SUCCESS OF IT BASED INNOVATION IN HEALTHCARE: THE ART OF IMPLEMENTATION AND USE OF AN ELECTRONIC PATIENT RECORD.

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ABSTRACT

Many information systems do not meet the expectations of the end-users. For electronic patient records (EPR) it is even worse, they are often not implemented yet. For more than a decade the society boasts the advantages of an EPR varying from millions of dollars to thousands of lives. Why do these IT based innovations not come to improvements of healthcare performance? This paper explores the transitions in the life cycle of an EPR from healthcare domain to information domain and back again. Both transitions have a large impact on the EPR success.

Main result for theory is that the two major distinctions, Business and ICT and product versus process, lead to a strange dogleg in the lifecycle of information systems. The two major transitions form a cross on their own that we call the Relevance Gap and the Participation Gap. The old adagio "success is quality (relevance) times acceptation (participation)" is still valid.

Main results from the empirical study are that:
The relevance of EPR focuses on the availability of information anywhere anytime. The question is whether this is enough to start such big changes in healthcare. We conclude therefore that from the end user point of view the electronic patient record is not very relevant.
The participation shows little involvement from the top management leading to a poor diffusion. In general from these four cases we conclude that when top management is participating that end users are less involved and when end users are highly participating, top management is less involved. Further research has to confirm these findings

1. Introduction

The ability to determine how well a system meets the information needs is a critical component of any system (Miller, 1999). He calls it bridging the information transfer gap. This information gap is visible in many IT based innovations. The functional uncertainty is often described in information systems literature. It occurs in the task domain of Leavitt (1965). In each situation, the interpretation and the meaning can be different. Therefore, it is necessary to establish a functional specification with users and providers of the information systems. Henry & Stone (1999) state this to be information quality. Larsen (1998, p.413) notes however "the quality of the IS/IT product is a necessary but not sufficient prerequisite for IS innovation success. The *people* within the organizations determine the outcome." The involvement of stakeholders is arguably one of the most distinctive characteristics of IT projects. There are instruments to identify user-needs, but Walley and Davies (2001) question whether they are actually used.

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We see that "modern" systems design is making a big effort to make the requirements analysis more dynamic and iterative (Harmsen & Brinkkemper, 2001) but lacks both an in depth relevance study. The developments in method engineering (Schalken et al., 2004) promise a better participation of the user and we hope to contribute to that with this paper.

2. Background

The first ingredient to our theoretical framework is based on the innovation-diffusion theory by Rogers (1983; 1995). This theory builds on a wide range of empirical studies, including studies in the HealthCare sector. (e.g. Rogers & Scott, 1997). Diffusion is the process by which (1) an innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system. Diffusion is a special type of communication concerned with the spread of messages that are perceived as new ideas.

An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. The characteristics of an innovation, as perceived by the members of a social system, determine its rate of adoption.

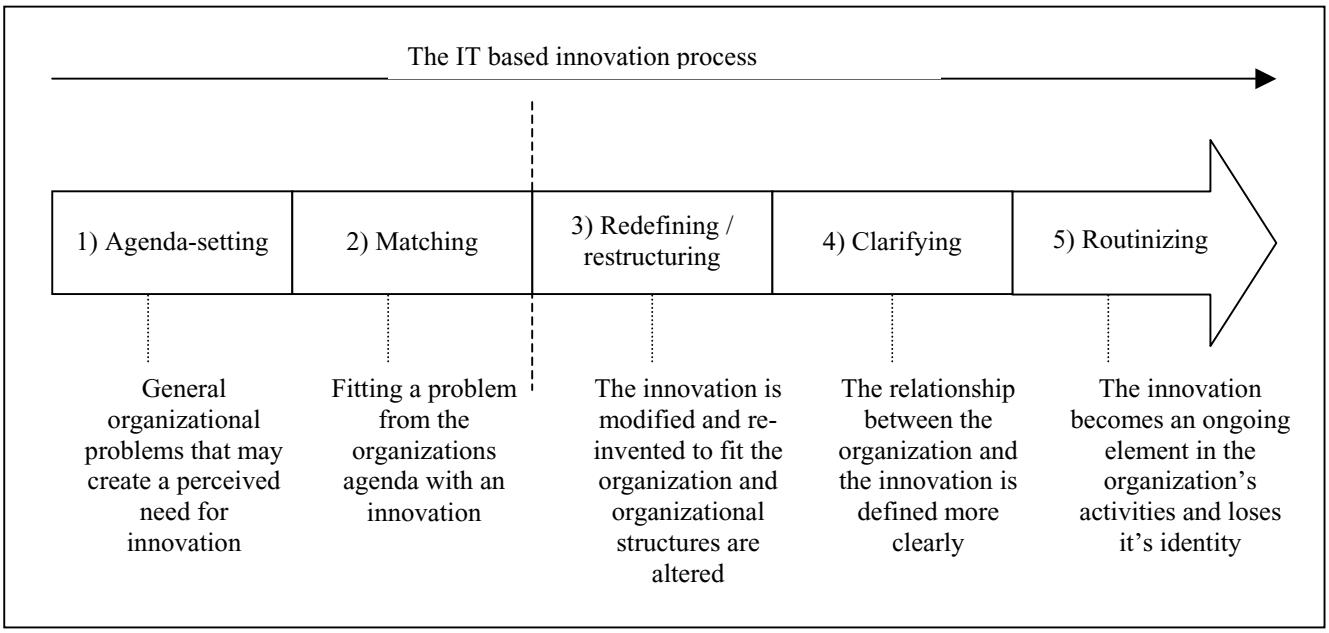

Figure 1 The IT based innovation process adapted from Rogers(2003)

The second ingredient of our model is the Business domain and Information domain distinction. It is used quite often used in literature in the Netherlands by Sebus (1981) and Wassenaar (1995, pp 103) but also well known in the alignment model (Venkatraman, Henderson & Oldach, 1993).

The third ingredient is the process and product distinction. The process in the innovation dimension refers to the innovation process, similar to the process defined by Saarinen and Sääksjärvi(1992) and the innovation process structure of Larsen (1998). The product is the result of this innovation process. This corresponds with the definition of the product by Saarinen and Sääksjärvi and the artifact structure in the framework of Larsen. Also the IT domain is part of the artifact structure; the user domain represents the organizational structure in Larsen's framework.

Following the innovation processes of figure 1 we discovered that the transitions within the business domain and within the information domain do not introduce serious adoption problems. When crossing these borders a new cross arises that seems to be responsible for a great deal of the information gap as described before. In the remaining part

of this paper we explore the new cross from business to information and back again. The USE IT model (Spil et al, 2004)is used to analyze the transition from Business Domain to Information Domain. Chismar and Wiley (2003), Spil, Schuring and Michel-Verkerke (2004) and Venkatesh (et al, 2004) concluded that (Job) Relevance or Performance Expectation is the most important determinant of diffusion of information systems in healthcare. In accordance with that conclusion we like to focus on the Relevance gap first.

The research notion on implementation (Markus, 2004; Orlikowski & Gash, 1994) is used to analyze the transition from Information Domain to Business Domain. It is argued that participation is the most important determinant of IS implementation success (Schmidt et al, 2001, Mumford, 1985, Markus & Ji-Ye, 2004). Therefore we focus on the Participation gap in the second part in our theoretical section.

If we combine these two notions we find an old adagio that success is quality (relevance) times acceptation (participation).

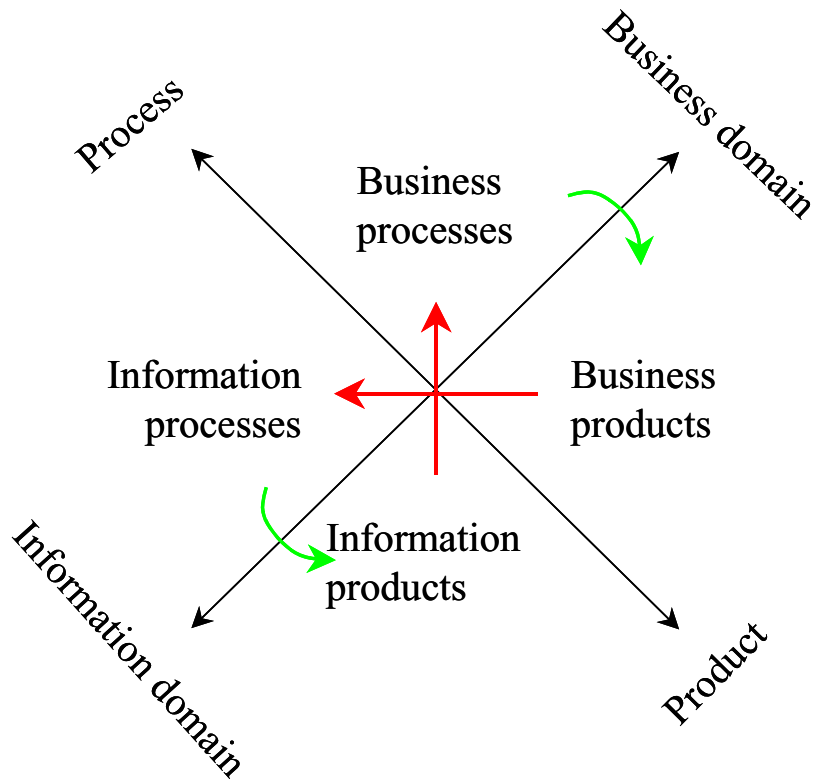

Figure 2. Cross of Wassenaar adapted from Sebus (1981) and Saarinen & Sääksjärvi (1992).

3. RELEVANCE

Many researchers of diffusion have sought to explain difference in diffusion patterns. (Venkatesh et al. 2003) propose a synthesized model of user acceptance, which they call the UTAUT (Unified Theory of Acceptance and Use of Technology). In this model, they propose four constructs that play a significant role as determinants of user acceptance and usage behavior. Of these four, the performance expectancy construct is the strongest predictor of use intention. Performance expectancy is a concept that evolved over time. It resembles Rogers' (1983) *Relative Advantage*, Davis' (1989) *perceived usefulness*, Thompsons' (1991) *Job-fit*, *usefulness and outcome expectations* (Compeau et al. 1995). Schuring & Spil (2003) used to call the factor relevance, which is in fact the net value of performance expectancy and effort expectancy.

In the IT-diffusion literature, relevance was originally defined by Saracevic (1975) as a measure of the effectiveness of a contact between a source and a destination in a communication process. This is a somewhat abstract wording of what we would call the degree to which the user expects that the IT-system will solve his problems or help to realize his actually relevant goals. There are three dimensions in this explanation that are kept implicit in Saracevic' definition that we want to explain. As many authors, we use the word "expects" since we want to make more explicit that relevance is a factor that is important in the course of the adoption process, not only in evaluation. Second, instead of effectiveness we use "solve problems and goals". By doing so, we imply that effectiveness has two dimensions: to take away existing negative consequences (problems) and, to reward with positive consequences (reach goals). Third, the word "*actual"* is crucial in our view of relevance. Relevance is not to be confused with the degree to which the user considers outcomes as being positive. The set of outcome-dimensions that someone considers "positive" is larger than the set of outcome-dimensions that are relevant. Imagine a physician, who basically considers IT-outcomes of a computer decision support system, such as, assistance in diagnosis, disease prevention, or more appropriate dosing of drugs (Thornett 2001) as "positive". This does not automatically imply that the IT-adoption is relevant to him. It is only relevant if these outcomes are high on his goal agenda. That is why we use the word actual. Relevance as discussed in this paragraph can be divided into macro relevance and micro relevance as shown in the next paragraphs.

Macro relevance, is defined by Spil et al. (2004) as: "the degree to which the user expects that the ICT system will solve problems or help to realize her actual goals". Some goals or problems may be entirely unrelated to the use of IT or Telehealth, but still may dominate the agenda of the "user". This is, however, the yardstick to determine the (potential) relevance of the application that is being studied. If we want to map macro relevance, we first have to determine what the aims and problem-areas actually are experienced by the user. So, item R1 asks: "What do you experience, *for you personally*, as important in your daily work when you look at the care you provide". And, item R2 asks "Which aspects in the ability to provide care, do you experience as a bottleneck or problem?" By weighing and comparing goals and solutions, the importance of each of the problems can be determined. (See Spil, Schuring & Michel (2004)for the complete questionnaire). We created the first version of the questionnaire with specifically Rogers (1983) work in mind, and this section particularly focused on, what he calls "relative advantage". During the course of the development of the instrument, these questions remained almost identical. Questions R3 to R7 help to determine the importance of each of the problems. Although the list of problems and goals is personal and may contain odd issues, we dare to conclude on the basis of previous work, that it is very likely that one or more of the following items may have a role on the problem list, and thus frame the macro relevance to the user.

- Economic improvements
- Social improvements
- Functional improvements
- Saving of time and effort.

Micro-relevance is defined as "the degree to which IT-use helps to solve the here-and-now problem of the user in his working process" (Spil et al. 2004). Even if an innovation is relevant in the way discussed in the paragraph above, it might never come to actual use of the innovation, simply because the "right moment" is never there. Let's presume that the use of new equipment or new IT-procedures is a conscious activity. In every conscious activity that is goal-oriented to a specific goal, there is a reason why that course of action is being chosen, *on every very moment.* So, a course of action that a user basically considers as "positive" may not have any particular moment in which the use of the innovation is "micro-relevant". The effect is that the innovation is never actually being used. Again, let's illustrate this with an example. Imagine a patient with a viral infection visits a physician. The physician might notice the similarity to a number of other patients he has met that week and decide on diagnosis and treatment fairly quickly. To this doctor, the use of a decision support system to determine diagnosis is not micro-relevant. However, a colleague of his may not feel so confident on that very moment and thus use the system. Schuring & Spil (2003) discovered that micro-relevance is a key factor in explaining IT-use in their case studies. The following items can be used to measure this:

- Absolute value of innovation in terms of macro relevance
- "Here and now" value (performance expectancy on micro level)
- Low initial costs: it is well possible to use the innovation "here and now" (effort expectancy on micro level)
- Immediacy of the reward: does it help to solve the "here and now" problem within the time-frame that is acceptable on that very moment?

Regarding the first item, it should be noted that micro relevance will always stay limited if macro-relevance is absent or small. The second and the third item repeat in fact the consideration of the instrumentality of the innovation, yet on "here and now" level. In our studies so far, we have not been able to measure micro-relevance in a real-time fashion, which would be the most logical thing to do. However, this can only be done *ex-post* the innovation, so, instead, at question R2 we ask for problems related to any specific actions in the working process and question I2 asks for the possibility to integrate the solution in the present situation. Most important however, are the "process-questions" (section P) that ask how the interviewee acts at each of the tasks that he has mentioned (P.1), and disturbances that make this kind of care or the coordination of this care fail (P.3).

The distinction of macro-relevance and micro-relevance is a notable refinement of the way the role of the user is being discussed in the existing literature. Thornett (2001) implicitly refers to relevance and micro-relevance when he discusses limited adoption and use of DSS by primary physicians where "consultation time is lengthened by their use and there is no appreciable impact on patient satisfaction". It is an example where other outcomes that are basically considered as positive (as mentioned above: better diagnosis, more appropriate dosing of drugs, and other) are overruled by limited relevance and micro-relevance. In other sources, we also found reason to reconsider the general relevance-construct. Cooper (1971) stated that "Relevance is simply a cover term of whatever the user finds to be of value about the system output, whatever its usefulness, its entertainment, or aesthetic value, or anything else". Wilson (Wilson 1973) adds to this that relevance is situational. Ballantine et al. (1998) put it in the following way: "Depending on the type of task, the information generated by the system may be more or less appropriate, which will affect its success or failure".

However, most other sources do not distinguish between the "general" role that relevance plays and the situational "here and now" conditions. However, by definition, without micro-relevance, a high value of macro relevance may never lead to actual use. There needs to be a time and condition to actually adopt the innovation and there might be series of moments needed in which the innovation is micro-relevant in order to "grow" to full use.

It is most notable that the organizational factors (Barnard 1938) or social influence (Venkatesh et al. 2003) are not explicitly included in our user-relevance framework. It should be kept in mind that the user's agenda of problems and goals depends on his role in society (Barnard 1938). The influence of the organization on this agenda depends on many aspects, including the involvement with other organizations, on time and on place. As a consequence, our framework reflects the actual impact that organizational goals and preferences have had on the user in the sense that it has changed the relevance of the innovation to him.

4. PARTICIPATION

When we continue the line of reasoning in this article we now come to the second cross leg during the IT enabled innovation process (Rogers, 2003 Figure 1) where the information product, as a formalized IT artifact, is returned to the business domain (Sebus 1981, Figure 2. Figure 1 may give a linear impression of the innovation process, but the "border crossing" between Business domain and Information domain in the Sebus cross (Figure 2) not necessarily is a one time affair in the dimension of time. Fichman & Moses in 1999 introduced their Result Driven Incrementalism (RDI) and later developments have shown beneficial results of this repetitive border crossing. Continuing this line of thought different authors in the IS domain describe the IT driven innovation process as an organizational change -and learning process (Orlikowski and Hofman, 1997; Markus, 2004). Nevertheless current implementation approaches, that are adopted to introduce ICT technology into organizations, still are mainly functionalistic, design oriented and incorporate linear or waterfall project management approaches. The problem is that many organisations fail to take the organisational aspects into account when implementing the new technology (Boer and During, 2002), which leads to the so-called 'organisational lag' phenomenon (Damanpour and Evan, 1984).
Hirschheim and Klein (1989), in the IS domain, distinguish four paradigms of information system development: functionalism, social relativism, radical structuralism, and neo-humanism. Another distinction between two paradigms stems from the organizational science domain and is more applicable to this paper's perspective of the technology driven organizational change and learning process. This distinction concerns the extent to which one believes that social systems (such as organisations) can be realised using a design oriented approach, or that social systems are completely formed through the interaction of the people in the system, a more development line of thought. In change management literature there is rich empirical evidence that bridging the functionalistic design

oriented approach (Theory E or design paradigm) and the social constructionist development approach (Theory O or development paradigm) is a successful way to structure the change process (Beer & Nohria, 2000; Binney, 1995; Boonstra Vink, 1996). One of the main enablers to bridge the design and development paradigms is participation. From the domain of Organizational Development (OD) Passmore & Fagans (1992) introduce a participation theory that characterises the different levels of participation and success factors for effective participation. See Fig. It is important to notice that the 'system' notion in their understanding means the organization as a system. It is not the information system. But in line with the innovation process being a learning and change process this holistic perspective on the process holds for the IT enabled change process.

1	Conforming	Simply joining and participating
2	Contributing	Helping to improve the system
3	Challenging	Attempting to change the system while retaining the existing structure and distribution of power
4	Collaborating	Seeking to involve or support others who share the agenda of changing the system while retaining its essential characteristics
5	Creating	Designing the system itself or even transcending the system to create a more hospitable environment for the system to inhabit

Figure 3. 5 levels of participation (Pasmore & Fagans, 1992)

According to Pasmore & Fagans a lot of the participation efforts fail, because of being ineffective. It is not just enabling the people in participating during a project. People should be prepared, competent and willing to participate. There are three moderating variables that influence participation effectiveness. Organizational receptiveness (1), individual ego development (2) and knowledge availability (3).
Organizational receptiveness is the readiness of the organization in terms of willing to support participation in its authentic form. It is all about the organization freeing people from their daily tasks and making them available to participate in an innovation process. Individual ego development is all about the individual being prepared to shape decision making into its own future. In this matter both the personal vision -and needs play a role, but also the social context the individual is participating in. In the specific context of ICT introduction relevance plays an important role in the willingness of people to shift habits and routines towards future ways of working. Knowledge availability concerns the availability of knowledge and information that the participants need to make decisions and set up dialogues with other participants. This latter form requires a monitoring and evaluation of both training of the participants on specific moments and the transparent availability of information across the project organization. Experience from the field of Organizational Development shows that a lot of participation occurs at the levels 1 and 2. Effective development of both the organization and individuals requires higher levels of participation (Schuiling, 2002). On the other hand one should not overdo. Enabling high levels of participation across the whole organization is not possible due to operational tasks and may also result in very slow decision processes. Combining the insights from the field of Organizational Development and Information systems development enables us to specify the findings from Mumford (1985) and Schmidt (2001) in this specific context.

In our empirical section we will characterize the used implementation approach in terms of design and development paradigm. Secondly we will analyse the levels of participation. With this information we want to answer the following questions:

- What are the differences between design and development paradigm on levels of participation?
- Do higher levels of participation have a positive effect on the adoption of the EPR?

5. Case descriptions

5.1 Introduction

Four hospitals were selected in which at least one specialism was fully digital. In every hospital three persons (total of 12 interviews) that were involved in the EPR project are interviewed. In general, three roles can be identified to select the interview candidates: supported sponsor, process owner and key-user. A supported sponsor has a leading position in the functional area where the change is implemented. The supported sponsor has to be committed and facilitates the necessary resources. The process owner is responsible for a certain change process and coordinates all activities. The key-user has a specific knowledge on the functional characteristics and a planned end-user. In each case all three roles were interviewed. The interview protocol is based on the relevance determinant of the USE IT

model (Spil et al, 2004) and the participation determinant theory on the implementation of ICT innovations is used. The interviews were semi-structured and resulted in qualitative data.

5.2. Empirical Relevance in all four cases

Macro-relevance

Functional improvements

The important functional improvements from the EPR are to get access anywhere anytime (11 from the 12 interviews), to analyze data (4/12), the reliability (3/12) and a uniform working method (3/12). With analyze data is meant that it is possible to create management information and information for research. This is only an advantage in the two hospitals (B, C) that work longer with the EPR. This advantage occurs after the users work some time with the EPR and the data is available.

To work with the EPR in a department it is necessary that everybody work at the same way. This results in a uniform working method. The users do not notice this advantage of a uniform working method. The persons that think about processes (process owner and supported sponsor) will notice this advantage.

Save time and effort

The EPR can save time and effort because it results in less administrative work (10/12). It can be realized because there is less searching for data (5/10), data does not have to be entered several times (3/10) and letters can be generated easier (2/10). The first reason occurs because the access of the data is better. There has to be made difference between who can save time and effort. A secretary or medical doctor's receptionist can save more time and effort with an EPR, than a medical specialist can. The first period after the implementation, so called shakedown phase (Markus en Tanis, 2000), the medical specialists has to insert all the data, this takes time. There is also more time necessary during a consultation. The specialists say that they can return to the old consultation length after half a year till a year. And after the shakedown phase the medical specialist say they save time and effort. But there were no measurements on the necessary time during consultation. In an article from Mitchell and Sullivan (2001), they conclude that in five from the six cases the consultation length was increased by 48-130 seconds.

Micro-relevance

Compatibility with working process

To get the EPR compatible with the working process the processes sometimes has to be changed also. For example, a medical specialist wanted the data in the EPR the same day available, but the process was to make the data once a week. This can only be realized if the working process is changed. When the EPD is not compatible with the working process there will not be much advantage for the medical specialist. For this reason the commitment from medical specialists is very important.

5.3. Empirical Participation for each case

Hospital 1

In this hospital the project itself developed and was executed in a more project based manner after quite a significant period. It all started with a thinktank group existing of three specialisms and the internal ICT department. Unsatisfied by the COTS at that time it was decided to try out an in-house development.

In the early stages of the process, there was time for hearing out the end users on their vision. This resulted in an approach to develop the EPR itself using open web and database technology. Specialists and other professional users in the early stages had difficulties in creating a common vision, but by specific training and introducing extra intermediary consultants this problem was solved. The specialists are satisfied by the process in which they have influence and there is time and space to think over and discuss alternatives with each other.

From the point of view of the Project manager a difficult task was converge the different goals and vision into an unambiguous one the IT people could continue with. After a while a more formal project management was installed by the board. This created another balance between designing and developing, but did not disturb the sensemaking process. People felt they were forced a bit more to create common visions and set goals. Currently the hospital is piloting in three different specialisms and though out of the official time and budget scope, cost are not exceeding dramatically according to the hospital board. After assessing the pilots the plan is to have the whole hospital covered at the end of 2006.

An important success factor according to all respondents is the joint agreements in a formal contract between using and delivering domain. Thus specialists conform to using the system in an appropriate manner and the ICT department continues servicing and developing the system according to the users needs and wishes.
This contract is a kind of bilateral Service Level Agreement.
The participation from a holistic view started very broad and decreased in number of participants towards the end of the project.
Education specific to the system itself is still part of a discussion.
Currently progressions are made, respondents are positive on the outcomes, but for an external observer it seems that this hospital is still but this project Though this may An ongoing pilot that never seems to come to an end.

The implementation in this case can be characterized as a transfer from development in the beginning towards more and more interaction between the design and development paradigms. The introduction of a formal project management approach assisted this transfer and did not result in a complete switch towards the design paradigm. In line with the theory the participants in the beginning stages had great difficulties in converging towards an unambiguous scope, but where competent and skilled enough to start with the development approach. (Boonstra & Vink, 1996)

Hospital 2

This project started in 1999. It is part of an ERP implementation. The EPR part is covered by a specific healthcare solution in the ERP package. The project is executed in the typically phased structure of an ERP implementation (Markus & Tanis, 2000). In the beginning phase large scale sessions with participation of all levels from the hospital were held in which vision and strategy were discussed and defined. There was a forcing deadline by the move of the hospital to a new location, with less space for the archive. Therefore a formal project management approach was installed from the initial start. There we two typical champions from the specialist that were the driving force and enthused others. As in the first case managing user's expectations and wishes was difficult along the project according to the project manager. Though the project stays within budget it exceeded its time line. A pilot with three specialisms results in a significant decrease of resistance along a group of non progressive specialists. To the specialists the benefits are difficult to see. To them the introduction of the system results in more work and less output. From the view of the administrative personnel the implementation has resulted in more efficient working routines. This is quantifiable substantiated by a decrease in administrative staff and reorganization of a central appointment centre towards a decentralized solution.

This implementation in this case can be described as mainly design oriented with moderate levels of participation. It typically is a 2nd order change process with reengineering working processes and reorganizing structures, but besides the normal communication and training programmes there is no specific support in the sense of a change management consultant or team that supports this process. Though the pilot has decreased resistance, a large part of the specialists up to now does not accept the system well.

Hospital 3

In this case the introduction of an EPR is focused to only one specialism; otorhinolaryngologism. This initiative starts independent from the board of the hospital and its strategic EPR vision. In this relative small setting all people from the department itself and a significant amount of ICT people participate in the brainstorm sessions during the first phase of the project. The sessions take two full days. Different respondents report these brainstorm being very fruitful and the agreements made form the basis for the system definition. One aspect though is forgotten. The supplier does not participate in these sessions. This has lead to major delays due to conflicting agenda's along the timeline. New ways of working are discussed during these sessions in which the specialist's way of working sets the direction for the working routines of the administrative staff. All participants comply with this line of thinking. The management of the process was an informal approach to project management. No project plan and no formal deadline are set during the beginning stages. At a specific stage during the innovation process a visionary date is set to go live with the 100 percent paperless office. This date is exceeded by nine months. The scope and requirements do not change significantly. Respondents report this due to the agreements in the beginning and a no nonsense approach by most of the participants. This is a great source for motivation and less resistance. The Education of the users was outsourced, because the suppliers is small scale an internal expertise on this matter is low. Training mostly

is executed on an individual basis for specialists. Though this is difficult to achieve in a larger setting all respondents report good results from this approach.
Currently the department is working paperless and the board of the hospital is looking for a follow-up on a larger scale.

The implementation process in this case can be characterized in mainly the development paradigm. But this only holds for the perspective of the specialists. The administrative staff is expected to follow. The way in which this is supported by a dialogue results in the acceptance by the administrative staff. Their participative role during later phases in the project therefore decrease to the level 1 of Passmore & Fagans (1992).

Hospital 4

A group of cardiologists, 8-years ago, created the vision for an information system that should support the medical staff in its reporting and diagnosing tasks. It thus starts not with the intention of creating a hospital wide EPR. In the beginning there is no functional design or project plan. There are two champions in the department itself that create support for the idea in the whole department. After a first training in ICT systems both even adopt programming skills and start creating parts of the system themselves. All specialists clearly took the lead in the innovation process and only after they have adopted the system the administrative staff followed. The administrative staff was trained by the specialists on the job. This is a typical incremental project in which the two cardiologists pulled and enthused the other specialists in their group. Participation from other department members is low during the beginning stages and afterwards only the communicating levels are executed. Currently a part of the specialists works paperless and another part choose a heterogeneous way of working.
After completion of the system the board of the hospital tried to introduce the system as a hospital wide solution. In this they failed due to the fact that the system was cardiologic specific and management did not succeed in creating a common vision and support to use this platform as the basis.
In this fourth case the implementation process enrols mainly in the development paradigm. Though this results in a successful implementation in the small setting of cardiology, but the adoption of this EPR technology to the hospital scale still has been failing.

In Figure 4 underneath we present an overview of the development of the different participation levels in the four cases for different participants. In this figure also the predominant approach is given in design or development terms.

Case	1	2	3	4
Participant				
Specialists	5	5→2	5	5
Professional medical staff	5	5→2	5	1
Administrative Staff	5	5→2	5→1	1
Internal ICT Staff	5	5	5	5
External ICT supplier/consultant	0	5	0→5	1→5
Hospital Board	2	2	1	1
Paradigm				
Paradigm (Design /Development)	Development → Design & Development	Mainly design	Mainly Development	Mainly Development

Figure 4. Case comparison on the levels of participation by the participants and the adopted implementation approaches.

6. Analysis

Answering the research questions:
What are the differences between design and development paradigm on levels of participation?

- Development like implementation approaches go hand in hand with high levels of implementation. Though in Case 3 and 4 the specialists took the lead and the participation level of other users decreased. This was not experienced by these participants as a problem though, because their involvement was high during the first phases of the projects.
- A design oriented approach results in a decrease of participation during the project timeline. The specialists in this case (No.2) clearly have acceptance problems due to the extra workload.
- In Case 1 the typical development approach transferred to a more interaction between both paradigms of design and development not resulting in lower participation levels.
- In all cases the hospital board has a low level of participation.

Do higher levels of participation have a positive effect on the adoption of the EPR?

When we analyze all respondents view on the systems implementations success there are not many unsatisfied users. Only in case 2 the specialists have problems adopting the system. But their participation level changed similar to that from the administrative staff that reports fruitful new working routines. Maybe here the answer of the systems success lies in the Relevance aspect.

No big differences were found however between the four hospitals studied on account of the relevance account. If we summarize the findings then we can see five factors that the end-users find relevant for an EPR:

1. Availability
2. Less administrative work (letters, search activities and redundancy)
3. Analyses (information for research and information for management)
4. Uniformity of working processes
5. Reliability

The functional improvements seem to be the most important sub-determinant for the hospital. The access is becoming more important and is the most important functional improvement. This is because hospitals are spreading over more locations. Better access to information and reliability can result in fewer mistakes, because of the quality of information.

Also saving time and effort is seen as important. In this case it looks like that it is possible to save time with an EPR. In the literature they conclude that the consultation length is increasing. This depends on the moment of measurement, because it is decreasing in time. In this case some people are working three and a half-year with the EPR, but there were no measurements on the necessary time.

The sub-determinant economic improvements seemed to be not important. In all the projects no economic goals were set for the project. Therefore there were no measurements on economic improvements. This is a bit weird, because at the moment there are a lot of cuts in expenditures in the health sector. The hospitals are not trying to reach this with an EPR.

7. Conclusions

It seems to be difficult to get a fit between the business and information domain. When crossing these borders a lot of information is necessary in order to get the fit between the two domains. This can be realized by paying attention to the discussed factors. The users have to be convinced about the advantages (relevance) that the implemented EPR (macro-implementation) can deliver. This can be done with training and support (micro-implementation). The old adagio “success is quality (relevance) times acceptation (participation)” is still valid for new information systems, Electronic Patient Records in particular.

The availability of information is clearly the most important relevance factor. The question is whether this is enough to start such big changes in healthcare. We conclude therefore that from the end user point of view the electronic patient record is not very relevant. We did not study the other stakeholders perspectives and further study can be done on the other interests of stakeholders in the EPR environment.

Three cases lacked top management participation but in hospital 3 and 4, the bottom up participation was that good that in these cases it was not a problem. In hospital 1 these problems were partly solved by strong project management. In case 2 we find that top management is heavily involved but the end user participation is not optimal. In general from these four cases we conclude that when top management is involved that end users are less involved and when end users are highly involved, top management is less involved. Further research has to confirm these findings.

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