achieving a tentative redesign approach where possible work process redesigns were reviewed.
Giving sense	Structuring the project into phases; the Archive preparing lists of documents in advance; the IT department providing information about external constraints as it became known, and providing tools for visually working with work process mapping; providing templates and overall versions (level 1 procedures) of the requested work procedure documents.
Demanding sense	Pilot departments requesting information about external constraints and expected actions; group members requesting specific information from each other; project management requesting concrete deliverables from pilot departments (procedure documents).
Sense specification	Active specification of norms and principles to explain why certain procedures exist; secretaries pointing out legal demands to protect sensitive information; doctors reminding others of current work practices that might be difficult to change due to well-established procedures.
Breaking sense	A climate allowing group members to question other members' assumptions and decisions; pilot departments objecting to overall guidelines and decisions by requesting adaptations and exceptions; rejecting given deadlines if infeasible.

The anticipatory exploration of what the task entailed was supported through imposing some degree of structure of the problem space (i.e., delimiting the task and dividing the project into phases), of the organizational response (i.e., establishing cross-disciplinary project teams and giving them a sequence of assignments), and of the expected outcomes (i.e., revising work redesign as written, formal procedures, and following shared standards). This was not a rigid structure, but one that allowed for tentative examination of its feasibility, as well as modifications along the way. Collective communication – both through real-time discussions in shared meetings and through the circulation of examples, templates, procedures, and standards – was a core necessity for this to happen.

6.2. Achieving collective mindfulness

The challenges mentioned above are important to understand for managers and change agents who wish to support the necessary sensemaking and facilitate collective mindfulness. [Swanson and Ramiller \(2004, p. 561\)](#) claim that mindfulness during the IS assimilation phase demands “sensitivity to the particulars that come to define the mutual adjustment and interaction between the innovation and the firm's work systems [...] This implies a practical and realistic view [...] and a dedication to opportunistic learning from the inevitable surprises and mistakes that attend such undertakings, not only when new systems are first rolled out to their users, but beyond.” Our empirical case offers a possibility to examine these processes more closely. In [Table 4](#), we have mapped the observed responses of our case to the five principles of mindful organizational behavior. This helps us underpin the mindful qualities of these responses and thus to draw out capabilities of collective mindfulness to support sensemaking processes.

In the same way that the challenges of this “action-oriented” sensemaking case differed from classic sensemaking cases, so also the characteristics of the mindful qualities deviated somewhat from other accounts of mindfulness. The first principle of mindfulness in anticipating the unexpected *preoccupation with failure* took the form of *preoccupation with constraints and preconditions*. A core mindful practice in the scanning project was the widespread questioning of the preconditions and effects of decisions, seeking to check and validate the assumptions acted upon before decisions were implemented. We also saw examples of the *reluctance to simplify* and the willingness to proceed on insufficiently known ground. Every decision and proposal was questioned and examined for its upstream and downstream requirements and consequences. Plans were tentative and could be reformulated if the context changed or as new knowledge became available. The principle seemed here to take the form of *reluctance to premature commitment*. Final decisions were postponed until after having sorted out the preconditions and consequences of a proposed action and after having charted the relevant constraints. Dealing sensibly with constraints and consequences crucially depended on *sensitivity to operations*, more specifically seen as *sensitivity to interdependencies and continuous prioritization*. The workers possessed the detailed knowledge required, but the task was not trivial and needed strong organizational support. The case highlighted the crucial role of collective discussions, specification of details, as well as the support from the project management with workflow mapping and graphical charting. A particular focus in these processes was on detecting the interconnections and dependencies between elements in the work system. Acquiring such sensitivity to interdependencies required a collectively constructed understanding and thus appropriate participation was crucial.

In addition to anticipating the unexpected, we also saw acts of mindfulness that contained or minimized the unexpected. The principle of *commitment to resilience* here seems to have a slightly different form, namely that of *commitment to avoid disruptions*. Maintaining as smooth operations as possible and minimizing disruptive changes were crucial guiding principles in the decision processes. The final mindfulness principle of *deference to expertise* or under-specification of structure is a fundamental premise for these kinds of user-driven post-implementation change processes. Implicit or explicit delegation of responsibility occurred where end-users were involved and responsible. However, their action space could be larger or smaller, depending on the associated resources and mandates. The need for support of the user-driven assimilation/redesign could be either overruled or supported by the organization. The challenge was related to broad considerations of the effects of planned changes, consequently “expertise” was not found in a singularly defined location. It was significant to *seek out an appropriate mix of expertise* in order to create a constellation of actors that would be able not only to cover the necessary domains but also to ensure that preconditions and consequences were noticed.

Table 4 sums up the principles of mindfulness and the accompanying supporting activities that could be taken on by managers and change agents.

With the recommendations outlined in Table 4, we purport that this study has clear implications for managers and change agents. We have shown that the post-implementation IS adaptation process needed to draw on collective resources for sensemaking, both within the department and across the whole organization. Moreover, it required an iterative and flexible approach in order to detect

Table 4
Qualities of collective mindfulness.

Principle	Supporting activities in the case	Achieving collective mindfulness
Preoccupation with constraints and preconditions	Non-negotiable (e.g., external) constraints were identified to delineate the task and to reduce the scope of action. Substantial time and resources were allowed to discuss preconditions and implications of various ideas concerning redesigned work processes. Constraints on redesign and disturbances on continuous work were identified and anticipated.	Clarify as much as possible in advance to give sense, and continuously update information that impacts the task. Support mapping and exploration exercises that help identify constraints and preconditions. Encourage and facilitate participants to demand sense.
Reluctance to premature commitment	Sufficient time was spent on sorting out and modifying proposed structures and rules before reaching settlement. Openness was a mantra in considering justifications for allowing variance, special cases, and deviations from standards (possible through designing a hierarchy of standards).	Allow enough time and leeway for exploration and learning through trial-and-error. Implement flexible forms of standardization when possible (flexible to different use contexts and adaptable through time). Establish a culture where breaking sense is encouraged.
Sensitivity to interdependencies and continuous prioritization	Contextual knowledge and detailed information about the work system was shared among key actors in local groups. Detailed mapping of work flows was central. Awareness and handling of problems and issues discovered during pilot implementation was paramount for the continuous process (e.g., creating shared procedures for handling after-sent documents).	Center and ‘anchor’ activities with end-users who know process details. Bring in participants that span across local contexts to specify sense. Ensure sufficient attention towards – and communication around – emerging issues.
Commitment to avoid disruptions	Smooth operations – to the extent possible – were maintained. The extent of disruptive changes was minimized.	Allow continuous operations to be a primary goal. Do not impose ‘artificial’ (i.e., externally defined) deadlines. Emphasize ongoing sensemaking processes.
Seeking out appropriate mix of expertise	Expertise was delegated to users from the very beginning of the process. Collective engagement and seeking out appropriate expertise for an actual problem was paramount for the continuous process.	Create communicative resources that allow collective sensemaking among relevant users (i.e., wide participation). Encourage questioning attitude and allow breaking sense across hierarchies.

the impact of decisions and changes. Thus, providing as much information as possible to end-users about known constraints, decisions, and issues, both from management (vertically) and between departments (horizontally), may help the project participants define the preconditions and consequences of the decisions they need to take. The crucial role of expertise implies that facilitating participation of key personnel in meetings is essential. A robust structure for information flow will enable communication of facts about the workflow, information about choices and decisions made, and about experiences and learnings. The processes of cross-departmental standardization need to be conducted in an iterative and flexible way. Instead of a sudden imposition of a given hospital-wide standard, here a hierarchy of standards that allowed local variation was developed through iterations and alignments between departments throughout a period of several months. These insights may prove useful for key personnel and change agents on how to mindfully cope with post-implementation adaptation of IS. The role of these persons is not fully captured by terms such as 'IS specialists,' 'facilitators,' or 'advocates of change' (Markus & Benjamin, 1996); they should also be 'mindful managers' of change who can draw on the five characteristics of mindfulness to ensure more productive organizing to support mindful sensemaking.

7. Concluding remarks

IS implementation studies have, to a limited degree, focused explicitly on the post-implementation phase where new systems get more fully integrated into the organization. The prevalent emphasis on project management and reception in the organization has generated valuable insights, e.g., IS researchers have demonstrated the importance of top-level management support (Myers, 1994), the role of users' resistance due to various reasons, such as badly designed systems or organizational politics (Keen, 1981; Markus, 1983; Jaspersen et al., 2005), the importance of learning from previous experience (Lyytinen & Robey, 1999), and the need for learning-oriented and adaptive approaches (Orlikowski & Hofman, 1997). Our study leads us to agree with these insights, and we posit that an emphasis on minor instances of interactions and interdependencies is complementary to these studies. Our study shows that such details are important in any project, although they may be overlooked or abstracted away in the accounts that are produced. We believe that the challenges of such processes are widely encountered and practically significant. Achieving organizational change constitutes a particularly challenging aspect of leveraging information systems. Yet, just as it often happens "below the radar" of management, it may also slip outside IS researchers' focus. In addition to bringing these issues to light, we have sketched what a more mindful approach to the organizational sensemaking could look like.

This study has a few limitations as well. First, the findings pertain to a healthcare context and thus have a limited generalizability to other contexts. We encourage other IS scholars to translate our findings concerning the capabilities of collective mindfulness to other settings and to come up with new principles. Second, while we contend that sensemaking processes and collective mindfulness capabilities are important in the continuous adaptation of IS, we recommend other scholars to also investigate the post-implementation adaptation process using other theoretical angles to single out other aspects. In conclusion, we believe that it is valuable for managers, including project managers and change agents, to be aware of the challenges that such mundane, post-implementation change entails in order for them to support, facilitate, and make these sensemaking processes more mindful.

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