Impediments to change: the case of implementing an electronic patient record in three oncology clinics

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ABSTRACT
The aim of this paper is to provide a deeper understanding of the complexities of IT implementation processes in health care by studying the introduction of an electronic patient record (EPR) system at three oncology clinics belonging to an association of hospitals in Austria. It examines the larger political and organizational context, the role of different stakeholders, the impact of arenas of influence and participation, and gives an in-depth analysis of the case dynamics.

It argues that in order to better understand large scale IT implementation in health care a profound understanding of the complexities and interdependencies of clinical work is needed as well as the inclusion of other involved social arenas and their agendas. Careful planning and a powerful agenda in all these arenas are essential for the alignment of the different perspectives and the resulting demands.

Keywords
Electronic patient record, implementation, organizational issues, change management, participation

INTRODUCTION
Many advantages have been listed for the use of electronic patient records (EPR), the primary benefit being that of more and better access to patient information [21]. The use of IT in health care is seen as a possibility to get a grip on rapidly rising health care costs and to improve patient safety, quality of care, and efficiency.

Nevertheless the diffusion of IT systems into health care appears to be rather slow. In a survey conducted in 2002 it was found that less than 10% of US hospitals had adopted physician order entry systems (CPOE), a part of EPRs [3]. These problems are not unique to the United States. Health care organizations seem to treat IT projects with reserve, as system failure rates are rather high. It is estimated that 60 – 70% of all software projects fail [8], leading to an enormous loss of money within the health care system and also declining confidence in IT from both, users and managers [2]. In the 1970s, when the first IT systems were introduced, the technical design was seen as a main factor deciding over success or failure of the system, but soon experience suggested that the primary causes for system failure were uncared-for organizational complexities [24]. A paper on the new U.K. national health care system indicates that there is "a long history of health care IS failures in the U.K. and elsewhere" [4, p. 69]. Among the issues numbered are: a lack of fit between ICT applications and work practices, poor project management, the piecemeal nature of IS development, and organizational uncertainty. One of the arguments is that "the enterprise is too small a building block for health care, and models that start with national context, scale, and complexity might serve health care better" [4, p. 71]. It is also claimed that "better person-to-person models are needed to understand how the collegiate and interpersonal elements of care delivery could be embedded better in the systems used for care delivery" [4, p. 73]. These two arguments point to what Bowker and Star describe as an inescapable 'permanent tension' between the need for a global or larger scale perspective and local concerns and practices [11, p. 139].

The research presented in this paper has a closer look at the impediments surrounding a complex implementation project: the introduction of a common EPR system at three oncology clinics belonging to an Association of Hospitals (AH) in Austria. This common system was expected to allow data sharing but at the same time be flexible enough to support variations in local workflows. The implementation of the system was scheduled for 18 months. It started in December 2004 and was still ongoing at the end of 2007. We witnessed a difficult and tangled process, where the motivation of the project's initiators was deeply frustrated, technical and financial limitations were reached (and partially mastered), and where the project came to a total halt for more than half a year, many expecting its cancellation.

By reconstructing and analyzing the implementation process from its first idea to its status quo, including its immediate and broader context, we expect to contribute to a deeper understanding of the dynamics of technology-related change processes, of the role of different stakeholders, the arenas of influence and participation, as

well as the role of IT development and implementation in the process.

More specifically, our aim is to a) identify the factors that shaped the implementation process; b) demonstrate that these factors have to be considered in their interrelatedness in order to be able to understand system failure or success; and c) outline what Participatory Design (PD) may learn from our analysis of an unsuccessful project.

The paper starts with an overview of related research with a focus on reasons for system failures as well as the characteristics of successful implementation projects. We also look at findings from research in CSCW (computer-supported cooperative work), as well as a variety of theories explaining the dynamics of organizational change. The paper proceeds to describe the case and its larger political and organizational context to then provide an in-depth analysis of the case dynamics.

RELATED WORK

There is a vast body of literature on IT in health care, including EPRs. Within CSCW research several studies have been carried out examining paper-based as well as computerized patient records and their use [e.g. 19]. Their value lies in the detailed account of collaborative practices and coordinative artifacts they provide, based on ethnographic research. One of the conclusions to be drawn from these studies is that documentation is a multi-purpose activity, serving different purposes, such as information exchange, accountability, and workflow management. Fitzpatrick gives examples of how carers use informal documents alongside formal ones and how they manually annotate printouts of documents or modify templates so that they fit their needs [15]. This has also been observed by organizational theorists. It is argued that often organizations handling uncertainties may be well served by tolerating equivocal information, because unequivocal, exact messages can oversimplify complex, ill-defined events [35].

While IT providers and health managers stress the need for sharing health information across institutions, others argue that in health care, "typified by a complexity that defies the predictability and standardization required for simple reengineering", the implementation of IS "is *fundamentally* unfit for a planning and controlling approach". No agency can design 'integrated care delivery systems' that 'fit' and can then be 'rolled out' [7, p. 150]. This resonates with the concept of 'emergent change' [29]. It suggests that health care organizations find themselves in an environment of constant flux, caused by demographical changes, political pressure, increasing demands for quality care and new medical technologies. This process of change never stops, thereby making outcomes of implementation processes unpredictable.

More specifically, it is shown how, with integrated health care systems cutting across multiple local settings and disciplines, the question of how to account for the variations of work practices in standardized information systems becomes virulent: "It is neither practically nor analytically feasible to fine-tune design to all local settings" [14, p. 444]. For example looking at discharge letters, it is argued that more research should be done into „how different forms of standards such as 'the good discharge letter' may be designed to inform its many audiences yet be sufficiently flexible not to close off other professionals' interpretation on a patient's case" [37, p. 63]. This reflects our own experience that standardizing reporting formats and practices requires a careful and detailed understanding of all the observed variations and evaluating, which of these are accidental, 'ad-hoc' or low-frequency, and which, although reflecting substantial differences in local practices, also contain a certain 'grammar' [32].

Bardram describes how "none of the EPR systems we have studied have mechanisms for adjusting e.g. a display to specific work situations. The same client user-interface is used in all clinical situations, whether the client is used at a ward, in a surgical clinic, a medicine room, or on a laptop at the patient's bedside" [6, p. 1574]. However, there are also reports on successful system implementations, most of which have practiced a participatory design approach, including some of Bardram's work. For example, Moller-Jensen et al. [25] describe a project developing a configurable EPR, where all stakeholders specified the content of the EPR in five full-day PD workshops, and the complete specification was presented and reviewed in a final workshop before the actual configuration was implemented.

This research also suggests that stakeholder participation is a prerequisite for successful implementation. The challenges increase, when a system is not to be implemented in 'just' one organization but in several. Furthermore, the question whether an implementation has been successful or not is *socially negotiated*: „Success, in short, has many dimensions: effectiveness, efficiency, organizational attitudes and commitment, worker satisfaction, patient satisfaction—and not all parties in and outside of the implementing organization may agree about which dimension should be the most relevant. 'Success', then, is a multi-dimensional concept, which can be defined rather differently by the different involved parties, and which evolves over time" [7, p. 145]. Multiple implementing organizations and the fact that a system, such as the EPR, tends to strategically affect the whole organization, further complicate the issue.

The literature offers a variety of concepts that help understand the implementation process. A prominent one is the concept of 'fit', which is seen as a key factor for successful implementation of ICT systems [1]. It has various dimensions, such as the fit of a workflow with a newly introduced technology, or of the organizational structure with the way a new information system is configured and used. The authors argue that "[F] fit is not a property that relates to the nature of technology or work practices; it has to be actively produced." [1, p. 215 f.].

In a previous paper we have introduced the notion of *social arena* as a place in which different communities of actors

or stakeholders meet to discuss shared or overlapping projects and concerns [17]. Arena A (Designing Work – Designing Systems) is the arena where specific systems are designed and new organizational forms are created. In the second type of action space – arena B (Designing Organizational Frameworks for Action) – stakeholders meet to negotiate those 'productivity and social agreements', which are necessary for ensuring a "context of limited cooperation, partial commonalty, and mutual interdependence of different groups of actors" [33, p. 28]. In arena C (Designing the Industrial Relations Context) the general legal and political framework is negotiated which defines the relations between the various industrial partners and sets norms for a whole range of work-related issues. The notion of arena is particularly well suited to analyze the introduction of health care systems, where global actors, such as international standards bodies, large technology vendors, and national health agencies almost entirely disconnected from local policy-making influence hospital information system (HIS) implementations.

METHOD

Qualitative research methods were used to investigate the implementation process with special regard to changing work practices. They are very appropriate to study systems in organizational contexts. Information systems in organizations are complex technological artefacts because they are shaped by time and continuous change [31]. For the reconstruction of the implementation project and the capturing of its context, various materials were collected from different sources using a palette of qualitative research methods:

- Participatory observation of five user group meetings during the implementation process (OBS1-5), as well as analysis of the minutes of the other four important meetings;
- Semi-structured interviews with different stakeholders (INT1-14), as well as focus group discussion (GD) with members of IT management, project management, and the local IT department of one hospital, where we used a 'vignette' – a short narrative representing a series of ethical issues we had identified [5];
- Document analysis of the original order for EPR implementation, the list of system requirements defined by physicians, the contract for system purchase, etc., as well as performance reports and various health reform documents.

In sum, a combination of observation (of project meetings) and ex-post reconstructions through interviews with stakeholders and document analysis serves as the empirical basis of our research. Data analysis was concept-driven. We identified the important steps and crucial episodes, stakeholder perspectives on these events, as well as organizational and policy measures relevant to the process. We gave feedback to each clinic about our observations.

We also carried out in-depth case studies of current documentation processes in the three oncology clinics (ONC1-3), which have deepened our understanding of the project's context [32].

THE CASE

The research site

The 'Association of Hospitals (AH)' is one of the biggest municipal associations of hospitals in Europe. It has about 32.000 employees and consists of 15 community hospitals, a general hospital where all university clinics are located, and five geriatric centers. It handles about 400.000 admissions a year.

The study was conducted in three of five oncology departments of the AH (ONC 1-3) that actively participated in the introduction of the common EPR system. All three clinics use a computerized HIS that dates back to the 1970s and contains basic administrative data alongside a sophisticated paper-based documentation system. Only in ONC3 a self-developed oncology information system is in place, which supports the documentation and ordering of chemotherapies and lab tests, as well as the scheduling of appointments.

The larger political and institutional context

Austria's health care system has a mixture of private and public funding, although only 25% are subsidized by taxes [20, p.72]. This goes back to 1887/88 when mandatory health and accident insurance was introduced. In 2006, 97.6% of Austria's population was health insured [20, p. 2]. Today the responsibilities within the Austrian health care system are scattered between a variety of federal and provincial authorities, as well as 24 health insurance institutions.

Stabilizing the growth in expenditures and modernizing the structures of the Austrian health care system have been the main issues for the last decades. These attention points were even reinforced when Austria joined the EU in 1998 and took the obligation to reduce its structural budget deficit. Measures had to be taken "to guarantee a fairly long-term ability to finance the Austrian health care system through cost cutting measures, measures to increase efficiency respectively control..." [9]. A top to bottom reform of health care services was initiated, as a result of which the AH was transformed from a municipal (public) health care service provider to a 'municipal enterprise' in 2002, its hospitals obtaining additional management authority and autonomy in financial affairs. While decision-making competencies (concerning a five years budget) and the responsibility for implementing measures were shifted from politics (health council) and central management (AH's General Board of Directors) to hospital management, the latter still has to comply with the long-term financial plans and performance criteria developed by the AH.

As part of the reform AH adopted the concept of 'new public management', which focuses on quality, efficiency and effectiveness, as well as patients' needs and introduced instruments for controlling, reporting, quality management, performance comparisons, and the use of ICT. While increasing decentralization and autonomy, these measures

also require the introduction of shared standards and procedures. Examples of measures aiming at cost containment are: no hiring of new staff during the last two years, limitations of overtime work for physicians, and limited resources for the servicing of IT infrastructure already in place. As we will see these measures, as well as the changing political context, have a profound impact on the implementation process we studied.

The chain of events – the project's history

The project idea (2002 – January 2004)

The idea to unify the medical documentation of all oncology clinics of AH came from ONC3. They have been successfully developing and running their own EPR for twelve years and hoped to convince AH, as well as the health council, that their system should be implemented in the other clinics. AH in turn was interested in the project since it was in line with their strategy to modernize their IT infrastructure, in the long run replace the old HIS, and to generally look for unified solutions/products, since these seem more easy to maintain, hence more economical. The oncology system was supposed to support physicians. Other health care professionals were not invited to participate at this stage of the project. The rationale that was put forward was to harmonize oncology documentation, hence allow data sharing between clinics in support of research, but not to standardize work processes or therapies. By initiating this IT project ONC3 hoped to get an update of their system in place, which had been delayed already several times before. The head of ONC3 got the support of ONC1 and ONC2, who were interested in getting an IT solution.

At the end of 2003 the idea was presented to a member of AH's executive board and the city's council of health care. The idea was welcomed. The original need of a local update was transformed into a political order to install a common system at five clinics, two of which were not interested at all. One of the clinics had just started implementing a self-developed oncology system. The decision to purchase a system was reached in January 2004 by the council of health care. Preparations of the documents for a call for tender were started. At the same time all activities going beyond usual servicing of already existing EPR systems at the involved oncology clinics were stopped. Figure 1 provides an overview of the different stakeholder groups.

Definition of system requirements and system selection (January 2004 – May 2005)

The clinic heads delegated the work of formulating a requirements document to (interested) physicians. In seven meetings organized by the project manager a work group consisting of physicians of the involved clinics defined system requirements, with the experienced ONC3 in a dominant role. Project management, IT management and IT experts from central IT units of the AH revised the working groups' requirements paper, included technical, service- and training requirements and completed the call for tender. A committee was set up for the evaluation of proposals and selection of the system; each oncology clinic could name two persons to participate. Vendors who participated in the call for tender presented their systems to the committee.

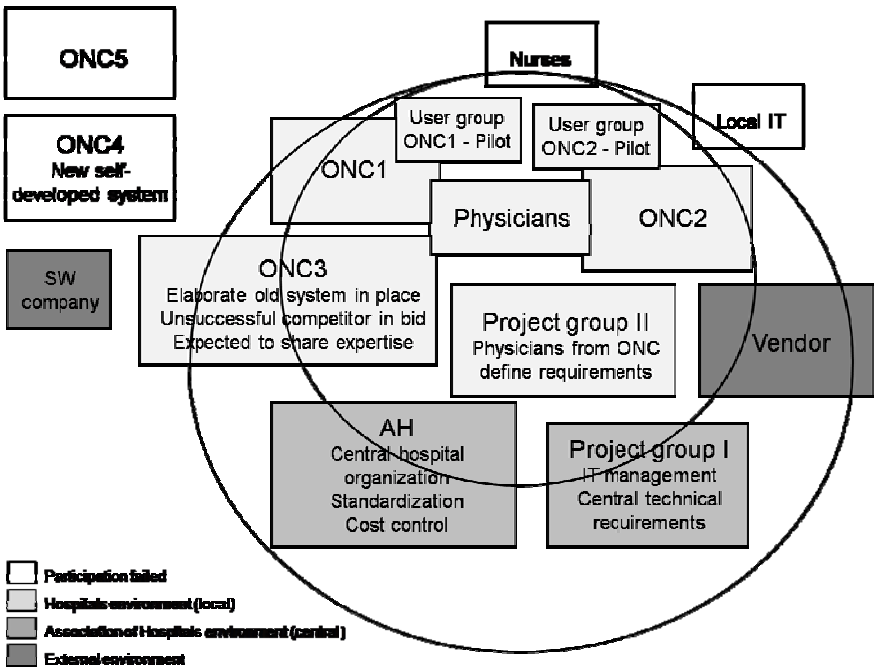

Figure 1: Overview of stakeholders

The idea was that members evaluate the system's performance range and ease of use after having tested it. What happened, however, was that vendors gave a slide presentation and participants evaluated the systems straight afterwards, without testing it. Price and evaluation results decided which system would be purchased.

The result of the selection process was presented to the work group and the heads of the oncology clinics on December 22nd by IT management and project management. ONC3's system had not won. Another system, which asked for half the price than ONC3's vendor (a small software company with whom they had cooperated from early on), was selected. This caused an uproar by representatives of ONC3. The vendor of ONC3's system formally objected.

The implementation process (May 2005 ongoing)

A meeting between the selected vendor, IT management and IT experts took place to discuss the tailoring of the system to the needs of individual clinics and to clarify basic technical conditions for the start of the implementation. It was decided that ONC1 and ONC2 should start with implementing the system. A user group meeting was conducted at ONC2, this time with participants from all user groups – physicians, nurses, local IT experts, the project manager and the vendor. The hospitals' IT experts claimed that they had not been informed about the project in time. They were angry as they were expected to cover parts of the implementation costs at a frozen budget.

Nurses were invited to the first user meeting by project management and they were asked if they would like to do their care documentation in the system. As they had only little information they were not prepared to take a decision. Moreover, at that time care documentation was covered by another project that aimed at a nursing documentation system for all clinics of the AH. So they decided that the oncology system was of no interest for them.

Confronted with the system, which was demonstrated by the vendor, physicians at ONC2 started an intense discussion of a variety of issues, none of which seemed as easy to resolve as project management had imagined. A major concern was the interface to order lab exams, which is currently done within HIS. This was immediately declared as technically very difficult, hence too costly, by both, the vendor and project management.

The next point was the ordering of chemotherapies, for which each of the hospitals has a different system run by their local pharmacies. The question was who should be responsible for the process and who for the maintenance of the drug catalogue – clinicians or the pharmacy. Names of drugs seem to change frequently – who should do the updating and how to deal with facts such as that the pharmacy often replaces an ordered drug which is not available with one with the same properties, with nurses 'tacitly knowing'. There was also the question of interfacing here: *"If you don't design the interfaces, then he or the nurse, after having documented in the new oncology system, what should happen with the patient, a blood test, an X-ray, a nuclear-medical exam, the nurse or doctor would have to log into another program, identify the patient a second time, and type in the order"* (OBS4). There was also concern about how to integrate orders issued by external consultants. Finally, there was the question of protocols, which in chemotherapy may change quite often – how many should be supported and who should do the work of continuously updating them.

There were heated discussions about the different templates physicians need, from the anamnesis sheet (a long and a short version) and the discharge letter to different kinds of overview sheets: overview of patient status, overview of activities – how should they be designed, which data can/should be automatically inserted from the system, which data should be hidden, how much standardization should be designed into a template, and so forth. Without being able to report on the full range of the discussions here, it became clear that at what seemed the beginning of implementation a time-consuming process had started, which uncovered contextual richness and highly relevant detail that would require much more attention than both, the AH and the vendor, were prepared to give.

During a user meeting, in which ONC1 and ONC2, as well as representatives of their local IT departments, and the vendor participated, physicians stated that they were not interested in the system, in case the ordering of lab tests was not supported. The implementation process was stopped until IT management would arrive at an ultimate decision. This happened six months later when IT management decided that the ordering of lab tests should be integrated into the system, so the project could continue. An alpha version of the software would be installed in two clinics and tested during daily routine work. In the fall of 2007 it was still unclear how this will be organized.

CONFLICTING PERSPECTIVES – UNRESOLVED ISSUES

The politics behind

Orlikowski and Gash use the notion of technological frames to account for diverse and potentially conflicting perspectives on a technology, which they define as: "A set of assumptions, meanings, knowledge, and expectations that people use to understand the nature and role of technology in organizations. This includes not only the nature and role of the technology itself, but the specific conditions, applications, and consequences of that technology in particular contexts" [29, p. 178]. They argue for the importance of understanding people's technological frames as references to their interpretations of technology, which then shape behavior [see also 23].

We can say that in the oncology case, different stakeholders have developed different technological frames and that the new system is connected to different goals and expectations, to diverse notions of the nature of problems, hence also system requirements, as well as views of the implementation process. These differing, partly conflicting goals and expectations remained hidden, hence unclear, for a long time. One of the main arguments – repeatedly

articulated by several actors (physicians, IT management, and project management) – was that the system should provide a standardized way of documenting patients' medical history. This would give physicians access to a much bigger pool of patient histories for their research projects and ultimately help improve therapy concepts. In interviews some physicians expressed reserve about this idea of sharing data.

The perspective of ONC3, which is one of the main players, is of special interest here. ONC3 is the first AH hospital which was equipped with sophisticated IT infrastructure. In the 1990s they were able to develop their own EPR system, due to financial support and the personal involvement of members of the clinical staff, including the head of the clinic. Starting in 2000, the resources for system adaptation and updating declined. At the same time, the staff of ONC3 realized that their system was becoming more and more inadequate, due to the rising numbers of patients and more complex requirements (e.g. the more innovative and complex therapies). Attempts to get funding for necessary improvements failed and the idea of launching a common EPR project came up. Submitting a proposal to the call for tender was seen as a possibility to get a complete system update and at the same time standardize the systems of the other big oncology clinics, thereby improving the possibilities to exchange data and promote research. But their system did not win.

The decision to give the project to another vendor did not pay heed to the effort and expertise of ONC3, thereby diminishing their motivation to share their knowledge with the other clinics and jeopardizing the whole project. ONC3 had continuously improved its system over the years and adapted to changing work practices. More and more user groups were involved, including nurses, by designing system features that made system use attractive for them. Nevertheless these experiences and advantages, which had been financed by the AH, were not included in the rating of the system.

The technological frame of the AH is shaped by its interest in saving costs through making IT systems more homogeneous on the one hand, in comparing and measuring health outcomes on the other hand. This is in line with IT management's strategy of 'one product solutions' to counteract scattering of the association's IT infrastructure. AH did not realize that the amount of flexibility such a 'one product solution' afforded would not be sufficient.

Lin and Cornford argue: "How people think about and evaluate technology … substantially influences the course that the project takes. We describe this as a process of social translation of technology in which interest groups involved make sense of the technology and offer others their interpretations of technology based on their own interests. The challenge that IS management faces is how to appreciate the processes of translation that occur, and how to achieve an optimal balance between different versions or translations offered by interest groups" [23, p. 203]. We cannot only see that stakeholders' technological frames differ but that very little effort has been made to explicate, contrast, and better align these frames.

Budget allocation

The decision to implement a unified oncology system was also strengthened by the fact that, as a consequence of decreasing hospital funding, local IT budgets had been cut back. This was only possible since hospitals' increased financial autonomy allowed an internal regrouping of funding. Moreover, AH ran a policy of cutting local IT budgets in favor of inter-organizational IT projects coordinated by new centralized units. In this way, a change process on a higher organizational level – the move to inter-organizational IT solutions – accelerated the drying up of local IT project funds.

Another policy issue added to the project's difficulties. Recent law reducing the weekly working time of physicians aggravated the tight financial situation of hospitals. As a consequence, physicians involved in formulating requirements for and implementing the oncology system, could not expect any funding and had to rely on the decision of their head of clinic to be allowed to take compensatory time off. Some clinics nominated up to three physicians to make sure that at least one will be able to participate, whereas some clinics never joined team meetings. This caused fluctuation within the implementation team resulting in loss of know-how and contributing to time delays and misunderstandings.

It proved difficult for project management to work with a changing team of physicians, who volunteer to participate while struggling to keep up with their regular daily work. AH did not provide IT project managers with the resources to offer physicians any form of compensation. Hence, managers are not in a position to request much time and cooperativity and have to be satisfied with whatever they get. Consequently, they act rather defensively whenever cooperation is refused or delayed and find it difficult to establish trust and communicate openly. The way in which the conflict about the interface to the lab system was handled, illustrates this problem. It seemed as if project management had hoped that physicians would somehow drop the topic if they play for time.

IT experts as well as project management are used to keep the time schedule of IT implementations rather flexible "... *we learned to live with delays, we are a big organization that is able to deal with this...*" (GD). But time flexibility easily gets in conflict with rather strict budget regulations. At the start of the implementation process it was unclear how much additional budget would be needed, e.g. for buying and installing hardware that will be needed. The situation was complicated by AH's ongoing reorganization, which also affects budget responsibilities. In this way flexible time schedules, inflexible budget deadlines, and unclear budget responsibilities counteracted against each other.

A fragmented process

We can identify fragmentation of (inter)organizational relationships as one of the reasons for some of the problems encountered. The implementation process took place in several only loosely coupled social arenas [17] between heterogeneous actors – AH, vendor, the different clinics with their differing interests, the different occupational groups, different user groups (see also Figure 1). Project group meetings at AH constitute the first social arena, with a varying set of participating physicians from some but not all the clinics, user group meetings at ONC1 and ONC2 the second one, again with changing participants. A third arena had been arranged for reviewing the incoming proposals – slide presentations of the competing proposals with no possibility to see the system in use (a visit to a user site was only organized after the decision had been taken). A special social arena had been set up for nurses viewing the proposed nursing documentation system, which is discussed separately, with the consequence that its potential relationships with and implications for the oncology system cannot be addressed.

These social arenas were only partially and intermittently connected. We have also seen action in other arenas shaping the process: AH using its power position, curtailing the needs for updating old systems by stopping financing (arena B), as well as new regulations of physicians' working time (arena C).

The high level of autonomy, especially of the heads of the medical clinics, contributes to this fragmentation. As collaboration between different hospitals was felt as quite unusual, agreeing on a standard for the exchange of medical records proved to be difficult. Although the clinics cooperate to some extent, chemotherapy protocols have not been shared until now. Physicians and IT experts hardly communicate with each other. The preparation of the requirements document was done without cooperation between these two groups. This was criticized in the first meeting of users, vendor and IT personnel. Also physicians and project management did not encourage nurses to participate, although they should know that care and medical documentation are not clearly separable and it is obvious that nurses will have to work with the oncology system.

Fragmentation is also visible in the rather heterogeneous landscape of IT systems in AH's medical departments. Traditionally, the initiative for new projects lies in the hand of physicians, reflecting their professional predominance in the system, in opposite to the rather defensive, service orientated role of IT management. This strategy led to the implementation of a large variety of IT systems, with hardly any provision for data exchange, with – as a consequence – cost-intensive service and interfacing demands.

Standardization and the notion of 'fit'

A report on a case study in a large Norwegian hospital shows how trying to design IT systems that span across multiple work practices (and in our case organizations) can lead to "reflexive processes that undermine standardization aims" [18, p. 563]. While different project teams worked on a common EPR, the number of specialized IT systems was growing, based on well-justified needs of different clinics.

Our oncology case can be read in a similar way, although it is smaller in scale. Although the project suited IT management's strategy of 'one product solutions', the clinic heads' relative autonomy undermined this strategy and the messages given by the AH concerning standardization were ambivalent. They insisted on a 'central view' on issues, such as the ordering of lab exams and reporting of lab results, which they require to be regulated in a uniform way. At the same time project management at AH declared that they would by no means expect that local work practices and therapies be homogenized. As soon as the oncology system was presented 'live' to physicians, an intense discussion on variations of local work practices started.

In another paper [32] we have stated that, in spite of basic commonalities, the overall work organization as well as the coordinative work practices in the three clinics differ quite strikingly. ONC3 has an EPR system that one does not find in the other clinics, which results in different coordinative artifacts (such as appointment sheets, therapy plans, order forms, etc.); practitioners at all three clinics occasionally experiment with 'better ways of doing things', which adds to these variations. We also argue that ethnographic fieldwork is needed to identify all these variations and be able to judge, which of them are 'essential'. This never happened, hence the lack of attention to social detail and variation on the side of project management, which in turn undermined the standardization effort across clinics.

As pointed out already, in studies of IT system failures, this is sometimes treated as 'lack of fit'. 'Effective fit' essentially means that the three domains – 'clinical work', 'organization', and ICT – will mould each other to obtain the best possible result in the delivery of care [1].

Misunderstanding participation

IT and project management had regarded physicians as those best qualified for providing detailed information about clinical working routines: „*Doctors know best what they need*" (GD). This is why they asked physicians at the three clinics to provide specifications of working routines and work flow to be supported by the new system, although these physicians lacked the experience and skills required for writing a useful requirements document. It turned out that the way physicians specified their requirements was lacking relevant detail so that something they had thought was a key requirement – easy retrieval of lab results – was formulated in a rather general and vague way, for example not defining when and in which form lab results should be communicated. This led to misunderstandings when translated into technological solutions by IT experts. Due to the lack of a comparative and detailed study of variations of work practices, they also were not (and could not be) aware of essential details that needed to be accounted for in a requirements document. The medium of participation – a

traditional requirements document – turned out to be inadequate.

In retrospect IT and project management admitted that they were misled in their expectations: "*Physician's focus is not drawn to routine tasks like documentation, ... they are only partly capable to conceptualize requirements, ... they are not used to anticipate possible effects of the new system on working routines, on cooperation between different professional groups or entities or on hardware configurations"* (GD). This resonates with Berg's observation that „Users are generally very bad in speaking the language of 'specifications', and in imagining what specific configuration of the technology they 'need' or what would work 'best' in actual work situations. Such judgment skills can only develop over time when users are taken on board in the development process early and systematically, and when careful attention is paid by those responsible for the implementation to the actual work processes that these users take as their starting point" [7, p. 149].

DISCUSSION

The story we have told will look familiar to many observers and researchers of IT projects in health care (and elsewhere). They will come to the conclusion that too many things have gone wrong and that much time will be needed to recover. What we think of as valuable in such a case description is that it allows identify the many different levels on which things can go wrong. System failure can be indeed understood as the result of a 'lack of fit' but the challenge is to arrive at an adequate understanding of the deep and quite disperse roots of this 'lack of fit'. Conversely, successful implementation requires attention to a complex web of factors and system failure rarely has one single or predominant cause. In our case we have seen how:

- The *political context* frames the conditions for an IT project in many ways: through the historically grown constellations of power that some actors are successful in using to further their own goals (the city's health council, the AH, individual heads of clinics); the changing legal situation which opens up new venues for some stakeholders but also sets constraints; budget allocation mechanisms, and so forth.
- *(Organizational) fragmentation* blurs or even prevents awareness of things going wrong: the lack of communication between different organizational groups (physicians, nurses, local IT personnel); the lacking willingness of different oncology clinics to share (e.g. chemotherapy protocols); the heterogeneity of the network of stakeholders who fail to identify, acknowledge, contrast and eventually align their 'technological frames'; the instability of project groups with varying (not remunerated) participation.
- *Configurational incompatibilities* result in lack of 'fit': e.g. the centralized focus on a standardization (and cost containment) strategy (on the side of AH) versus a decentralized structure; central requirements versus (unidentified and unaccounted for) local variations of documentation practices; financing one-product-solutions while curtailing funds for necessary updates on the local level.
- *A profound misunderstanding of user participation*, which in our case was voluntary and only partially informed, jeopardized learning from users (in our case physicians) and prevented them from contributing productively.

The project we describe here was obviously not a participatory design project. So, what can we learn from an analysis of an unsuccessful project for PD? First of all our case reinforces the old idea of multiperspectivity in PD [e.g. 27]. As Bratteteig argues: "Systems development is a multi-disciplinary work process involving technical, social, organizational, psychological, managerial, economical, cultural, political knowledge and skills" [12, p. 16]. Many of these skills were simply not present in the oncology system project. We can also see how difficult it is to design for and implement systems in organizations that have little experience in change management. In her analysis of a case of groupware technologies, Orlikowski introduces an improvisational model for managing technological change in organizations [30]. She proposes a view of change as based on improvisation, on the translation of ideas into new actions in new localities, and on learning. Orlikowski emphasizes the importance of a practice-based change logic in organizations: "In its presumption of ongoing action, a practice lens allows for the possibility of ongoing change. It conceives of change as situated and endemic to the practice of organizing. It affords an analysis of technology-based transformations that is ongoing, improvisational, and grounded in everyday, knowledgeable agency" [30, p. 225].

We have seen this kind of practice-based change logic at the clinical level, where we, for example, observed how staff identify gaps in their current documentation system, design new types of documents to fill those gaps, and also reorganize some of the workflow [32]. But these change activities are mostly confined to their own work unit, which they know intimately, and they concern practical issues, the relevance of which can be well argued at the local level. However, our case reaches beyond the confines of one clinic and it affects issues that have wide repercussions. Here we have encountered organizational fragmentation, which resulted in all kinds of 'configurational incompatibilities'. This is not simply a 'management issue'. From a PD perspective this means that there is a need to help practitioners establish such a practice-based change logic across these different involved units and professional groups. This may not be possible (or only to a limited extent), since, as Orlikowski points out, not all organizations are capable of following an improvisational model of change.

This case also helps better understand some of the challenges for PD when several user organizations are involved and IT systems are designed to span across multiple practices [18]. In our ethnographic study, we identified variations of work practices and work

organization, which do "not refer so much to the treatment itself but the number of professionals and the variety of treatments as well as the numerous networks developed by their interrelationships" [22, p. 79]. But a step further from identifying such variations is needed. Implementing an oncology system across multiple practices requires a deep analysis of the "advantages and disadvantages of different ways of doing what is to be done in terms of safety, security, productivity, timeliness, reliability, accountability, flexibility, etc." [32]. This analysis cannot be based on ethnographic work only; it requires developing a framework and method for identifying and evaluating these advantages and disadvantages. For PD this means to help practitioners engage in the difficult task of developing 'measures' of success, which, as Berg [7] argues, are always socially negotiated.

Yet another type of complexity has to be taken into account. A system of the scale of a common oncology system for several clinics is complex not just on a technical level but also on the social level, as it involves a large number of stakeholders with their own views and agenda, and different social arenas that are only partially and intermittently connected. One of the fundamental misunderstandings in the oncology case was about what it means to achieve participation in design. It reaches far beyond 'user groups'; it requires to research and systematically reflect on each stakeholder group's specific 'mediating' role and to formulate appropriate practices of intermediation. This echoes what Neumann and Star, in their study of a large digital library project, observed: "Each team in the project has different objects that they are focusing on; these many different foci and building projects revolve around one generally defined goal. Rather than an 'object world' we are dealing with an 'object universe'" [26, p. 235].

Here we again refer to the notion of social arena. Strauss et al. have argued that the debates held in an arena "will reflect more than (intra) organizational dynamics, since the debaters will be representative of professional, occupational, ethnic, gender, and other social worlds' [35, p. 158]. Our paper takes up a concern for political and policy analysis that was central to early PD and which is still present in some (for example in the MUST approach [10], which includes stakeholder analysis as an important element of PD) but certainly not all PD work. We perform what Clarke calls 'arena analysis': "The real power of arena analysis is that very different types of worlds can be studied simultaneously" [13, p. 138]. We have done this ex-post and also have shown how the different social arenas we have identified are only loosely coupled and that participation in them is not necessarily continuous. As our case involves multiple organizations, performing a thorough arena analysis becomes even more important.

Some researchers have developed and tested approaches to integrating diverse stakeholders in a joint effort. For example, Simonsen and Hertzum [34] developed an 'evidence-based IT development' approach, with which they succeeded in establishing a powerful agenda in all social arenas, not just the clinical one, with the result that clinicians' requirements, which drove the development process, had been formally agreed upon in terms of qualitative and quantitative effects. Our study confirms that strategies such as these are indispensable for large-scale implementation projects to succeed.

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REFERENCES

1. Aarts, J.; Doorewaard, H., and Berg, M. Understanding Implementation: The Case of a Computerized Physician Order Entry System in a Large Dutch University Medical Center. *JAMIA* 11, 3 (2004), 207-216.
2. Ammenwerth, E.; Iller, C., and Mahler, C. IT-adoption and the interaction of task, technology and individuals: a fit framework and a case study. *BMC Med Inform Decis Mak* 6, 3 (2006).
3. Ash, J. S. et al. Computerized physician order entry in US hospitals: results of a 2002 survey. *J Am Med Inform Assoc* 11, 2 (2004), 95-99.
4. Avison, D., and Young, T. Time to Rethink Health Care and ICT? *Commun ACM* 50, 6 (2007), 69-74.
5. Balka, E.; Reidl, Ch., and Wagner, I. Using Fieldwork for Discussing Ethical Issues related to IT in Health Care, in *Proceedings of MedInfo'07* (August 20-24, 2007), Brisbane, Australia.
6. Bardram, J. E. Applications of Context-Aware Computing in Hospital Work – Examples and Design Principles. *ACM Symposium on Applied Computing* (2004), 1574-79.
7. Berg, M. Implementing information systems in health care organizations: myths and challenges. *Int. J. Med. Inf.* 64 (2001), 143-156.
8. Beyon-Davis, P., and Lloyd-Williams, M. When health information systems fail. *Top Health Inf Manage* 20, I (1999), 66-79.
9. BMGFJ, Die Gesundheitsreform 2005, available at http://www.bmgfj.gv.at (accessed March 7th, 2008).
10. Bødker, K.; Kensing, F., and Simonsen, J. *Participatory IT Design. Designing for Business and Workplace Realities.* MIT Press, Cambridge, Massachusetts, 2004.
11. Bowker, G. C. and Star, S. L. *Sorting things out: classification and its consequences*, MIT Press, Cambridge, Massachusetts, 1999.
12. Bratteteig, T. *Making change. Dealing with relations between design and use*. PhD thesis, Faculty of Mathematics and Natural Sciences, Oslo University, 2004.
13. Clarke, A. Social Worlds/Arena Theory as Organizational Theory, in Maines, D.R. (ed.). *Social*

Organization and Social Processes. Essays in Honor of Anselm Strauss, Aldine Transaction, Edison, N.J., 1991.

14. Ellingsen, G., and Monteiro, E. Seamless Integration: Standardisation Across Multiple Local Settings. *Comp Support Coop Work* 15 (2006), 443-466.
15. Fitzpatrick, G. Integrated care and the working record. *Health Informatics J* 10 (2004), 291-302.
16. GAO, Information Technology: Benefits Realized for Selected Health Care Functions, Report to the Ranking Minority Member, Committee on Health, Education, Labor and Pensions, U.S. Senate, United States General Accounting Office, 2003, available at: http://www.gao.gov/new.items/d04224.pdf (accessed March 7th, 2008).
17. Gärtner, J., and Wagner, I. Mapping Actors and Agenda – Political Frameworks of Systems Design & Participation. *The Human-Computer-Interaction Journal* 11, 3 (1996), 187-214.
18. Hanseth, O.; Jacucci, E.; Grisot, M., and Aanestad, M. Reflexive Standardization– Side-Effects and Complexity in Standard-Making. *MIS quarterly: management information systems* 30, Special Issue (2006), 563-581.
19. Hartswood, M.; Procter, R.; Rouncefield, M., and Slack, R. Making a Case in Medical Work: Implications for the Electronic medical Record. *Comp Support Coop Work* 12 (2003,) 241-266.
20. HiT (2006) Health Systems in Transition – HiT summary Austria, European Observatory on Health Systems and Policies, available at http://www.euro.who.int/observatory (access on March 9th, 2008)
21. Kahnamoui, N. Electronic Patient Records: Lessons Learned in Implementation. ACTion for Health, Simon Fraser University, Vancouver Canada, 2004.
22. Lamothe, L., and Dufour, Y. Systems of Interdependency and Core Orchestrating Themes at Health Care Unit Level – A Configurational Approach. *Public Management Review* 9, 1 (2007), 67-85.
23. Lin, A., and Cornford, T. Framing Implementation Management, in *Proceedings of the twenty first international conference on Information systems* (Brisbane, Queensland, Australia, 2000), 197-205.
24. Lucas, H. C. *Why information systems fail*. Columbia Press, New York, 1975.
25. Moller-Jensen, J.; Simonsen, J., and Iversen, R. K. Measuring Effects on the Clinical Practice from a Configured HER, in *Proceedings of the 4th Scandinavian Conference on Health Informatics* (SHI 2006), Aalborg University, Aalborg, August 24-25, 58-62.
26. Neumann, L. J., and Star, S. L. Making Infrastructure: the Dream of a Common Language, in J. Blomberg et al. (eds.). *Proceedings of the Participatory Design Conference PDC'96* Cambridge MA, 231-240.
27. Nygaard, C., and Sorensen, P. The Perspective Concept of Informatics, in *Precedings of the Aarhus Working Conference on Development and Use of Systems and Tools*, Aarhus University, 1985.
28. Orlikowski, W. J. Improvising Organisational Transformation Over Time: A Situated Change Perspective. *Information Systems Research*, 7 (1996), 63-92.
29. Orlikowsky, W. J., and Gash, D. C. Technological Frames: Making Sense of Information Technology in Organizations. *ACM Transactions on Information Systems* 12 (1994), 174-207.
30. Orlikowski, W. Improvising organizational transformation over time: A situated change perspective, in Kamoche, K. and Cunha, M. P. (eds.) *Organizational Improvisation*, Routledge, London 2002, 185-228.
31. Patton, M. Q. *Qualitative research & evaluation* (3rd ed.). Thousand Oaks, CA: Sage Publications, 2002.
32. Schmidt, K.; Wagner, I., and Tolar, M. Permutations of cooperative work practices: a study of two oncology clinics, in *Proceedings of the 2007 international ACM conference on Supporting group work* (November 4-7, 2007, Sanibel Island, Florida, USA), 1-10.
33. Seltz, R. Re-Organisation von Kontrolle in Industriebetrieben, in Seltz, R.; Mill, U., and Hildebrandt, E. (eds.) *Organisation als soziales System: Kontrolle und Kommunikationstechnologie in Arbeitsorganisationen*, edition sigma, Berlin, 1986, 13-32.
34. Simonsen, J., and Hertzum, M. A. Regional PD Strategy for EPR Systems: Evidence-Based IT Development, in *Proceedings of the ninth biennial Participatory Design Conference 2006*, Vol. II (August 1-5, 2006 Trento, Italy), 125-128.
35. Strauss, A. L.; Fagerhaugh, S.; Suczek, B., and Wiener, C. *Social Organization of Medical Work*. Chicago, University of Chicago Press, 1985.
36. Weick, K. E. *Sensemaking in Organizations, Foundations for Organizational Science*. Sage Publications, Thousand Oaks, CA, 1995.
37. Winthereik, B. R., and Vikkelso, S. ICT and Integrated Care: Some Dilemmas of Standardising Inter-Organisational Communication. *Comp Support Coop Work* 14 (2005), 43-67.