

2008

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Recommended Citation

Kjaergaard, Annemette and Jensen, Tina Blegind, "Appropriation of Information Systems: Using Cognitive Mapping for Eliciting Users' Sensemaking" (2008). *ICIS 2008 Proceedings*. 164.
<http://aisel.aisnet.org/icis2008/164>

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APPROPRIATION OF INFORMATION SYSTEMS: USING COGNITIVE MAPPING FOR ELICITING USERS' SENSEMAKING

*Appropriation des systèmes d'information : utiliser les cartes cognitives pour
révéler le sensemaking des utilisateurs*

Completed Research Paper

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Abstract

This paper explores the use of cognitive mapping for eliciting users' sensemaking during information system (IS) appropriation. Despite the potential usefulness of sensemaking, few studies in IS research use it as a theoretical lens to address IS appropriation. A possible reason for this may be that sensemaking does not easily lend itself to be used in practice. We introduce cognitive mapping as a way to elicit users' sensemaking and illustrate its value by reporting on findings from an empirical study of the introduction of an Electronic Patient Record (EPR) system. The contribution of the paper is threefold: first, our findings demonstrate cognitive mapping's use for eliciting users' sensemaking during IS appropriation. Second, our findings illustrate how cognitive mapping can be used as a dynamic approach facilitating collective negotiation of meaning. Third, we contribute with a thorough discussion of the epistemological and methodological assumptions underlying cognitive mapping to ensure its validity and trustworthiness.

Keywords: IS appropriation, sensemaking, cognitive mapping, health care

Résumé

Cette étude porte sur la mise en place de cartes cognitives pour révéler le sens donné (« sensemaking ») au sein d'un groupe d'utilisateurs de technologie de l'information. L'étude met en évidence la fonction des cartes cognitives comme approche dynamique pour faciliter une négociation collective d'opinion. Nous discutons les hypothèses épistémologiques et méthodiques des cartes cognitives afin d'assurer leur validité et leur crédibilité.

Introduction

For information systems (IS) to be effectively utilised, they need to be appropriated by their designated users. The process of appropriation entails the assimilation of the IS to the point that it becomes part of one's routine and way of being (Orlikowski and Robey 1991). The act of appropriation further implies human agency, suggesting that humans are free, to some degree, to enact IS in different ways (Boudreau and Robey 2005; Emirbayer and Mische 1998). Organizational members enact technologies in the context of their local experiences and needs and may use the technology in ways that were not intended by the management or even not use the technology at all. Thus “technology can only condition, and never determine social practices” (Orlikowski and Robey 1991, p. 153).

Recent studies of IS suggest that more attention should be given to the social act of appropriation of IS by organizational members (Avgerou et al. 2004; Vaast and Walsham 2005). This implies a focus on human agency, including issues such as users' meaning constructions and sensemaking structures (Bansler and Havn 2006; Henfridsson 1999; Weick 1995), technological frames (Davidson 2006; Orlikowski and Gash 1994), and representations and actions (Jasperson et al. 2005; Vaast and Walsham 2005). These suggestions are based on the understanding that it becomes increasingly important to study the meanings that organizational members ascribe to IS given the local setting in which they are to use the IS and in which their meanings about the systems are constructed.

Some of the studies that so far have been made on technology adoption and users' meaning constructions (see for example Bansler and Havn 2004; Henfridsson 1999; Orlikowski and Gash 1994) state that it is important to clarify the sensemaking structures, values, needs, priorities, and preferences of the users in their local context when adopting IS. Furthermore, these studies and others (see for example Barley 1986; Vaast and Walsham 2005) emphasize the need to investigate the social aspects of IS adoption and use. However, many researchers using social theories to study IS seem to use them more as meta-labels and not as analytical tools which guide and shape their work (Shoib and Nandhakumar 2007). Weick's theory of sensemaking is an example of this as it is often referenced as a surface citation in IS research but is rarely used as a main lens through which a particular research problem is addressed (Kjærgaard and Vendelø 2008).

Our contention is that although sensemaking theory ‘makes sense’ to IS researchers (living up to its name), it does not easily lend itself to be used in practice. This issue has also been acknowledged in organization research studies where the sensemaking theory originates. To address this issue, Weick (1995) mentions some ways of how to ‘go about’ studying sensemaking processes; however, his suggestions mainly point to qualitative and naturalistic methodologies and do not provide much guidance for how to proceed as a researcher. In this paper, we wish to address this issue and to provide more guidance on how to study the social aspects of IS appropriation and thereby clarify how users make sense of IS. We thus address the research question of how to elicit users' sensemaking of IS.

A way to provide more guidance on how to explore the relationship between users' sensemaking and the appropriation of IS by organizations is to draw on cognitive mapping (Eden, 1992). Cognitive maps serve as representations of the way organizational members edit their organizational experience into patterns or maps of personal knowledge, i.e. the maps may be used to represent users' meaning constructions of IS. We argue that cognitive mapping is a useful approach for eliciting and clarifying users' sensemaking in relation to IS appropriation. However, we emphasize that cognitive mapping is too broad an approach for it to be used without a thorough explanation of the underlying epistemological and methodological assumptions as well as a detailed description of how data is collected and analyzed. It is important to make these assumptions explicit in order to ensure the validity and trustworthiness of the use and results of the cognitive mapping approach in a particular research context. Furthermore we state that cognitive mapping can be used as a dynamic approach to increase users' awareness of each others interpretations and reactions to IS, thereby facilitating a collective negotiation of the system's meaning.

To illustrate the use of cognitive mapping and to sustain our main arguments, we report on findings from an empirical study of the introduction of an Electronic Patient Record (EPR) system in a hospital ward. We explored how a group of doctors made sense of the EPR system by drawing a cognitive map. The purpose of using this methodology was to elicit statements from individuals in order to obtain subjectively meaningful concepts and relations regarding the EPR appropriation process. Furthermore the aim was to describe these concepts and relations in a visual layout (a cognitive map) which could then be used to spur a discussion among the participants. The findings show that the cognitive mapping process was useful in getting a more in-depth insight into the doctors' meaning constructions and sensemaking of the EPR system. Furthermore the map served as a way to create a dialogue with doctors about their experiences with and reactions to the appropriation of the EPR in the clinical setting.

In the next section, we outline the theoretical background of the paper where we look at social aspects in relation to the appropriation of IS by organizations and we introduce the theory of sensemaking. Next, we present cognitive mapping as an approach to clarify users' sensemaking. The research design is then described along with an introduction to the case setting to illustrate the usefulness of cognitive mapping. We discuss the epistemological and methodological assumptions underlying cognitive mapping before we finally conclude on the relevance of this study for research on IS appropriation by organizations.

Appropriation of IS as a Sensemaking Process

Previous studies in this field of research suggest that higher priority should be given to issues on social aspects of IS appropriation (Barley 1986; Schultze and Boland 2000; Vaast and Walsham 2005). This suggestion is based on the understanding that the appropriation of technology is influenced and created by those people in organizations who are going to use the technology (Barley 1986). Vaast and Walsham (2005) therefore call for studies examining the representations that shape users' understanding of their work and of the technology. Focus is here on human agency and social interpretation in order to explain the various outcomes from the use of technology. Users are more or less free to enact technologies in different ways and they adapt the use of technologies in response to local needs (Boudreau and Robey 2005). By reconceptualising the user as a social actor, we will not only be able to study users' perceptions and attitudes towards IS, but also take into consideration the organizational context that shapes IS adoption (Lamb and Kling 2003).

An important aspect in relation to IS appropriation is to understand how users make sense of the technology. Sensemaking theory originates from the field of organizational studies where it was introduced by Karl Weick in his book 'The Social Psychology of Organizing' (1969). Sensemaking is defined as the "making of sense" (Weick 1995, p. 7) where sense refers to meaning and making refers to the activity of constructing or creating something. Sensemaking is a retrospective development of a plausible story to explain what people have done and the reasons for why they have acted the way they have (Weick 1979). This perspective enables a better understanding of the appropriation of IS as a meaning construction process created in the interplay between action and cognition. Weick argues for the importance of studying the relationship between IS and sensemaking: "What is emerging as a growing issue for sensemaking is the disparity between the speed and complexity of information technology and the ability of humans to comprehend the outputs of the technology" (Weick 1995:177).

Although sensemaking is an ongoing process, it is intensified in circumstances where people face new or unexpected situations and when there is no predetermined way to act (Weick et al. 2005). These situations may appear when the nature of the problem is in question, when goals are unclear, when roles and responsibilities are vague and blurred, or when multiple and conflicting interpretations exist. Relevant for this study, renewed sensemaking processes may occur when new technology that changes present social relations and work practices is implemented in an organization. Weick refers to technologies as equivoques, meaning that they imply "[s]everal possible and plausible interpretations" (Weick 1990, p. 2). This indicates that technologies do not necessarily lend themselves to the same interpretations among different groups of users and require ongoing sensemaking if they are to be contextualized, managed, and adapted to a specific context of use.

The assumption behind sensemaking is that people act on the basis of their interpretations (Orlikowski and Gash 1994; Weick 1995). By acting, people enact social realities and give meaning to them. IS researchers have used sensemaking to examine social aspects of technology. For instance Orlikowski and Gash (1994) suggest that sensemaking theory is a useful lens for this purpose: "To interact with technology, people have to make sense of it; and in this sense-making process, they develop particular assumptions, expectations, and knowledge of the technology, which then serve to shape subsequent actions toward it" (Orlikowski and Gash 1994, p. 175). They

argue that organizational members act on the basis of frames of references that are implicit guidelines organizing and shaping members' interpretations of various organizational phenomena. They compare these frames with ideas of shared cognitive structures, interpretive frames, and mental models.

When organization members interact with IS, they have to figure out what opportunities the IS in question offers to them in their specific context of use (Bansler and Havn 2004). This is also known as bracketing, implying that organization members single out items and/or events in order to connect and make sense of them (Weick 1995). In this bracketing process, the users of a given IS single out specific cues that signify desired preferences and ends. It is through their active attribution of meanings to the IS that the users can make sense of it and it becomes useful in a specific organizational context. The interpretations that users create will guide their actions and attention in the situations that they face. The users will strive to achieve their goals and fulfill their needs by reflecting upon what is meaningful to them, i.e. what makes sense. Bansler and Havn argue that "sensemaking emphasizes that people try to make things rationally accountable to themselves (and others)" (2004, p. 62).

In his book 'Sensemaking in Organizations' from 1995, Weick discusses how we as researchers can study sensemaking processes, i.e. "how meanings and artifacts [are] produced and reproduced in complex nets of collective action" (Weick 1995, p. 172). Weick refers to studies which indicate that methodologies such as social surveys, causally acquired data sets, and computer simulations based on a simulator's meanings are *not* useful in capturing sensemaking. Instead, he opts for methodological approaches such as naturalistic inquiries, grounded theory, critical incidents, case scenarios, interviews, work diaries, and field observations to investigate sensemaking (see Weick 1995 for references to studies that use these approaches). He presents ten characteristics that are common to these types of studies, e.g. investigators must conduct their studies in closeness to the setting; participants' texts are central; observers must work in close rather than from the armchair; and density of information and vividness of meaning are crucial. Furthermore, Weick argues that researchers should focus on building a language that enables us to grasp sensemaking (e.g. using words such as enactment, sensegiving, and justification), including the representations and concepts that people use to build up their sensemaking structures (Weick 1995). Once people have formed representations or concepts of what they experience, they begin to tie them together in order to make sense of them. It is in this process that cognitive mapping can be a useful approach in eliciting and setting out explicitly users' sensemaking.

Cognitive Mapping for Eliciting Users' Sensemaking

Cognitive mapping is essentially a qualitative research approach. It is a way of eliciting meaning and promoting understanding of how an individual (Jenkins 1998) or a group of individuals outline and make sense of a situation (Ackermann and Eden 2007).

The label of cognitive maps originates from the ideas of Tolman (Eden 1992; Siau and Tan 2005) who wished to develop an alternative to the stimulus-response model for explaining human behavior in behavioral psychology. According to Eden (1992), this label is misleading as it implies that the map is a 'true' representation of cognition. Eden (1992) argues that it is likely that there is a large difference between what a research subject may be thinking and the cognitive maps created by a researcher as the process of articulation has not been taken into consideration. This focus on articulation is also emphasized by Weick who asks: "How can I know what I think till I see what I say?" (Weick 1995, p. 12). The process of modeling cognition is therefore of vast importance in understanding the potential use and validity of what we, following Eden, in the remainder of this paper refer to as cognitive maps which are artifacts rather than 'true' representations of cognition as originally suggested by Tolman (1948). Their use is therefore to "represent subjective data more meaningfully than other models and so have utility for researchers interested in subjective knowledge" (Eden 1992). This focus on subjectivity is also shared by Weick and Bougon (1986) who define cognitive maps as representations of the way people in organizations edit their organizational experience into patterns or maps of personal knowledge.

Cognitive mapping is thus not one particular approach but is a term used to address several ways of mapping cognition (Eden and Spender 1998; Narayanan 2005). Some are largely content and theory free, while others are based on specific social or cognitive theories (Laukkanen 1998, p. 168). In order to represent this type of knowledge, cognitive maps can be drawn on either an individual (Eden 1988; Eden 1992; Weick and Quinn 1999) or a collective level (e.g. Langfield-Smith 1992; Sheetz et al. 1994) and they can hold many types of relationships among concepts, for example proximity (A is close to B), similarity (A is similar to B), cause-effect (A causes B), category (A is a subset of B) and contingency (A follows B) (Swan 1997, p. 188).

Historically, cognitive mapping has been used in several research fields. While it was introduced within the field of psychology by Tolman, it was within the field of political science in the early 1970s that it was more systematically developed and described. Axelrod introduced a new approach to decision making based on the idea of a cognitive map representing a person's stated values and causal beliefs (Narayanan 2005). Within organization studies, the increased interest in managerial and organizational cognition has caused an increase in the use of cognitive mapping during the last three decades (Narayanan 2005).

Studies of organizations using cognitive mapping are several and quite varied with regards to the method used. One of the first uses of cognitive mapping was a study of a jazz orchestra by Bourgon et al. (1977) who used naturalistic observation and interviews to build a causal map. Another early study had a theory testing approach and was more experimental in its use of the cognitive mapping approach (Ford and Hegarty 1984). The approach itself was the focus of attention in a paper by Fahey and Narayanan (1989) in a special issue of *Journal of Management Studies* in 1989 where the authors reflected upon the important epistemological difference between the original understanding of cognitive mapping as presenting 'true' cognition and what they referred to as assertions of causality. These emerging methodological considerations in relation to cognitive mapping were intensified during the 1980s where the special group working with managerial and organizational cognition in the Academy of Management was formed. Documentation of research into managerial and organizational cognition under the labels of amongst many others mental models, social cognition, frames of reference, interpretive schemes as well as cognitive maps are provided by Walsh (1995) in his excellent review article from *Organization Studies*.

Cognitive Mapping in IS Research Studies

Within the field of IS, cognitive mapping has been used in conceptual modeling (Siau and Tan 2005) and in requirement specification and analysis as a way of making IS professionals aware of users' understanding of the work tasks or processes which the system should be designed to support (see e.g. Montazemi and Conrath 1986; Zmud et al. 1993). Siau and Tan (2005) explained the value of cognitive mapping in eliciting the technological frames (McKay and Marshall 2005; Orlikowski and Gash 1992) which may offer an insight into the socio-technical problems experienced when different stakeholders or groups have to negotiate the functionality of a system. In a study of software support operations, Nelson et al. (2000) used cognitive mapping to understand the major constructs of software support expertise and how the constructs interact in the support process. Specifically addressing the issue of researcher bias in the construction of the process, Sheetz et al (1994) discussed and explored the use of cognitive mapping using a Group Support System (GSS) and compared their results to individually derived maps. Swan and Newell (1994) used cognitive mapping to study managers' beliefs about the factors that influence technological innovations. Using the repertoire grid technique, they combined the maps of individual managers to give a group's representation of the factors influencing technological innovation.

In this paper we explore and discuss the use of the cognitive mapping approach put forward by Eden (1988), which is designed to be used as an interactive method assisting in clarifying problems and facilitating group solutions to complex issues (Bood 1998). Our understanding and use of cognitive mapping is based on a social constructivist approach. This implies that we do not believe that cognitive mapping results in an exact map of users' cognition. We believe that users' meaning constructions and use of IS are continually constructed and cannot be captured in a 'true' map (Narayanan 2005). The map itself is of little importance compared to the interactive mapping process in which the sensemaking occurs. We contest that there is a map in the mind of the participant prior to the process, which can be uncovered by an objective interviewer. Instead we believe that the map itself is created in the process of communication which is also why we quote Weick for saying that the articulation process is crucial for knowing what you really mean. In other words the set of meanings which the map represents is neither a reflection of what was in the mind of the person prior to the interview nor a new static construction, but rather a new construction created in the interactive process of communication which will never be a 'true' representation of a person's meanings because meanings are continuously recreated and changing and the map will always be 'old' in this sense. We will get back to the implications for use in the discussion section.

Research Design and Presentation of Case Study

The case study from which we draw in this paper is part of a larger research project (Jensen 2007) and has been conducted on the basis of an interpretive case study design. This design approach is appropriate for understanding human action and thinking in an organizational context (Klein and Myers 1999) and for our research purposes, it has

helped us understand EPR adoption as a social process unfolding in the interrelationship between technology, users, and the organizational context (Walsham 1993).

The EPR case study serves as an illustrative example of how we used cognitive mapping for eliciting the doctors' sensemaking of the IS appropriation. This means that we will not go into detail with the empirical findings from this study but we refer to (Jensen 2007) for further details.

We studied IS appropriation among a group of ten orthopedic doctors where an EPR system was introduced in an orthopedic surgery department in a Danish hospital. The orthopedic surgery department had an average of 3,000 admissions (emergency and planned) per year consisting of a standard ward, an outpatient clinic and a secretaries' office. Ten consultant surgeons and one managing consultant surgeon were employed. They were specialized in shoulder, knee and hip alloplastics as well as foot surgery.

The EPR adoption was initiated in 2002 and was considered a pilot project for future EPR projects in the hospital and in other hospitals in the region. The aim was to determine the consequences of introducing EPR systems in relation to work practices, organizing of clinical work in the department, quality enhancement of patient treatment, and economic effects. The EPR system represented a shared and interdisciplinary electronic version of what is known as a patient's paper record. Contrary to the paper version, the records were stored electronically making it possible for the nurses and doctors to access patient data and enter new data into the system simultaneously from different sites. The EPR comprised nursing notes, progress notes, physiotherapist notes, diagnoses, medicine schemes, history data, information on temperature and blood pressure, X-rays, and laboratory data. It was an off-the-shelf system where only minor modifications could be made.

The data collection occurred approximately four months after the implementation of the EPR system. Orlikowski and Gash (1994) argue that users' early interpretations of technology are of great importance to how the technology gets constructed and adopted to work practices and become part of the work routines. Despite the relatively short time frame, the majority of the doctors were more or less familiar with the EPR system (some more than others). Using the EPR system was mandatory: "We cannot perform our tasks without it [the system]", which meant that the doctors had brought the main functionality of the EPR system into their daily clinical practices. At the same time, however, using the EPR system reflected some ambiguity and novelty – especially as new roles and responsibilities still had to be negotiated between the doctors and the other health care groups (see Jensen 2007 for further discussion).

We used a combination of different data collection techniques. Observation studies took place in the surgical ward and in the outpatient clinic where we observed the doctors in their natural settings. The doctors showed us how they used the EPR system in relation to various work procedures, e.g. preparation of ward rounds, medicine prescriptions, stating a diagnosis, etc.

The richest source of empirical data stems from 10 semi-structured interviews with the doctors. In order to elicit the doctors' sensemaking of the EPR adoption, we used the cognitive mapping approach inspired by Eden (1992). As argued, we understand sensemaking as an on-going, subjective meaning construction process in which participants create meaning. This meaning is then articulated in the mapping process and is a social construction rather than a true representation of cognition. In the mapping process, the participating researcher was actively involved as the designer of the map which was created from interviews with the doctors.

We used 21 inspiration cards as a *center of rotation* for the interviews. These were prepared on the basis of observation studies at the orthopedic surgery department, an extensive literature study on EPR adoptions, and various documents from the EPR adoption in the hospital (e.g. the project plan, the requirement specification, the user training session schedule, and information on the webpage). Each card represented an activity or aspect of the EPR adoption at a more or less abstract level, e.g. user training, support, selection of EPR system, workflow analysis, and information activities etc. (see Jensen 2007 for a total list of the 21 cards). The cards served as a technique for tuning the doctors in on the EPR adoption and tell stories related to it. In addition to the cards, we asked the doctors during and again at the end of the interview to mention other aspects they would identify as important in the EPR implementation. This was done to ensure that no key elements were overlooked.

At the beginning of the interview, the doctors were asked to prioritize the cards and those cards that they considered the most important to describe their meaning constructions of the EPR system and its adoption were used as initiators for the interview. For each card, the doctors were asked: "What do you understand by...?" or "What is implied by...?" with regard to the card that they wanted to reflect upon. For example, if the doctors considered 'EPR user training' to be a central aspect, they were asked what was implied by this. To this question they might answer

that this activity concerned “the teacher’s competences”, “the number of hours disposed for user training”, etc. The interview was then continued by asking: “*Why* is this [aspect] important to you?” which allowed the doctors to reflect on their work practices, role as professional, perception of the technology, needs and priorities, as well as mention other issues in relation to the appropriation of the EPR system.

The interviews were conducted using a so-called laddering technique (Bourne and Jenkins 2005) where the doctors were asked to reflect on different aspects of the EPR appropriation and then reflect on *what* they thought these aspects contained and *why* they were important. Laddering is a method that helps to elicit the higher or lower level abstractions of the constructs or concepts that people use to organize their world. In organization research, Eden and Ackermann (2004) make use of a laddering method when they develop shared cognitive maps within organizations (Bourne and Jenkins 2005). The method is performed by using probes. According to Woodruff and Gardial, probing essentially means to “*peel back the layers*” (Woodruff and Gardial 1996, p. 186) of the informant’s experience, in this case in relation to the EPR adoption.

An important question in this respect concerns “how much to peel back?” i.e. how do we know when the ‘right’ level of abstraction is reached? We decided to use the criterion of reaching a point of saturation which was achieved when the doctors either repeated themselves or when they did not have any further information to add to the *why* question. Two interviewers were present for each interview ensuring that all aspects mentioned by the doctors would be discussed further. One interviewer was conducting the interview, i.e. asking questions and the other was taking notes and making sure that the informant would elaborate on the various aspects mentioned throughout the interview session.

After the interview, the researcher aggregated the doctors’ statements into a group map. In order to do so we carefully read through the transcripts of the interviews and the field notes to get a detailed picture and overview of the entire empirical material. We then categorized the different statements and observations into concepts and looked for relations between them. It was important that the categorization was close to the empirical data, i.e. the expressions used by the doctors (see next section on how this coding and categorization process was carried out). In order to define relations between the concepts in the maps, we used a software program. This program eased the construction of the maps. We only had to enter the different categories and their relations that were emphasized as important by the doctors into the program which then automatically constructed the maps.

The group map was returned to the participants to ensure that it represented their articulation of the topic and some amendments were made accordingly. The group map was also presented to the doctors during a focus group interview where the doctors and the researcher discussed the map and the different concepts. The focus group served as validation of the prior findings and conclusions. It was used to observe the nature and extent of agreement and disagreement among the doctors and it was possible to ask the doctors for comparisons among different views and experiences. The doctors participated eagerly in the individual mapping process as well as in the following focus group discussion and contributed with positive as well as negative statements of the use of the EPR system. The focus group activity also served as a way to ensure that no important aspects were left out of the map and that the point of saturation was reached. The map is presented in the subsequent section (Figure 2).

Findings

In this section we present the group map showing the outcome of the doctors’ sensemaking and meaning construction processes in relation to the EPR adoption. The purpose of including the map in the findings section is not to present and discuss the content (i.e. all the concepts and the relations) of the map in detail. Instead the purpose is to illustrate how cognitive mapping can be used as a way to elicit sensemaking.

In order to demonstrate how we coded the empirical data from the interviews to create the map, we present two short passages from interviews with doctors, where we talk about EPR user training:

Interview passage 1:

Interviewer: What do you understand by ‘EPR user training’?

Doctor: That I am taught the most basic functionalities in the system and obtain sufficient knowledge about the system and how it works.

Interviewer: Why is that important?

Doctor: It is important to me that I'll be able to use the system correctly in the daily work here in the ward.

Interviewer: What do you mean by using the system correctly?

Doctor: It is not unimportant how we use the system. If we do not use it correctly, then it may have consequences vis-à-vis the patients. For example, if we prescribe the medicine in the wrong place in the system, then others will not be able to find the prescription ... or if we prescribe the medicine twice because we do not know how the system works.

Interviewer: Why is it important that you are able to use the system correctly in your daily work?

Doctor: Because we cannot perform our work without the system. We need to be confident in using it. The system is here to stay.

Interview passage 2:

Interviewer: Tell me a bit about the 'EPR user training'.

Doctor: It is important that we're taught how to use the system and especially how to get an overview in the system.

Interviewer: What do you mean by overview?

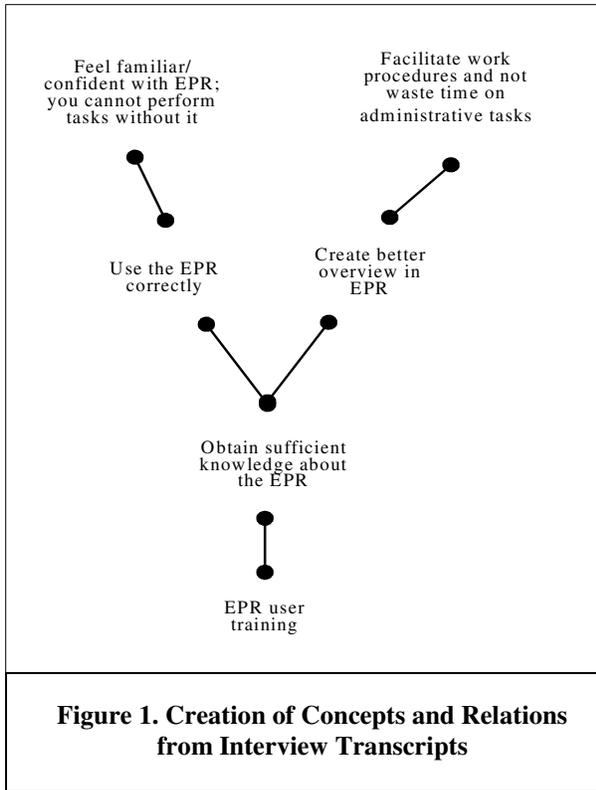
Doctor: As doctor it is vital to have an overview of the patient. For example if the patient is allergic to certain kinds of medicine then I need to know. It is important that we can find the information we need in the EPR system and get an overview of all the information that is related to that specific patient. Here I also think about test results from the different examinations of the patient.

Interviewer: Why is it important for you to have this overview and to be able to find the information about the patient in the EPR system?

Doctor: We need to be effective. It facilitates my work if I can easily find the information I need and in that way I do not have to use too much time on these administrative tasks.

The two interview passages reflect the use of the laddering technique where the doctors reflect on *what* they understand by 'EPR user training', by 'using the system correctly', and by 'overview in the system'. We also see how *why*-questions were used to elicit the higher level abstractions of the concepts that the doctors used to organize their thoughts about the EPR system.

From these interview passages, we created part of the cognitive group map as illustrated in Figure 1 below:



In Figure 1 we see an excerpt of the cognitive map based on the aspects (and the relations between the aspects) mentioned by the two doctors during the interviews. The concepts used in the map are based on the doctors' own expressions and accounts in order to illustrate what the doctors highlighted as important in their work practices.

Based on all the interview transcripts and the coding of the empirical data, we created the group map presented in Figure 2.

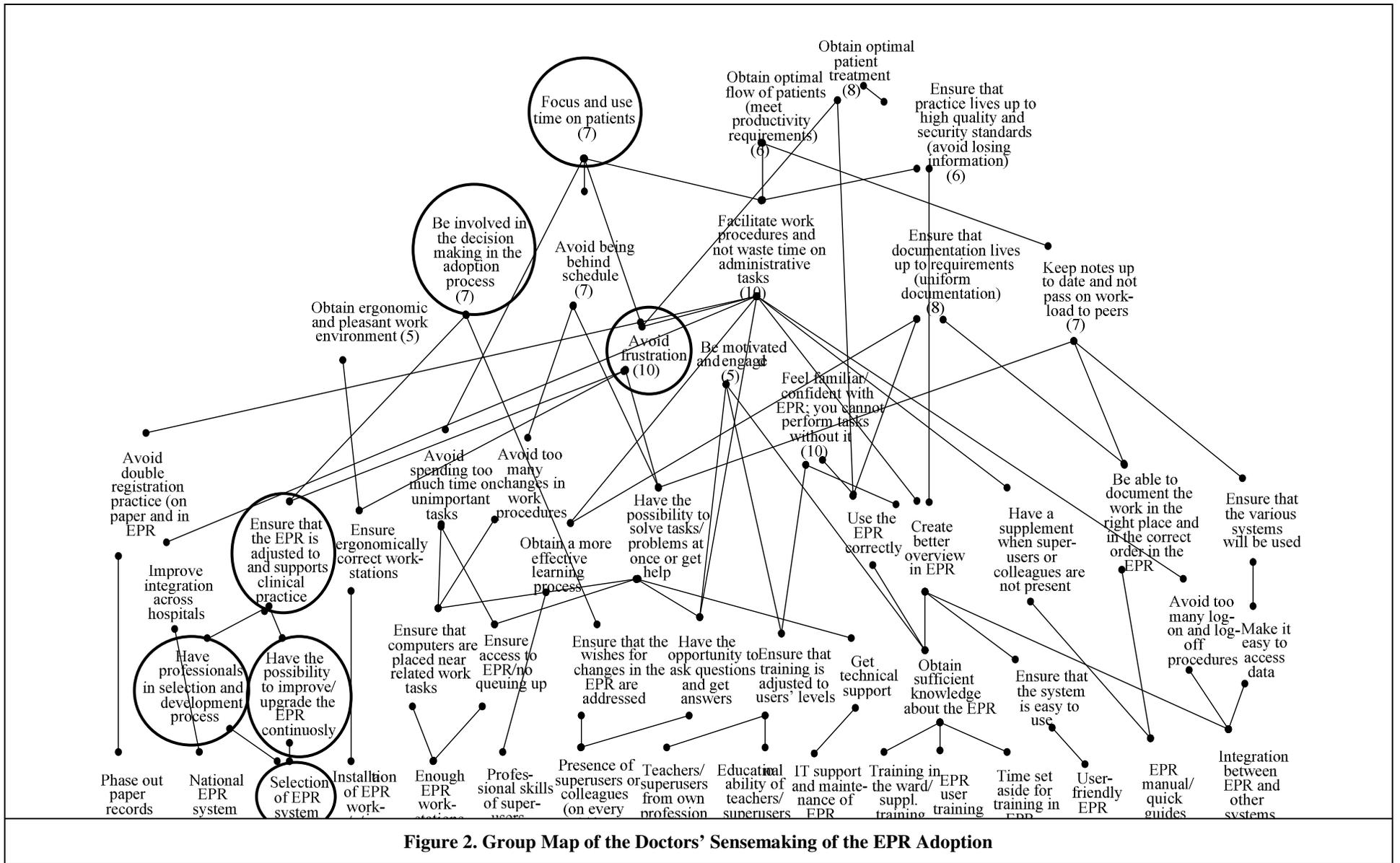


Figure 2. Group Map of the Doctors' Sensemaking of the EPR Adoption

In the map, we have highlighted some of the concepts (with circles) that the doctors mentioned as important. This is done to provide an example of how the map should be interpreted and used to elicit the doctors' sensemaking about the EPR adoption.

The doctors believed that the 'selection of the EPR system' was an important aspect in the adoption process. They believed that 'having professionals participating in the selection and the development process as such' and 'having the possibility to improve/upgrade the EPR system continuously' were important aspects. Why is that so? Well, the doctors argued that they 'want to ensure that the EPR system is adjusted to and supports their clinical practice'. Furthermore, this was important to the doctors, since they then felt that they were 'involved in the decision making in the adoption process'. Similarly they argued that if 'the EPR is adjusted to and supports their clinical work practices' they would 'avoid frustration' and be 'able to focus and spend time on patients'.

The interview passage below illustrates some of these aspects:

- Doctor: We would have liked to have a say in the selection process.
- Interviewer: Why is that important to you?
- Doctor: Because the EPR system is something that highly influences our practice and it is a central tool in our work procedures. Therefore, it would have been nice to be involved in the decision making process at some point. Of course, it is not possible for everybody to participate in this decision making process, but it would have been nice to have the impression that you were involved somehow, and that it was not something that was implemented without our approval. It is a tool that highly influences our practice.

The cognitive maps here served as representations of the doctors' meanings and sensemaking of the EPR adoption. As mentioned, a focus group interview was held with the doctors where the group map was presented and discussed. This activity served two overall purposes: First, it was considered an important step in ensuring the validation of the group map that was created by the researcher on the basis of the individual interviews. It was important to ensure that the map included the main aspects that the doctors had put forward during the interviews (i.e. that no aspects were lacking). Furthermore, the focus group interview was an occasion to ask the doctors for elaboration on certain aspects in the map that were not self-explanatory and evident. For example, the researcher asked for an explanation of the aspect in the map 'avoid frustration' by asking questions such as: "what do you mean by frustration?", "how is frustration reflected in practice?", "why is it important to avoid frustration?" and "what consequences does this frustration entail?" Furthermore, we asked the doctors what they meant by 'creating a better overview in the EPR' – i.e. how the doctors created an overview and what would facilitate or inhibit this overview.

Some of the aspects in the map also lacked relations to other aspects and the doctors were therefore asked to elaborate on these matters. For example, the statement 'be able to document the work in the right place and in the correct order in the EPR system' (see Figure 2) was not related to any other aspects at a higher level in the map. We therefore asked the doctors about the implications of this statement. Their answer to this question was that they were able to ensure that 'the documentation would live up to the requirements (unified documentation)'. This aspect was then added to the map. They also mentioned that 'being able to document the work in the right place in the system' would mean that they would be able to document their work in the system and thereby 'keep their notes up to date and not pass on work load to peers' (another aspect added to the map).

The second purpose of carrying out the focus group interview was to observe the nature and extent of agreement and disagreement among the doctors. The group discussion of the maps was particularly useful for the doctors to collectively negotiate the meaning and usefulness of the EPR system. The doctors seemed to agree on most of the aspects illustrated in the map and the relations between the aspects. One doctor stated: "I can recognize many of my statements in the map and I also recognize what some of my colleagues might have said. We do seem to agree on many of these things". Often the doctors used 'we' instead of 'I' when they commented on the aspects in the map and they reflected a high degree of agreement when discussing the content of the map. In this way, cognitive mapping was used as a dynamic approach to increase the doctors' awareness of each others interpretations and reactions to the EPR system, thereby facilitating a collective negotiation of the system's meaning.

The findings presented in this section serve as a means for illustrating the use of cognitive mapping in getting a more in-depth insight into the doctors' meaning constructions and sensemaking of the EPR system. Based on this example, we now discuss the usefulness of the cognitive mapping approach.

Discussion

This paper contends that sensemaking and cognition until recently have been underemphasized in IS research and that cognitive mapping provides a useful contribution for eliciting participants' sensemaking in the process of IS appropriation.

Our findings illustrate that cognitive mapping can be used as a dynamic tool to increase users' awareness of each other's interpretations and reactions to IS, thereby facilitating a collective negotiation of the system's meaning. However, following Swan (1997) we emphasize that cognitive mapping in itself is too broad an approach for it to be addressed without a thorough explanation of the underlying theoretical and methodological assumptions as well as a detailed description of the data collection and analysis process (Goldberg 1994). In this regard, cognitive mapping is similar to other more frequently used methods of interviewing and observing which also need further qualification for other researchers to assess the validity and trustworthiness of their use and results in a particular research context.

Based on our study, we outline three important points for discussion related to the use of cognitive mapping to understand IS appropriation: 1) maps as socially constructed vs. realist representations, 2) aggregated vs. collective mapping and 3) static vs. dynamic use. The discussion points are elaborated below.

Maps as Socially Constructed vs. Realist Representations

The first point for discussion addresses epistemological and methodological reflections upon the nature and scope of cognitive maps. In our use of cognitive mapping, the maps were constructed in the interaction between the interviewing researcher and the participants. In this regard, the maps represented a socially constructed view of reality, showing concepts and relations that were subjectively meaningful for the participants. In other words what the participants created was a reconstruction of their subjective beliefs, revealed to the interviewing researcher, triggered and framed by the questions posed by the researcher. The resulting maps are therefore bound by the method used for data collection as also suggested by Goldberg (1994).

The validity of the maps can consequently be questioned. When the outcome of the mapping process is a subjective representation of the meaning creation process taking place in the interaction between the participants and the researcher, how can the maps actually be trusted to capture the issues that are salient to the participants? And can we be sure that (more) important issues are not left out (Jenkins 1998)? The short answer to this is that we cannot be sure to capture a complete and true representation of the participants' beliefs and accordingly we do not claim validity of our study in a positivist sense. However, we can claim credibility of our findings based on the process of systematically pursuing issues suggested by the participants in order for them to reach exhaustion of the topic as we have done using the laddering technique and the focus group discussions.

The related issue of reliability is also relevant to address here in relation to the role of the researcher and other individuals who take part in or in other ways influence the mapping process or the maps themselves. We have already mentioned that the questions posed by the interviewer – however open they are – will create a frame for the mapping process and the resulting maps. Again this is a common topic for discussion in qualitative research and although we cannot claim reliability in a positivist sense, we argue that trustworthiness can be achieved in cognitive mapping by being as open as possible about what methods have been used and how they have been applied in order to make the study as explicit as possible.

Learnings can be interpreted from cognitive mapping, not by focusing on the maps themselves but by focusing on the process of constructing the maps and by observing the reactions of people to the contents of the maps. If we accept that the maps represent subjective beliefs of the participants and are created in the interaction between the researcher and the participants, we place emphasis on the process of articulating the participants' beliefs, i.e. on the mapping process itself. As mentioned by Swan (1997), the process of eliciting the revealed map may alter its composition because the interaction between the researcher and the participants involves articulation which can change the cognitions of both researcher and participants (p. 193). In the focus group interview, meaning construction happened in the interaction between doctors as well as in the conversation between the researcher and

the doctors, i.e. the concepts and the relations between concepts in the map were created in interaction between the participants.

Aggregated vs. Collective Mapping

A second point for discussion, related to the first one, is how a collective map is created using the cognitive mapping approach. Two issues are important in this regard: 1) whether there is such a thing as collective cognition and 2) whether the group map is made from aggregating individuals' maps into one map or whether the map is created by the group in collaboration.

The first issue touches upon the question of whether cognition belongs to an individual or whether cognition can be attributed to groups or organizations (Eden and Ackermann 1998). The relationship between the individual and collective mind remains ambiguous. Spender (1998) questions whether the collective mind knows the best of what each individual can contribute and thereby is a subset of what the individuals know together or whether the knowledge of each individual is rather only a subset of what the collective knows (p. 21). Regardless of whether one believes that the collective is a subset of individual knowledge or vice versa, it is generally acknowledged that groups and organizations cannot be attributed the ability to think or believe but that the process of eliciting thoughts and beliefs can happen in a collective process in which individuals' contributions influence each other reciprocally, resulting in a different result than if elicited individually (p. 194).

This is related to the second issue of the choice of modeling technique. According to Eden and Ackerman (1998), one way of creating group maps is to use one-to-one interviews and following integrate the results into a group map as was the case in this study. Another way is to base the creation of the map on a group discussion where participants work towards a common understanding or shared meaning. Although the result of both methods is a group map, the maps will be quite different. Where the integrated map has a large degree of researcher influence as the researcher puts together the individual statements into one map (as was the case in this study), the collective method is less influenced by the researcher. In contrast, the reciprocal influence of the participants will be more pronounced in the use of the collective model compared to the use of the integrated model where participants are interviewed individually.

The choice of model is closely related to the intended use of cognitive mapping. Where the integrated model provides a comprehensive representation of individuals' meaning constructions and will serve the purpose of providing an overview of variety in meanings, the collective model provides a negotiated understanding which can be useful as part of a process with the goal of reaching a shared understanding.

The main reason for why we chose the integrated approach was because of the study's explorative nature. By interviewing the doctors individually, we would have the option of developing a map for each doctor and thereby show a variety of meanings (and perhaps even contrasting meanings if necessary). This would not have been possible had we chosen the collective method to begin with. Although our approach, where ladders were first constructed individually and then combined by the researcher into one map, does not provide findings about constructing maps in collaboration as other researchers have reported on (Ackermann and Eden 2007; Sheetz et al. 1994), it did enable the doctors to discuss the categories and concepts put forward by their colleagues in order to negotiate the meaning of the EPR system.

Our study showed that the group discussion of the map was particularly useful to collectively negotiate the meaning and usefulness of the EPR system. As we pointed out in the findings section, the doctors recognized and agreed on most aspects in the group map. This may be related to the group's strong professional identity and shared work practices that may lead to 'group think' (Janis 1982). According to Weick, members in the same community are likely to share core assumptions and expectations, and meaning is often created by a group of people: "An organization is a network of intersubjectively shared meanings that are sustained through the development and use of a common language and everyday social interaction" (Weick 1995, p. 38-39).

Static vs. Dynamic Use

The third point for discussion addresses the static and dynamic nature of cognitive mapping and cognitive maps. As illustrated by our findings, the immediate result of the cognitive mapping process, i.e. the maps, are static snapshots representing the participants' meaning constructions at a given point in time. A static snapshot at a single and fixed time point may allow one to analyze a topic matter in detail; however, sensemaking in IS appropriation is an ongoing process and should be studied as such. An important question is therefore why we suggest using an

approach where static maps play an important role?

In our empirical study, the tension between the static maps and the dynamic process of sensemaking is clearly illustrated as the group map shows a static picture of the outcome of a sensemaking process and cannot illustrate the dynamic dimension of sensemaking on its own. This point is related to the first point in this discussion where we argue that the maps cannot be the end goal in a process study.

Based on our empirical findings, we suggest that the maps serve several purposes. First, they can be used as a visualization technique to help the individual articulate meaning constructions and to relate them. As beliefs are sometimes deeply rooted in the mind, the mapping process can help these beliefs to surface, which is a way of addressing the question often posed by Weick mentioned earlier in this paper: “How can I know what I think till I see what I say?” (Weick 1995, p. 12). This aspect was reflected in this study where the doctors’ thoughts about the IS adaptation were represented in the map and where they were able to recognize their own meaning constructions and discuss them in the focus group interview.

Second, the maps can be used as a starting point for a collective process of discussing and negotiating a shared map in a group. In our study the relevance of this use of the maps became clear in the focus group discussions where the dynamic aspect showed in the negotiating of the group map.

Third, the maps can be used to make explicit the changes in meaning constructions over time, instigating renewed sensemaking and negotiation processes individually as well as collectively. When maps are created at certain intervals they can be compared to discuss the dynamics of cognition, an issue which according to (Eden and Ackermann 1998, p. 192) has been neglected in studies of cognition and which our own study did not address either. Reflecting upon future research, we find the temporal dimension in cognitive mapping an interesting and relevant issue and we plan to revisit the group of doctors to repeat the mapping process and accordingly discuss changes (if any) by comparing the new and the old map.

Finally, a dynamic use of cognitive mapping would also contemplate exploration of the link between subjective beliefs and behavioral outcome. According to Swan (1997, p. 194) a link is often assumed between the two but only few studies have pursued this link systematically. Cognitive mapping in conjunction with process-oriented research might be a way forward to address this link between cognition and behavior.

Implications and Conclusion

The purpose of this paper was to explore the use of cognitive mapping as an approach for eliciting users’ sensemaking during IS appropriation. We illustrated the value of this approach by reporting on findings from an empirical study where we presented a cognitive map illustrating the meaning constructions among a group of doctors in relation to an EPR adoption and the system’s impact on their clinical work practices.

The contribution of the paper was threefold: first, our findings demonstrated that cognitive mapping is a useful approach for eliciting users’ sensemaking during IS appropriation. Second, our findings illustrated that cognitive mapping can be used as a dynamic approach to increase users’ awareness of each others interpretations and reactions to IS, thereby facilitating a collective negotiation of the system’s meaning. Third, we contributed with a thorough explanation and discussion of the epistemological and methodological assumptions underlying the cognitive mapping approach to ensure validity and trustworthiness of its use.

This study has several implications for research and practice. From a research standpoint, we discussed the use of cognitive mapping for eliciting users’ sensemaking and presented findings from our study of doctors’ appropriation of IS. Our findings suggest that cognitive mapping is indeed a valuable approach for eliciting IS users’ sensemaking which can help researchers address the issue of cognition in IS research. Although it is acknowledged by IS researchers that it is important to study users’ cognition in relation to adoption and use of IS, and it is often mentioned that sensemaking and meaning construction are important issues in this respect, the topic of *how* to study cognition has been paid relatively little attention in the IS literature. Based on our findings, we argue that the cognitive mapping process is valuable for embracing the dynamic and temporal aspects of sensemaking and that the cognitive maps play an important role in the articulation of meanings of the participants. The value of cognitive mapping is therefore not the resulting maps themselves but rather the process of constructing and negotiating the maps. We acknowledge that the dynamic, ever-changing sensemaking process is very difficult to capture in research and even though we suggest using cognitive mapping for doing this, we will not go as far as to claim that we see a perfect fit. Adding to this point, we find cognitive mapping specifically relevant to use in strategic processes where

collective negotiation of a topic is the focus and where the goal is to construct a shared understanding of a dynamic issue, realizing that this shared understanding is not a stable construct but a dynamic construct, continuously changing.

The study also has significance for practice, offering implications for IS managers engaged in processes of IS adoption and use. Research on IS appropriation has encouraged practitioners and researchers to consider the interaction between meaning construction and behavior through the application of sensemaking. However, only few researchers have proposed methodological techniques for applying a sensemaking perspective to understand users' meaning constructions in IS appropriation. The empirical findings from the present study indicate that IS appropriation is an on-going dynamic process which unfolds in the interaction between users' meaning constructions and behavior. By focusing on users' meanings constructions, IS managers can use cognitive mapping as a way to facilitate decision-making, problem-solving, and negotiation within the context of organizational intervention (i.e. when new technology is introduced in organizations).

While our findings provide support for the use of cognitive mapping for eliciting sensemaking in IS appropriation, our own study suffers from limitations, two of which we believe are important to address here. First our study is primarily a snap-shot study as we have worked with one set of meanings articulated in the cognitive map. Although there were two steps in the creation of the map – the creation of the group map based on the individual interviews followed by a recreation of the map in the focus group session – the time frame was quite narrow and we cannot claim that our study addressed the dynamics of cognition. It would have been relevant to include a longitudinal study were cognitive mapping was used repeatedly at regular intervals in order to study the dynamic changes in meaning constructions.

A second limitation of our study is the lack of focus on the link between sensemaking and action. We focused exclusively on the doctors' meaning constructions and did not compare or link this to their behaviors in relation to IS. As sensemaking is closely related to action, a focus on linking the two would provide relevant insights into their reciprocal influence that we will pursue in future studies. With the limitations of the present study in mind, we plead that continuous refinement and fine-tuning of the use of cognitive mapping is necessary to explore the most relevant use of the approach in future research.

In conclusion, our study was primarily aimed at exploring the use of cognitive mapping for eliciting user's sensemaking in IS appropriation. We hope that we have advanced the understanding of the approach's applicability in eliciting sensemaking processes in IS appropriation and that our study lays the foundation for future research applying the approach in IS research.

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