



Anne Forsell | Helena Karsten | Riikka Vuokko

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Anne Forsell

Åbo Akademi University, Department of Information Technologies

Helena Karsten

Åbo Akademi University, Department of Information Technologies

Riikka Vuokko

Åbo Akademi University, Department of Information Technologies

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## **Abstract**

Organizational implementation of an information system can fail for a number of reasons. We describe here the 104 different reasons the users gave for the failure of implementing an electronic patient record system in a surgical clinic. We classify these reasons with the issue order model introduced by Star and Ruhleder. The model follows Bateson's levels of learning and portrays the problems the users meet on three levels: the first one for simple and technical issues, the second one for more complex and possibly combined issues, and the third one for political or ideological issues. We were able to identify 48 first order issues, 36 second order issues (of which four were due to mutual influence of several first level issues), and 20 third order issues. This classification is not the only way to see the issues, as something that appears as a first order issue to a middle manager might be seen as an insurmountable third order issue for a worker. Moreover, all the issues are interrelated, and solving one issue might have substantial influences on the others. Also, the issues seemed to accumulate and concentrate on points.

**Keywords:** electronic patient record, social structures, organizational implementation of IT, user resistance, problems, failure



# 1. Introduction

Organizational implementation of an information system is an organizational effort to diffuse an appropriate information technology within a user community (Kwon and Zmud, 1987). Even when mandated, before the use of the new information system can become part of the institutionalised practices, it has to be accepted and adopted by the future users. Typically, organizational implementation is motivated by the needs of increased efficiency and modernization at work. This argument can be well accepted by organizational members, but nonetheless, during the implementation various problems may emerge. These problems are likely to be seen differently by different stakeholder groups. For example, from the perspective of the company or system developers, an interaction failure (Lyytinen and Hirschheim, 1987) occurs when the information system is not used, possibly due to negative user attitudes. From the users' point of view, the new system is a failure when it does not meet their expectations. Also, organizational members may feel threatened in some way when faced with the challenge of a new technology to be learned, by being forced to adjust one's work practices and routines, by not having a voice in the process, or by re-emergence of old tensions (e.g., Berg et al., 1998; Markus, 1983; Orlikowski and Gash, 1996; Zuboff, 1988). New technology may even be given the role of a scapegoat as technical issues can be used as a surrogate for other, cultural or behavioural issues (Hughes et al 2002, 2002; Massaro, 2005).

Markus (1983) was one of the first ones to explain resistance to emerge from the interaction of new technical features and the social context of use. When the future users feel threatened that the new system decreases their power within the organization, the organizational members may choose to resist the new technology. Damsgaard and Scheepers (2000) give a more detailed view into resistance. They claim that a new information system faces an existential crisis at each implementation stage, to be overcome for the system to succeed. In their study of an intranet implementation, they identified a first crisis right at the initiation phase: without sufficient "sponsors" and resources to nurture a new system, the system implementation stagnated. When the critical mass of users and information content was not reached, a second crisis occurred, and the implementation slowed down instead of evolving further. The third crisis emphasized the need to control both use practices and content of the system. When the content of the system became chaotic instead of organized and up to date, and when information could not be retrieved timely and accurately, the organizational members started to mistrust the system. Mistrust in turn can easily be transformed to avoiding or resisting the system. When even work-arounds or other adjustments do not help, avoidance or resistance can result in rejection, a decision not to adopt the system, or in discontinuance, a decision to cease to use of the system (Kwon and Zmud 1987).

In the case we present here, various socio-technical issues were behind the users' resistance towards the new electronic patient record (EPR) system, and finally, a halt to the organizational implementation. Thus we will not describe successes and benefits, but uncertainty and problems (cf. Berg, 1999). Like Orlikowski (1992b), we see that an

organizational implementation can have both intended and unintended consequences. Here the focus is on the unintended ones.

Thus, our main research questions are: What is the role of the implemented information system in the emerging problems? What are the organizational conditions that can trigger the emergence of such problems, and how could the conflicting features be noticed in advance to solve the issues before they become a conflict? How could the issue solving be supported? This leads to further points of interests: How does a failed implementation project affect a new implementation project? How does an IT failure affect the organizational staff members, their attitudes towards IT and towards new organizational implementation projects?

## **2. Failure of an Electronic Patient System in a Surgical Clinic**

This study is about a crisis during the organizational implementation; that is, a rejection of an electronic patient system in a surgical out-patient clinic and discontinuation of the same system in a surgical bed ward. The whole clinic of surgery is a part of the second largest teaching hospital in Finland with 953 beds and 3800 employees. The surgical in-patient ward has in total nine surgeons, three physicians, 50 nurses and a ward secretary. These surgeons work also in the out-patient clinic. Many parts of the clinic moved to a new hospital building in November 2003, with all new IT equipment. The goal was to have a paperless hospital with only electronic patient records. The goal was even to scan in all the paper records of the out-patients by the time they came for their visit. However, the resources did not allow scanning in the papers in time and the dual use of paper and electronic records began.

The patient administration system has already been in use since 2000, and the EPR system was introduced in the new hospital already in 2003. The following year, an integrating user interface combined these systems, with the old laboratory order system and the digital imaging component. The organizational implementation has been carried out slowly, and not all of the plans have been finalized yet. For example, in the surgical clinic, the use of the EPR system is only partial.

Implementation of large hospital information systems is described by various authors as a problematic phenomenon, and shortcomings of such implementations are documented to prevent repeating the same mistakes in the future implementations (e.g. Berg, 2001; Jones, 2003). Tensions caused by uncertainty and continuous change are present in Berg's (1999, 2001, 2004) writings, where he describes large information system implementations in various hospital environments. Berg argues that success stories in the hospital implementation projects are less common than the stories of less successful implementations. Heracleous and Barrett (2001) argue that during an organizational implementation, the future users' interpretations and actions are based on their deeply structured values and beliefs, and as such, the interpretations can have a lasting influence on the success or failure of an organizational implementation. Also past experiences have a long shadow (McGrath, 2002). Although the organizational

members may have divergent or even competing perspectives from the management's point of view, their interpretations may well be legitimate from their own point of view.

According to Massaro (2005), a new information system challenges existing institutional assumptions, which may cause problems to emerge. In a hospital working environment, professional patterns of conduct and institutionally established work practices are not easily altered even when the implementation is mandatory. Massaro argues that the competitive advantages of retail industry, such as efficiency and cost cutting, do not necessarily translate into a hospital environment when "the healthcare sector places the most highly trained professional personnel with the greatest opportunity cost in the data-entry role" (ibid, p. 254). However, he proposes, acceptability of information systems as a part of physicians' profession follow from IT use in teaching hospitals.

Berg claims that a reason for the failures in the hospital implementation projects is that the social environment of working has received far too little attention in systems design (e.g. Berg, 1999; Berg et al., 1998). An information system with sophisticated functions can be a poor choice for its future context of use, if the natural working order or the workers' practices have not been considered at all during the system development phase (Suchman, 1995; 2007).

Jones (2003) argues that the resistance of information system use decreases as the users learn to use the system more fluently and in a more routine way. He claims that this learning occurs even when the system is inconvenient and complicated for carrying out a particular task or when the system usability is not sufficient. Through learning and familiarizing the new system, its use becomes a habit and a routine. To continue, Jones (2003) describes differences between the physicians' and nurses' use of information technology. In his study, physicians were more ready to bring up the shortcomings or failures in the new system, and they could even categorically decline to use the system whereas the nurses typically became used to the system despite its possible shortcomings. According to Leidner and Kayworth (2006), medical professionalism may be the cause for strong cultural resistance when the values interpreted from technology and professional context contradict.

Jones (2003) summarizes that the user-resistance is more typical for users who are satisfied with their current information system in use, whereas users of older and slower systems are more eager for the change and emphasize more readily the positive features of a new, advanced information systems. This conclusion by Jones's studies led us – wrongly – to believe that in our hospital case, the implementation of the EPR could be a long awaited new feature in the hospital working environment where previously patient records were kept manually and with considerable effort. Thus we expected that fairly mild user resistance would be encountered.

Sahay and Robey (1996), however, emphasise that the implementation of an information system can be a smooth process, if the working conditions and practices stay as relatively similar to the situation before the implementation. In our case, the

patient documentation practices were expected to change. It is still uncertain how the EPR documenting practices have influenced other arrangements in nursing. Star and Ruhleder (1996) argue that the tension during implementation project is caused by the contradiction between the various users' local and fluently adapted use of information system, and the organizational need for standardizing and ensuring continuation on a more abstract level of use. Our case study illustrates also the aspects of different interpretations by, for example, the nurses and the hospital management.

### **3. The issue order model**

Star and Ruhleder (1996) studied an implementation case of a large information system, and how such implementation affected the various organizational units of action or different stakeholders with varied capacity for information system use. They compared impacts of information system use to the duality concept that was introduced in structuration theory: a new information system can either enable or constrain changes in the environment of working. The new information system can cause various adapting or conciliatory actions, which then affect already existing working practices and standards in the future.

Star and Ruhleder (1996) were inspired by Bateson's model of learning (1978) in building their model. Bateson researched how there are communication gaps between different levels of learning, or constructing knowledge and how these gaps hinder learning. Nonaka and Takeuchi (1995) emphasize Bateson's (1979) view that "information" differs from "knowledge", but that information is needed for creating knowledge of, for example, new technical features. Nonaka and Takeuchi (1995, p. 58) conclude that "information is a necessary medium or material for eliciting and constructing knowledge." Before the members of surgical clinic can learn to use the EPR, before they become knowledgeable users of the new system, they have to receive enough information about its functions in order to interpret and fit it into their own working context. In the model by Star and Ruhleder (1996), the technical infrastructure provides the context for communication, learning, and distributing information. In this approach, information systems, actors, and work tasks and processes form together an infrastructure that either works or breaks down. Star and Ruhleder identified three levels of issues in their analysis of problems within the implementation case that they were studying. In the following, we summarize these three issue orders.

First order issues are the ones that are quite easily solved by re-allocation of resources. These problems are often easily visible and solutions to them are practical in nature. First order problems concern, for example, getting user accounts, connecting or putting up the system, learning the basic use of the system, or arranging user training. Typical first order problems are related to everyday situations, such as how the system should be used and how it is used.

Second order issues can be caused, according to Star and Ruhleder (1996, p. 118), by "unforeseen or unknowable contextual effects" – that is collision or combinations of



two or more first order issues. Second order issues are often unexpected by nature because they emerge as secondary effects after the implementation. These unexpected effects may be caused, for example, by technical choices made or by the differences between the various cultures of practice that are working together in the implementation. Generally the uncertainty that is present during implementation of information systems is also considered a second order problem.

Third order issues are often political or social by nature. Their nature means that these problems are also hard to solve. For example, such problems can be caused by the historical reasons behind the choices made in the implementation project or distinct features in the organizational culture. According to Star and Ruhleder (1996) the differences between various disciplines or viewpoints can have a nature of permanent disputes.

According to Star and Ruhleder (1996) the three levels of issues are not unambiguous as various problems can be inspected on different levels by stakeholders. Relations between different problematic or conflicting issues or even double binds (Bateson, 1978; Star and Ruhleder, 1996) can be affected also by how the members of user groups identify these problems. According to Star and Ruhleder (1996, p. 118), double binds in information system implementation are situations that cause constant discordance amongst the users of the system, and can cause “organizations which are split and confused, systems which are unused or circumvented.” In order to avoid development of such situations, it is important to understand the intertwined nature of issues in organizational implementation.

The issue order model or the concept of double binds has been rarely discussed or used as analysis tool in later research although Star’s and Ruhleder’s (1996) article is much cited (Barrett and Walsham, 2004). Even Star (Bishop et al, 2000) herself has later modified the definition of the three issue levels. In the later definition (Bishop et al, 2000) the first order issues are simple such as getting the system running, the second order issues contain abstract choices that the users need to make, and the third order issues are described as political or philosophical. An example of third order philosophical question is negotiations about the value of functions in the information system. In this study we aim to adhere to the original definitions of the issue levels (Star and Ruhleder 1996).

Issue order model can be used to describe contextual problem situations emerging during infrastructural changes. The issue order view implies that it is not sufficient to simplistically list technical or user-related reasons to understand user resistance or “crisis” in the implementation and use of information technology. As the issue order model uses rich contextual data, it is a suitable conceptualising tool in a qualitative study.

## 4. Research methods

The qualitative data in the hospital case is composed of interview materials and various hospital documents that are related to the implementation of the EPR. The semi-structured interviews were planned as relatively informal discussions between the users of the EPR and the first author of this paper. Interviewing was chosen as the method of the data gathering, because it enables the gathering of data to understand local meanings and to explore the change process from new viewpoints (Lofland and Lofland, 1995). In this case, the study subjects were chosen amongst the members of the surgical clinic according to their own and the project administration's recommendations. The staff of the surgical out-patient unit stated that they weren't using the EPR in November 2005 when the problem situation emerged in the surgical clinic. In whole, ten of the interview subjects were members of the two surgical units and three were members of the EPR project. The interviews were carried out during spring and summer 2006. They were audio taped and later transcribed. The interviewees consisted of two surgeons working in both units, a ward secretary from out-patient unit, four nurses from out-patient unit and three from the in-bed ward.

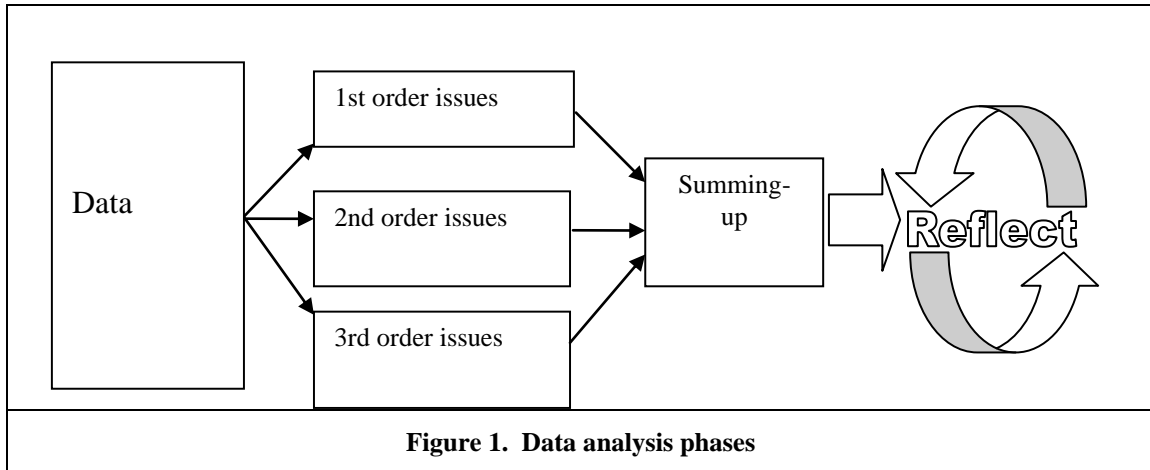
In addition to the interviews, there was a video recording of an actual use situation of the EPR in clinical work at the surgical clinic. The recording was made to inspect and find solutions to the problematic situation during February 2006. The document shows both manual and electronic recording of patient data and a situation where a surgeon and a nurse worked with one of the in-bed patients.

Background information was also gathered by scrutinizing previous studies in the same university hospital. The previous studies include materials from interviews and observations, and academic writings. Several related hospital documents were also reviewed for an overall picture of the situation.

Data gathering was carried out using qualitative methods (e.g. Lofland and Lofland, 1995). The validity of qualitative research is improved by using several methods for gathering data and by ensuring that the data is relevant to the research questions (Altheide and Johnson, 1994; Lofland and Lofland, 1995). Altheide and Johnson (1994, p. 488) describe the validity of qualitative research as depending on the interpretative communities – the audiences – as well as on the goals of the research: “All knowledge and claims to knowledge are reflexive of the process, assumptions, location, history, and context of knowing and the knower.” As such, the results of this study cannot be used, for example, to generalize best practices for using an EPR. Instead they provide a description of some possible situations and may be used in deepening the understanding of issues associated with the EPR use.

The data analysis was conducted in the following way (see Figure 1). First, all of the collected data was arranged according to themes relating to the research questions. Second, within these themes, we arranged recurrent issues according to the issues orders in Star's and Ruhleder's (1996) model. We noted that the same issues could be placed on different issue order levels depending on the perspective of the informant. A single

issue could also be seen to have different consequences if looked at from the perspective of different contexts, which also supported our decision to position some issues on multiple levels. Third, after the issue order analysis we summarized the results and consider their interactions. In the last phase we reflected issues with new perspective of the issue order model.



During the case study, our main interests were in the analysis of the user experiences by the personnel in the surgical clinic. We attempted to analyse how information system use was interpreted in various daily working situations and what kind of meanings were given to different features of use, or how problems were connected with use. We attempted to give voice to different interest groups as they studied the problems from various viewpoints and as the problem situation affected their working in multiple ways.

## 5. Findings

### 5.1. First order issues

First order issues were common and easily visible in the hospital case. In our analysis, the first order issues were grouped according to the themes of redistribution of work resources and working time, arranging user training, user-friendliness, and in relation to technical problems during the implementation. Furthermore there is a group of issues concerning the organization members' expectations, attitudes and values of the new information system. In each of the issue groups, we found issues complicating the every-day working with technology. For example, during the manual recording of patient information there were often gaps in the surgeons' dictations about their patients. Often the dictations existed on tapes, but the surgeons didn't know how to access this information. Dictations were accessible only after the ward secretaries had typed the dictations and printed them on paper.

After the implementation of the EPR, a similar problem in information access was caused by slowness of use. It was slower to use electronic records in comparison to using paper records at hand. One of the system features that increases slowness is the structured character of the EPR. For example, there are over 50 headings for recording a nursing action. One of the nurses describes the situation as follows:

*“Now I have to open Miranda [EPR], to open the nursing records. Now I’ll make the record, that takes many clicks – like surgeons name, date, and cause this and cause that. Then I’ll have to choose the right headings, and then I can go and record the day visit by the patient, I can make it, and then I’ll have to choose the next suitable heading... I have many phases here, phases that I have never done before... Before I just wrote, for example, ‘covering letter’ and ‘breast cancer’ on the paper and that was it.” (Nurse02)*

The slowness of use affects the working in various ways. For example, in the surgical ward, work-around practices have emerged. During doctor’s rounds in the ward, surgeon-patient interaction was disturbed because of the slowness, and this is now worked-around by having two physicians on a round. The other examines and converses with a patient, and the other enters or retrieves patient information in the EPR.

*”[There’s] always, like, one is like a scribe, and the others are like [doctors], because it was just taking so much time, that round... ” (Nurse09)*

One reason to slowness was that the EPR-system consists of several separate applications. To complicate the slowness issue, the medical personnel had no means to know the reasons causing slowness when they attempted to use the EPR. It could be anything from occasional capacity issues and use peaks to actual breakdown of the EPR or a system component.

Slowness of use was visible feature especially in the surgical out-patient unit. While continuous patient visits demand constant working with the EPR, medical personnel stated that half of the working time consists of making and accessing patient records. In contrast, fiddling with the EPR took only about 1/8 of the working time in the surgical ward.

The medical personnel were much concerned about how time was re-divided between caring of a patient and documenting care. Documenting care in the EPR was experienced as an extra work task that in practice means triple time for handling a single patient.

*”It takes 20 minutes with a computer and 10 minutes with a patient. [Before, when the documentation was penned down to paper] it took 10 minutes with a patient.” (Surgeon 01)*

A curious work-around was double-documenting practices in some of the hospital units. Due to the slowness and mistrust of the EPR, a part of the medical personnel was documenting care in both the old paper forms and in the electronic form.

The medical personnel interpret the new information technology as forcing them to reconsider situations of doctor-patient interaction: they claim that their focus of concentration is shifting from handling a patient to handling the computer.

*"And all of my time is spent mending the computer. And like, if I were, if I would be alone, without a patient, then this would be really useful and handy [system] in many ways." (Surgeon 01)*

In this view, it is understandable that the slowness of use can cause problems for daily working. One of the surgeons describes the situation:

*"With the paper system we would have handled ...two thirds of the patients in the same time that it takes us to get the electronic system open and running.."* (Surgeon 02)

This can cause the staff to think twice whether to use paper records or electronic records as they weight the pros and cons of the EPR use - especially in situations where a patient has an acute need.

For example, in the surgical clinic it was the nurses who decided that they will not use the EPR, whereas in the ward it was the doctors, who didn't want to use the EPR. This caused a situation where some of the patient records were on paper and some in electronic form. Furthermore, in relation to the slowness of use, general usability of the EPR is not very good if we consider the need to "click" many times, the problems with scanning the records, or getting some understanding of a patient's current situation at one glance, without having to check several views. Nurses are careful when making entries as they are still learning the use.

*"And really, when we write things with the computer, you notice it in yourself, you notice that the writing feels more nice and accurate ...is this now grammatically right, do I have all of the stops and commas in the right places."* (Nurse 09)

In the training sessions, first order issues emerged as amongst the medical personnel, there were individuals with wide range of experiences and knowledge of information technology in use. Some of the personnel would have needed more time to internalize various features of the EPR use.

*"Because we have also those who haven't used the computer much at all, those who don't even know the basics, like how you can move a window or close it from the X-icon." (Nurse 07)*

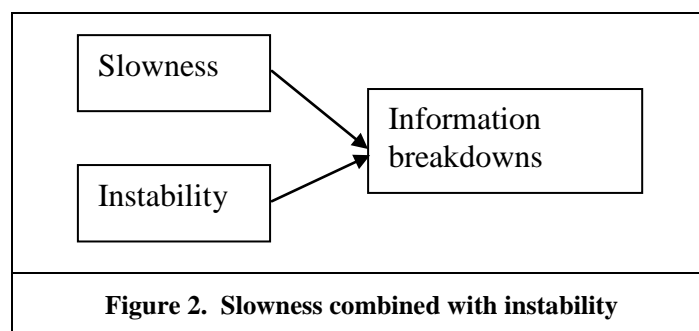
One first order issue was due to different interpretations about developing the EPR system. A contracting issue was that the development work takes time – even years. Medical personnel felt frustrated when they were expected to work with temporary applications and with temporary practices. One of the biggest wishes is "a flying exchange" – possibility to acknowledge orders and prescriptions with a smart card. Then, in an ideal situation, a nurse could write an order and the surgeon would just acknowledge the order with her or his smart card.

First order issues were analysed to consist of 48 different issues that were grouped in six various themes (see Appendix 1, Table 1). Most first order problems concerned usability issues, but also the other first order issues tended to be the ones that you would notice with repeating patterns.

## 5.2. Second order issues

Several of the first order issues can be interpreted as second order issues if the viewpoint is different. The interviews brought up second order issues, which we have grouped to eight groups: the first order issues' combined effects, prolongation of the implementation, vast and constant changes at work, interpretation issues, technical issues, cultural differences, training issues and reliability or trust issues. Some of the issues could have been placed in several groups as most of them relate to each others. Also Star's and Ruhleder's (1996) guidelines suggest that issues are closely in relation.

Major part of second order issues are caused by combined effects of several first order issues. System's slowness and instability in use situations bring up these kinds of issues. For example, the instability of the EPR system is related to trust issues, as system instability could result information breakdowns (see Figure 2) that complicate work situations and increase mistrust during the organizational implementation.



Information breakdowns prompt several practical problem situations. When patient information is not timely and up to date in the EPR system, situations such as patient transfer can be delayed or problematic: patient is taken care of with inadequate information, and new treatments cannot be attended to, while there are no acknowledged surgeon's orders.

*"What we have here is the ultimate slowness. When the hourglass stays there for 15 or 30 seconds before you get the next window open ...It's a long time to wait, ...because you're supposed to get on with the hings, you want to reserve an appointment for a patient who's waiting there, or you should be placing laboratory orders as a patient is already on the way to the laboratory, but all you get, is the hourglass. [...W]hen I bring up these things here, they may seem to be small things, but it's not as it is constant, and as it all repeats with the next patient. Our mot important work task is, after all, that we take care of the patient..." (Nurse 01)*

While the environment of working is a large teaching hospital that has a role of a forerunner to maintain, also the development of hospital information systems has been a long-time feature at work. Although positive attributes are attached to the status of being forerunners, medical personnel has also shown signs of being tired or frustrated with the continuous change at work environment. In the surgical department this was an apparent issue:

*"The [problematic] situation climaxed somehow, all of us people, we were tired and completely stressed out." (Surgeon 06)*

From the medical personnel's viewpoint, an issue is that not all of the try-out versions are taken into lasting use. For example, there can be training sessions with a trial version of a system, but when the finalised product comes to use in the hospital wards, parts off the system can be altered. As plans are re-formed during the development, what was learned during the training is no longer necessarily usable. This comes up as insecurity or resistance amongst the future users.

*"It goes like this: they develop it, and we got a new version, and it's something else – it feels like, you go 'oh no'. Because, nowadays everything is possible, everything can be done ...technology is so advanced already, but no, they can't make one system work." (HH07)*

During the organizational implementation, two parallel systems of patient information documentation have been maintained. It felt more secure to the organizational members to uphold also the old documenting practices. Furthermore, at first there remained gaps in the EPR system, and it was needed to fill in those gaps with the old paper system, it was conflicting to document partly with the old practices and then proceed to do some of the entries again in the EPR. In practice, this was interpreted as double documenting and as increasing work load.

With the EPR, documenting practices are nothing like in the old system, and a significant change is not the environmental change, but a change of care classification system. The personnel needed time to adjust to a new structured classification of documenting care. Previous documenting practices were more free or individual, whereas in the EPR documenting practices are controlled by structured headings and categories for care. The combined effect from new mandatory work practices with slowness and instability of the EPR in use resulted in serious resistance of the implementation.

*"We tried to strike; we won't use this ...we declined to use the system. We don't cure patients with the system... We told the head of the surgical clinic and the management of the profit center that we would not use it [...] Surgeons declined to use it before the basics would be in order." (HH05)*

Due to the resistance, the use of the EPR system was discontinued totally in some of the units, and in some units the number of the patients entered the EPR was minimized. According to the surgeons, changes of work practices can cause malpractice in the worst case scenario. The old patient information files with paper forms were familiar and rich information channel. It was based largely in the nurses' personal expertise, and a lot

could be interpreted from what written down as well as what wasn't documented. At best, for now, it seems to be harder to interpret meanings from the electronic documents. For example, in the electronic version, a nurse cannot use colours to reemphasise certain information. In the paper version, it was typical to use various colours and symbols to emphasise a meaning.

*"And it's a problem that everything is uniform black, for example, when we give strong painkillers, it would be all red in the paper form; as you see the whole day at once, you know that there's something [serious] when it's all ...now we don't have these colours anymore." (HH09)*

Smaller scale combined effects of technical features that caused user resistance, are, for example, the way the EPR logs off users, how the technical artefacts are arranged in the wards, or other kind of problems which are caused by the constant need to re-login to the system. Small but repeating technical issues caused the users to feel that the EPR does not ease their documenting load so much but interferes with their working and causes un-needed periods of waiting, for example, for the system to open or to find the next patient's data. Technical problems are further illustrated by the varied practices during breakdowns of the EPR use. During such breakdowns patient records can be written as separate text files that can then be added in the EPR after the breakdown. Problems emerge when the separate text files are attached only as printouts to the paper version of the patient records and not in the EPR. This causes that the EPR system is not necessarily up-to-date, and that the staff cannot trust the information in the EPR. The slowness of use can also be inspected as a second order issue when it is related to problems of resource allocation. One surgeon isn't necessarily able to carry out multiple tasks at a time, but instead she or he has to prioritize. And when tasks are prioritized, caring for the patients wins over documenting the care:

*"...during weekends – it can be that one surgeon is responsible for the whole ward, and he or she can also be the one on duty for the operating room at the same time. That is quite an impossible situation." (Nurse 10)*

Regarding cultural issues, different wards and clinics may have quite different goals for action and, therefore, different needs for information in the EPR. Although the EPR has been planned to support all working in the hospital, the staff members feel forced to use a system that doesn't, according to the staff, support the working of all.

*"It's forced like that, with the way it's told: then we implement system part [x], it will be taken in the use right away. It's all like that, like parts are taken into use no matter what, not regarding if... When you think about working in the hospital, like how different wards we have in here, well, it could well be that in some wards the system works all right. But you should also consider it, when the implementation doesn't progress likewise in all of the wards." (HH04)*

When comparing the hospital units, for example, in the ward for in-bed patients the action appears as more continuous and dilatory, even. Then again, in the surgical clinic, the tempo of action is more acute, as relatively short time span is reserved for each individual patient. Variances of action taking reflect also in to the EPR in use. For example, in the surgical clinic, the slowness of use issue grew up to a second order issue



together in relation with the issue of appointment durations. While an individual patient's appointment time is approximately 15 minutes, there is no extra minutes for both examining a patient and document the examination in the EPR before the next appointment. Some development has been made during the implementation to align the system more fitting to certain environments of use. For example, the heading lists in the EPR have been shortened in some wards to support the working better.

The second order issues are also related to the working time allocation, such as, how nurses' working time is divided between nursing in the surgical clinic and, for example, participating in user training. The user training has been arranged within different wards in a manner that the key users are responsible for training the other users. This decreases the number of nurses working in the wards and increases nursing tasks for those who are not attending the training. This can cause the nurses to think of the consequences for their co-workers if they themselves are attending user training session. The nurses can also weight what are necessary workplace training sessions that they will participate in. In practice, this causes a situation where the use of the EPR is learned step by step in the actual nursing work. Further problems are caused by the cultural differences between different organizational units that can be inspected in the ways the use varies and how the EPR has been modified to local needs.

For the surgeons, the physicians and the nurses, time spent learning to use the EPR is away from the time in disposal for curing and caring the patients. Situational issues such as this are related to issues of trust and professionalism during the organizational implementation. The new structured documenting became also a situational issue, while it takes time to learn to use the new system tools, and while the staff members have quite varied previous experiences with information technology in use. However, all of them share the need to learn and develop new work practices.

The medical personnel mistrusted the EPR based on their own experiences. For example, it was possible to make an entry of a treatment and attach the file to a wrong patient's information. Such happened, when the personnel could not see at all times, which patient's information was open and at the screen. As a wrong entry could cause malpractice or wrong treatments, mistrust of the EPR caused resistance of use. Mistrust was further caused by long and unplanned for breakdowns. During the breakdowns, there was no secondary system to be used, and the personnel felt that it was safest to go back to the old ways, to the old practices.

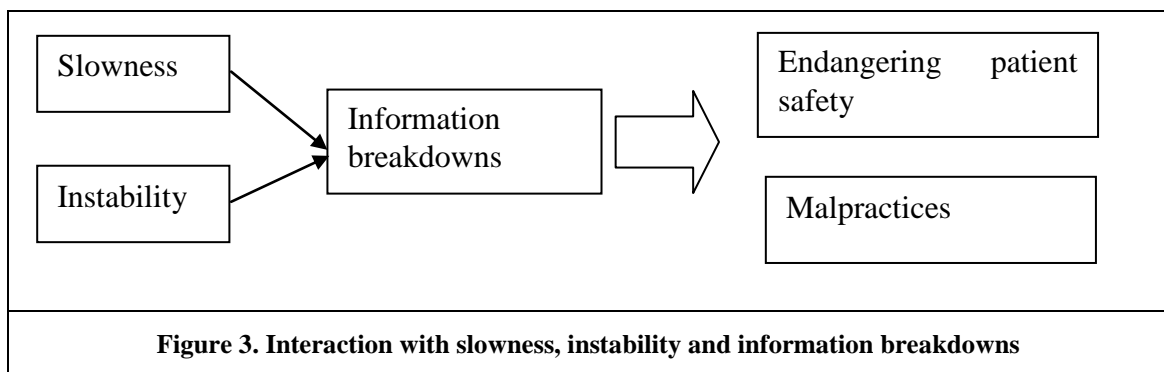
The second order issues were analysed in 36 different instances from the data (see Appendix 1, Table 2). The second order issues were quite evenly grouped in eight themes.

### **5.3. Third order issues**

Some of the second order issues can be interpreted as third order issues while these issues have a long-term and large-scale impact in the organizational context. We grouped the third order issues to six groups: first and second order issues' combined

effects, rationals for implementation and application development, attitudes, work tasks, technical issues and political viewpoints. We grouped similar third order issues to same groups.

System's slowness of use may cause the medical personnel to bring up the question of malpractice. If the patient information is not available quickly enough, the surgeon could make a decision regarding patient's treatment with insufficient information (see Figure 3). This brings up both fear and ethical questions: how one can do one's work without necessary information about the patient's status. To what extent the nursing staff should be responsible of their own choices about the treatment if information is unavailable?



Third order issues are related to the issues behind the implementation project and its goals, and the technical choices made during the implementation. Some of the interviewees thought that the pre-existing decision on the chosen system vendor influenced subsequent decisions. Furthermore, outcomes of previous implementation projects arise to the surface again, as the staff members re-weight information technology's success. For example, in the hospital, an unfinished system of digital dictation was previously implemented at the surgical clinic - the failure in this implementation increased the resistance in later implementations.

Successful organizational implementation demands the whole organization to commit to the goals and to the overall process of the system's implementation. If the management of the organization does not stand behind the information system it may cause issues on all three orders with the end users. Attitudes of highly recognized workers easily transmit to other workers in the same unit. In this hospital case the surgeons' attitudes to the EPR were generally negative. As they mistrusted the EPR, they declined to use it. Most surgeons used alternative ways and tools to mediate orders concerning care instead of the recommended EPR, and their practices influenced nurses' attitudes towards the EPR.

*"Yes they did also some documenting ...or it was more like, you could find orders in some papers, or in the margins, or something like that – but hardly a physician would open the computer to make specific orders." (Nurse 07)*

The medical personnel in the surgical clinic felt that they had no influence in the system design and development. They felt that the EPR was developed according to the needs of larger hospital units or ward nurses. The surgeons felt also that the slowness in EPR can cause multiple third order problems. For example, while working bedside both a surgeon and a nurse may record information quite fluently and not consider whose user account was used to log in the system. Problems of responsibility emerge when mistakes are made in the records. The one whose username was used is held responsible. On the other hand, surgeons fear that the slowness of use can cause malpractice in situations when patient information cannot be accessed as easily as needed. A surgeon may have to make a decision concerning the patient care with insufficient information.

To increase the medical personnel's trust on the EPR, more technical help was arranged. The surgical clinic's contact person in technical issues is a person with nursing background and a history of working with patients. The contact person has several tasks, such as, training new employees and sorting out different EPR issues the staff have encountered at the clinic. At some wards there have been questions about how long one contact person can stay in touch with the clinics' work tasks and working environment. With a new working role, the contact person's viewpoint shifts from practice to observation. The new work role brings the contact person in close contact with the system vendors and their viewpoint can start to align more with the vendors than their previous colleagues. At the same time the nursing staff members observe the system development from their own viewpoint – bound to their own working role in their own working environment. Transforming work roles and processes can bring up new socio-technical issues when the clinic's staff members expect that the contact person does his or her work based on the previous working roles.

Several issues are caused by the division of work tasks and the re-forming of work practices during the implementation. Division of work tasks also varies between the hospital units, and this causes the personnel to repeatedly ask: "Whose responsibility is this particular task?" The answer is often dependent on the person who gives the answer. For example, a surgeon, a nurse or a project leader can all give different answers. Also one of the third order issues is how the nurses interpret meanings behind the new record keeping. Most nurses state that EPR does not help their work and that instead the records are kept for some third party. Hospital administration, researchers, the national health record project, and other nursing representatives are named as representatives as such third party:

*"...it can be a little easier to find new information in EPR, where they are structurally arranged, than if we still would have the paper story... But in practical nursing it is often hard to understand why we do it in such a difficult way just because someone else wants to make statistics or research." (Nurse01)*

Work practises have been altered to adjust to the electronic documenting. For example, now the nurses have a practice of printing out a patient's *vital information* –form in the EPR and attach the print-out to the patient's paper file. With this practice, the next nurse

immediately knows that this particular patient has also new electronic files in the EPR. If the nurses don't contribute to the care documenting in the EPR, the patient and the patient care information does not show up in the hospital's train of events. Varied documenting practices cause problems especially with internal transfers. It is possible that a nurse has started patient documenting electronically but a nurse in the next ward then continues the documenting on paper records because she or he does not use the EPR. Finding the patient information in either system became an issue:

*"[T]here was of course all kinds of problems... someone could start to use [the EPR] by choosing only a few patients. So, the overlapping became... an issue... Like, there were paper [records] and electronic [records]. A part of the patients were in the electronic system, and others were not... there was nothing like a register where you could see, which patient was in the electronic system, we found out this at times only when there were no paper records."* (HH04)

The medical personnel think that a web-based EPR could be a faster way to access patient information. Due to encryption issues a web-based system could not be used, though. Here, the medical personnel had two choices: which is more significant – patients' safety or avoidance of potential information leaking. It was normal to choose patients safety.

Our case study showed two examples of a situation that could lead to double binds. The first was the tension caused by the expected mandatory use of EPR and the breakdowns and information gaps in the EPR. And the second was the clinic personnel feelings when they are expected to use a system, which information content they cannot fully trust upon.

Issues which can endanger patient safety or can even cause malpractices rise up to the third order because handling of these kinds of issues is related also to political factors within the organization. In the long run, the third order issues can affect the reputation of the hospital and even the hospital's financial standing.

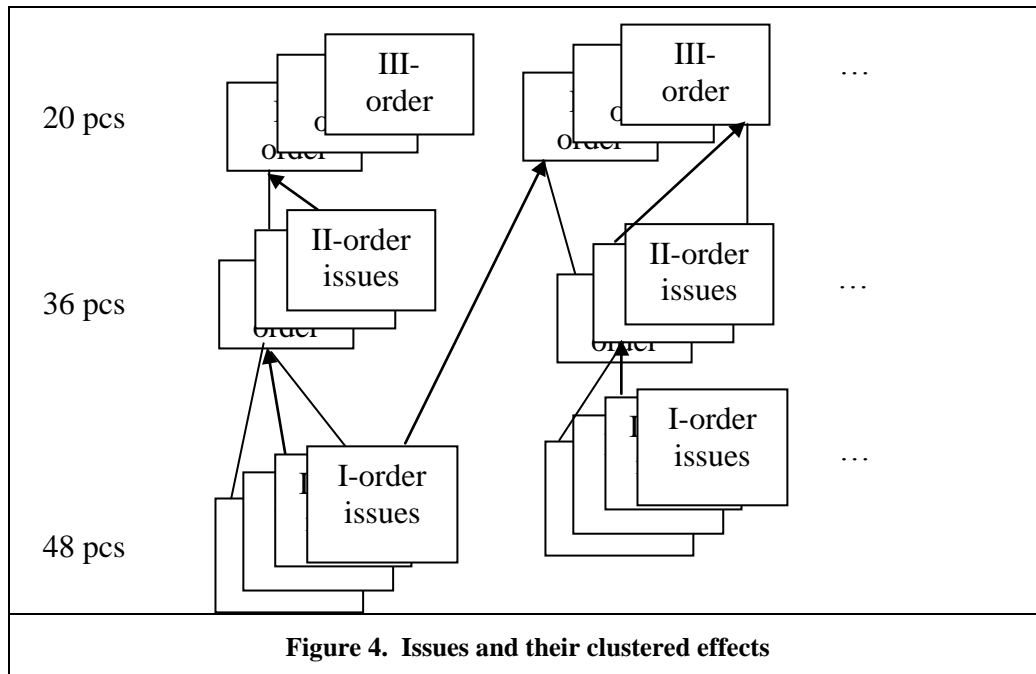
It is normal to find only a limited number of third order issues in the organization. At the case interviews we found 20 issues, which were at the third order (see Appendix 1, Table 3). However, analysis of these issues reveals how they are related to all other issue levels and how they largely influence working conditions in the organization. Third order issues shed also a new light on the issues of the first and second orders.

## **6. Discussion**

### **6.1. Issue order relations**

Exploring issues that emerged during the organizational implementation show that these issues tend to cluster and accumulate as the implementation continues. Single first and second level issues cluster, and become second or third level issues. Star and Ruhleder (1996) emphasise the relations between actors, organization, information technology

and information with the issue order model. They argue that in the context of actions, new information technology has an organizational impact. However, changes in the organization don't necessarily have impact on information technology. Still, in time, the practices and use of information technology tend to evolve and be transformed.



With the issue order model, we identified 104 various issues, of which 48 were on the first order, 36 on the second, and 20 on the third order (see Figure 4). Four of the second order issues were analysed as emerging from the combined effect of various first order issues. Two of the third order issues were clusters of several second order issues.

McGrath (2002) recommends that something familiar of the previous way of working should be preserved to give the organizational members a sense of continuity instead of heightening the sense of unfamiliarity. She proposes that a successful change can be achieved with a phase-by-phase development to increase the future users' knowledge and trust of the new information technology. In the hospital case, the medical staff experienced the change at work as radical and uncontrollable. Moreover, they didn't expect the new documenting practices with the EPR to improve working arrangements significantly.

McGrath (2002) continues her argument with the idea that a parallel use of the old and the new system could have a positive impact on the success of the organizational implementation. However, the hospital case shows that a long lasting parallel use of two systems becomes a negative issue as the organizational members' work tasks increase. In addition, the organizational members tend to stick to the old practices instead of learning the new practices and familiarizing themselves with the features and functions of the new system. This slows down internalizing the new practices as a part of the

organizational culture. Although the parallel use could be a good alternative for a short interval, in time parallel use becomes a hindrance.

When the medical personnel declined to use the EPR, information validity in the system became an issue. At times, the staff members' didn't have the knowledge where to find the latest patient information – would the information be in the old paper system or in the new electronic system. These issues cumulated into the third order, while investments, budgets, resources and project schedules needed to be modified. Zuboff (1988) and Orlikowski (1992) argue that managerial commitment is crucial for the system success. In the hospital case, managerial commitment wasn't interpreted by the medical personnel, while they were allowed to choose whether to use or to reject the use of the EPR. Especially, in the surgical department, it was interpreted that even the implementation project management hesitated about the usability of the EPR. User resistance was based on experiences of technical faults and usability issues. During our analysis, social and organizational issues emerged as intertwined and clustered with technical and usability issues. These clustered issues emerged when the organizational members had to re-form the daily working arrangements and distribution of diverse tasks.

## **6.2. Gaps and double binds**

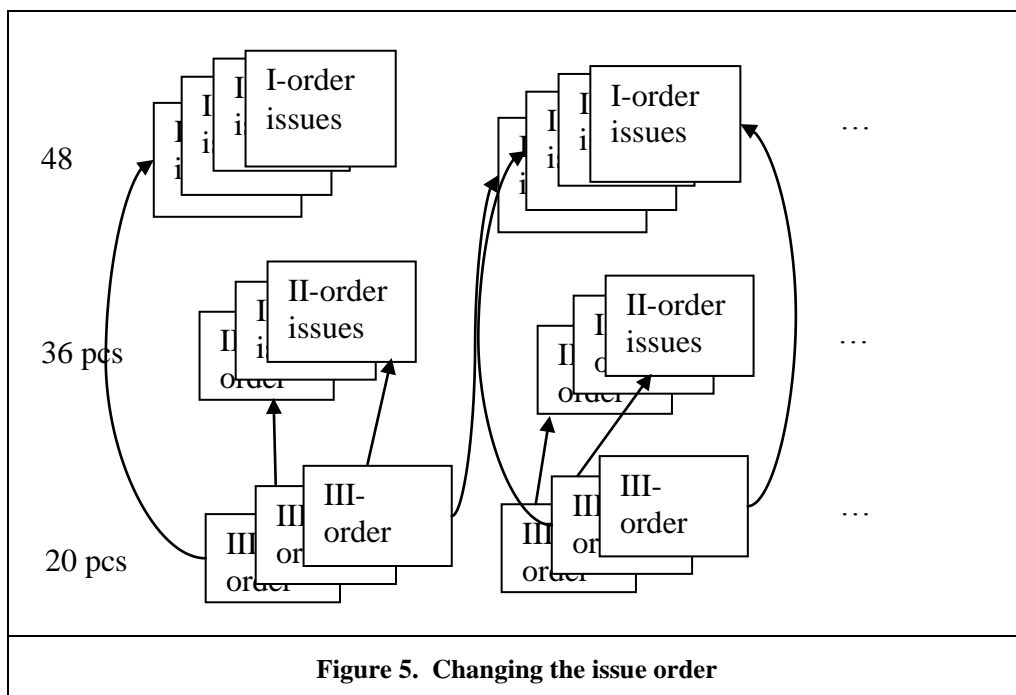
Star and Ruhleder (1996) argue that emerging gaps during the implementation cause further issues between the organizational members. Stakeholder groups may have varied basis for adopting and learning the new system depending on their educational and occupational backgrounds. These issues may cause communication gaps between the stakeholder groups. For example, the application supplier can use more technical terms to flourish her or his language, and the medical personnel may interpret the terms wrongly or not at all. The communication gap affects the situation also when reversed: the medical personnel and the hospital representatives use language learned within their profession, and likewise, that might be hard to fully understand by the application suppliers.

Added tension between various issue orders and “gaps” in the organizational relations are caused by varied interpretations between the stakeholder groups and even within them. Our data showed, how even the EPR as a concept can mean various things to different groups. The medical personnel interpreted the EPR various ways: it could mean just files of patient information, the whole care documentation or a combination for making appointments and documentations, for example. Only the implementation project leaders seemed to have an understanding of “a semi-integrated EPR” as a whole. The organization members seemed to interpret various meanings in the EPR depending on which unit or in what tasks they were working.

Star and Ruhleder (1996) present double binds (Bateson, 2000) in the view of developing infrastructure. In the hospital case, we analysed two significant double binds. The first double bind emerged while the medical personnel were expected to use the EPR system they could not trust. The second double bind was caused by the

tensions when the medical personnel were expected to use the EPR as efficient and accurate care documentation. The EPR, as it was, didn't support quick entries or patient information retrieval.

Easterby-Smith (1997) argues that learning in organizations is a continuous process. To achieve the shared goals of action, all organizational members should reach an agreement at some level – instead of situations where orders are given as mandatory from the above. During the system development and implementation, also the system developers should have some kind of understanding of the third order issues and solutions to the issues in the organization in question. Although there are a limited number of the third order issues, their consequences are meaningful and expanding. In addition, the third order issues appear as basis for other level issues: it is on the third order level that certain values and structures for all action are approved in the organization.



### 6.3. Third order issues as a starting point

Up to this point, we have analysed issue orders from bottom upwards. When analysing the issue order levels in reversed order (see Figure 5) by changing the viewpoint, new relations between the issues emerge in the picture. Star and Ruhleder (1996) argue that higher level issues are caused by the combined effects of the first or second order issues. Bateson (2000) adds on this with the idea that the third order level is actually a basis for the learning and adjustment that takes place on the other levels. When a third level transformation takes place, it can be observed as changes in the every-day action on the

first and second orders. For example, when one of the guiding principles in hospital working is the patient safety, there emerge also first and second order issues that are based on this principle. When the basis for all action is transformed – such as changing the principle of patient safety – such changes would influence the values and beliefs of working in the hospital. That is to say, when new values or ideals are presented on the third order, it may influence new tensions and issues to emerge on the other levels.

According to socio-technical approach (Lamb and Sawyer, 2004), information technology should not be analysed as separated from its context of use. In the hospital context, the third order issues could be first observed as simpler first and second order issues. Still, the third order issues define the realities on the other two levels – that is, the realities that the organizational members face with in their every-day working. Probably the issues wouldn't even be apprehended as problems and conflicts, if the third level context would be different. Likewise, the gaps hindering action taking and communication are caused by differences of third level context: for example, the third level basis for action differs between an application supplier and a surgeon and a nurse.

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## Appendix 1: Grouping of issue orders

Table 1: First order issues.

Issue group	Issue
Redistribution of work resources	
	New and changing work tasks
	Issues with the distribution of work tasks
	Slowness of documenting
	Too few computers in the ward
	Issues with disposition of computers
Training	
	Slow tempo of training, mixed experiences
	Complicated instructions for beginners
	Lack of time for learning the use
	Changes of documenting practices
	Terminology changes
	Changes at working processes
	Documenting became visible
	Frustrating training
	Different levels of computer knowledge
	Lack of peer support
User-friendliness	
	Demanding entries
	Slowness
	Structured character of the EPR
	Problems with allocating a new patient
	Too many 'clicks'
	Disconnectedness of patient views
	Slow to open different parts of the EPR
	Hard to get an overview of a patient
	Limitations in browse
	Usage cumbersome
	To understand of a patient's status user has to check several views
	Warning sign not linked to patient information
	Functionality is uncertain
	User can check only one patient's information at a time
	Users mistakes are complicated to repair (entries are locked)
	Readability of printouts is poor
	The EPR does not support a user
Technical problems	
	Slowness
	Breakdowns
	The EPR logs off users
	Function of the cordless network
	System lock
	Lack of parallel logon on the same computer
Changes in work tasks	
	Changes in work practices
	Patient work versus computer usage
	Not inconsistent practice in documenting
	Diminishing of discursive entries
New features and expectations	
	Smart card signature
	Flying exchange
	Promise pie in the sky

**Table 2: Second order issues.**

Issue group	Issue
Combined effects	
	Imperfect usage of the system
	Learning the use while tending the patients
	Information breakdowns
Prolongation of the implementation	
	Exhaustion on implementations
	Staff cannot trust the information in the EPR
	Two parallel documenting methods
Vast changes	
	Changes in nursing process
	Changes in work practices
	Exhaustion by the users
	Uncertainty
	Usage resistance
Technical issues	
	Breakdowns
	Clump of problems
	Instability of the information system
	Slowness
	Issues with consolidation
	Uncertainty about the information system's functionality
	Incompleteness
Interpretive reasons	
	Fear about usage's difficulties
	Work satisfaction
	Delays to repairing
	Information system is too significant in relation to the patient work
Cultural differentials	
	Different work roles
	Different situational goals
	Different needs
	Different ways to use the system
	National versus local level
	Issues of circumstantial factors
	Issues with motivation
Training	
	Previous experiences
	Hierarchical differences
	Impact on attitude
Reliability	
	Wrongly saved entries
	Mistakes in documenting
	Sophistication of functions
	Unsystematic breakdowns

**Table 3: Third order issues.**

Issue group	Issue
Co-operative action	
	Endangering patient safety
	Malpractices
Rationales for implementation and application development	
	Meaning of the documenting
	Rumours about stopping the usage

	Communication gaps
Attitudes	
	Management's commitment
	Attitude to the information system
	Weight of previous implementations
	Gap between generations
Work tasks	
	Limited possibilities to influence
	Varied practices in documenting
	Professional school differences
	Responsibility issues
	Information validity – patient safety
Technical issues	
	Slowness
	Breakdowns
Political viewpoint	
	Choosing the EPR system
	National requirements
	National archive project
	Occupational ethics and professional identity

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