Towards Understanding and Overcoming Hurdles in PDMS Projects in Germany

Completed Research Paper

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Abstract

While the benefits reaped by patient data management systems (PDMS) are well understood, the market penetration in Germany still remains rather low. Managerial issues are considered to be one of the main reasons for this phenomenon. Based on a study carried out, hurdles for PDMS implementations have been identified for this specific industry and have been matched to a literature-based change management framework. Furthermore, with the help of expert interviews some first guidelines have been derived in order to overcome the most important obstacles. The implementation of appropriate change management measures is absolutely necessary to support end user acceptance in this industry. However, one important finding is that the trade-off between end user acceptance and reaping the full benefits of the PDMS needs to be balanced very carefully.

Keywords

PDMS, change management, overcoming obstacles.

Introduction

A PDMS (patient data management system) is able to gather and display comprehensive medical and nursing information that is related to a certain patient and relevant from an “intensive care and anesthesia viewpoint” (Raetzell et al. 2005). Therefore, it has to be distinguished from hospital information systems (HIS). PDMS are intended to simplify documentation, but computer-assisted decision support and reporting are functions a PDMS also provides (Röhrig and Rüth, 2009). Despite their technical feasibility, market penetration in Germany is still low (Euler 2007). Despite technical feasibility, market penetration in Germany is still low (Euler 2007). While large sectors of the healthcare industry have seen a surge of IT-investments during the last decades, PDMS projects in healthcare are sluggish. Even though German hospitals support their administrative and quality assurance processes almost entirely with the help of IT-systems, this development cannot be transferred to the field of clinical core processes (Behrendt 2009). Hence, there are special requirements of the industry that need to be considered: The process of patient care is complex and especially in intensive care complexity is even higher due to the different occupational groups involved, high technical effort and information density (Prause 2002). Challenges resulting from the Medical Device Act, interoperability issues and high end user expectations have to be handled in addition. There is a lack of guidelines on how to steer and manage successful PDMS projects under such compound conditions. This study investigates the existing obstacles for PDMS in Germany and provides insights to overcome these hurdles. It was developed in collaboration with General Electric Healthcare IT (GE).
Beside huge investment costs combined with an unclear cost-benefit relation (Euler 2007; Röhrig and Wrede 2011) and interoperability problems (Röhrig 2013), literature describes acceptance problems on the end user level as a hurdle for implementing PDMS in practice (Bröckerhoff and Schellhase 2012). The inevitable side effects of a PDMS are an increasing transparency of work performed, a redistribution of tasks, altered organizational roles, and flatter hierarchies. These changes are not necessarily appreciated by all affected participants (ibid.). Hence, the fear of a subsequent lack of acceptance is one of the main reasons that PDMS are not widespread on the German market yet. Even though consensus arises that problems of system implementation in the healthcare sector “are more managerial […] than technical” related (Kaplan and Harris-Salamone 2009), there is a lack of guidelines that consider the human issues during the implementation of a PDMS. In order to close this research gap we will provide some insights on these managerial related hurdles in this specific industry.

Related Work

While there are already useful approaches for solving the cost-benefit question and interoperability problems, recommendations for overcoming acceptance hurdles are mainly linked to technical details (Raetzell et al. 2005). Authors stress the importance of adequate user interfaces and configuration and parameterization (e.g. Raetzell et al. 2005; Benson et al. 2002) of PDMS for end user acceptance. Studies confirm that employees and decision makers in hospitals attribute a higher value to those IT systems that feature an adequate usability (Fähling et al. 2009; Phichitchaisopa and Thanakorn 2013). Bundschuh et al. state that “[…] usability and especially the design of dialogues between humans and information systems is one of the most important issues to enable IT in health care” (Bundschuh et al. 2011). These recommendations imply that if the PDMS is easy to use, people will apply it without further effort. PDMS today - already tailored to a very special environment in a hospital - offer a good basis for optimized human-computer-interaction: According to findings from Bundschuh et al., the available products are perceived to support work processes effectively and also software ergonomics are evaluated positively (Bundschuh et al. 2011). But if poor usability is not the source of problems in PDMS projects, obstacles have to be looked for in a different area.

Benson et al. point out that failure of PDMS projects is rarely due to the software itself, but founded on rigid structures of the wards and insufficient project planning (Benson et al. 2002). There are many studies that tried to define success factors for IT projects. Some of them come to the conclusion that non-technical factors are more important for project success than technical ones (e.g. Nasir and Sahibuddin 2011; Peppard and Ward 2005). Related studies within the healthcare sector confirm that implementation has to be understood as both a social and technical issue. Aarts et al. conclude that successful implementations of IT systems in healthcare are those compatible with work processes. Hence, implementations always have to be regarded “as a process of organizational change” (Aarts et al. 2004) which also includes a redesign (ibid.). Ammenwerth et al. describe that the level of acceptance of a new information system in healthcare depends on how well characteristics of the users, technology and tasks and processes match each other (Ammenwerth et al. 2006). Shaping the fit between users and PDMS might demand more than proper technology. Harrison et al. advise against prevalent assumptions that problems with healthcare IT (HIT) can be solved solely with “[…] more or better HIT” (Harrison et al. 2007). System design is not the only variable to encourage end users‘ satisfaction. Instead, the authors claim that successful systems also address sociotechnical consequences (ibid.). Literature frequently mentions that physicians fear that a new IT system steals or dehumanizes their time with their patients (Rossos et al., 2006; Shortliffe 2005). Usability can limit, but not totally iron out such doubts. In order to emphasize the human-related factors relevant for system success, we conclude that effective change management measures should accompany every PDMS project.

The work of Davis et al. (1989) provides insights in understanding why people accept or reject using IT-systems. They conclude that the ease of use, but even more importantly, also the usefulness of the system are variables accountable for user acceptance (Davis et al. 1989). With a special focus on healthcare IT systems, Yusof et al. describe that the right sociotechnical fit between employees, organization and health information systems depends on users‘ attitude towards the system as well as on their skills to apply it. They furthermore stress the importance of leadership, an IT-friendly surrounding and sufficient communication as important preconditions (Yusof et al. 2008). Thus, we argue that effective change management measures are those that are concerned with sustaining end users‘ willingness to use the
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systems as well as the ability to do so. We therefore suggest a framework that is founded on the dimensions ‘willingness’ and ‘ability’. The dimensions represent factors that need to be considered in order to successfully enforce changes required by software implementations. We further claim that there are certain factors that have an impact on willingness and ability. In our framework we call these three supportive dimensions “reinforcement”, “leadership support”, and “communication/participation”. We briefly introduce our framework in the following.

Willingness, as our first dimension, is largely connected to the motivation of employees to embark on the changes. Users must feel that the required changes are worth the effort and are of value for them (Weiner 2009). Famous change management models of Krüger (2006) and Kotter (1995) indicate that a felt need to change is an important factor in this context. Change management literature suggests that changes also need to be institutionalized in order to sustain the willingness to do something differently also in the long term; the new behavior should become the new routine (McCarthy and Eastman 2010). Kotter calls for planning for “short-term wins”; without them people will not “go on the long march” (Kotter 1995). Providing incentives is anchored in his model. Skinner indicates that punishment is another form of encouraging certain behavior (Skinner 2005). Overall, the mechanisms can be subsumed under the term “reinforcement” which we identify as our second dimension for our framework of analysis.

In addition, people must be equipped with the right knowledge and skills to feel they are capable of performing changes dictated by the software implementation. This confidence is also called “efficacy” (Armenakis et al. 2004) and in our model we call it “ability” (our third dimension). Referring to Krüger it is important to minimize capability barriers with the help of adequate qualification and training (Krüger 2006).

We further derive two supportive dimensions from change management literature that have an impact on the degree of willingness, ability, and reinforcement:

**Leadership support:** Top management’s commitment is widely accepted to have an impact on the success of change projects (Kotter 1995). The ability to promote change initiatives can be due to a certain hierarchical position held by a person. It can also result from expertise and skills or the role assigned to a specific person (e.g. project leaders). Leaders become enablers of change if they are able to affect employees’ attitudes and behaviors in a direction that supports the intended transformation (Krüger 2006).

**Communication & participation:** Creating willingness and ability demands some kind of influencing strategy (Armenakis et al. 2004). This requires the appropriate setup of a communication strategy (McCarthy and Eastman 2010), so that the right content, at the right time, through the most effective channels can be targeted to the appropriate audience (Krüger 2006). This is predominantly important for reducing willingness-barriers (ibid.). Another way of influencing others is to actively involve them (Armenakis et al. 2004).

Research Method and Data Collection

This study has an exploratory character. We try to uncover and understand a complex phenomenon in an industry in Germany where little knowledge is available. We carried out expert interviews in order to understand the issue from different perspectives. The goal was to benefit from the specific expertise of the experts at the highest possible level of detail.

In this study, experts were persons who were involved in PDMS implementation projects or have experience in applying such a system. Since the study aims at finding “answers” to existing obstacles, insights from successful projects seemed to be a good way to identify critical success factors for PDMS implementation. Since we focus on managerial issues we looked for experts on higher hierarchical levels or individuals who consult such levels. Eventually, six in-depth interviews with seven interviewees were conducted between June and August 2013. The interviews were semi-structured.

In table 1 we briefly present the experts from our interviews.
Table 1: Experts for our Expert Interviews

Figure 1 summarizes our research approach:

Figure 1: Research Approach

After having transcribed the recorded interviews, a content analysis of the text material was chosen as the evaluation method. With reference to Meuser and Nagel, there are six steps in the preparation and analysis of expert interviews on the basis of a qualitative content analysis (Meuser and Nagel 2009). Those steps are displayed in the following figure 2 and were applied in this study as well.
In order to ensure the rigor in our qualitative research, we used the following key principles to guide our research (Myers 2009; Walsham 2006; Wand and Weber 1990):

- **Credibility** refers to the internal validity of the research. We transcribed all interviews and used triangulation to clearly separate between the original source and our interpretation. Conclusions have been discussed with colleagues in order to ensure validity.

- **Dependability** refers to the reliability of the presented results. The transcribed interviews have been reviewed by different researchers in order to check if the same conclusions can be reached.

- **Confirmability** means that the results have been verified by the interviewees. We forwarded our conclusions to the experts and asked for feedback.

- **Transferability** examines if the findings can be transferred to other cases, industries, or domains. We clearly described the focus of our research and the special need for our study in the healthcare industry. We argue that there are special requirements in this industry that need to be considered. Hence, the results cannot be directly transferred to other industries or countries.

### Results - Hurdles and Identified Change Management Measures

Based on our theoretical change management framework we will now present the results of the interviews.

**Willingness**

Our explorative study indicates that hospitals that implement a PDMS do not necessarily have to cope with an initial willingness problem. Our interviews show that mainly increasing documentation efforts triggered by the introduction of the DRG-system (Diagnosis Related Groups) as well as growing data traffic in intensive care and anesthesia are important pain points in German hospitals. Convincing the staff of a “need to change” - as recommended by change management theory - is probably not difficult due to these external factors. According to the interviews, many people know that coping with these circumstances demands a switch from paper based to electronic documentation.

> “Hospitals know that they cannot handle the abundance of data without a PDMS. Each activity and each expensive drug they prescribe but forget to document will be..."
When it comes to financial compensation, PDMS support this very easily.”
(Anonymous Interviewee 2013c, Consultant/translated)

“At that time [when we decided to implement a PDMS] it was clear that Germany will develop in the direction of a DRG system and we knew we are going to need a lot of data from the patient in order to work safely. That would have been impossible with a handwritten system.”
(Anonymous Interviewee 2013b, Chief physician/translated)

We conclude from these findings that a lack of motivation among the staff is not necessarily the main problem here. The aim is to become paperless and the benefits this change will bring are anchored in the minds of many people.

The findings from our study illustrate that in intensive care and anesthesia physicians and nurses seem to be open to technical innovations. This contradicts the initial assumption that this sensitive area is rather reluctant to major changes.

“We have had many, massive, medical changes [in our hospital]. And there was an enormous motivation among the personnel: ‘We do this now, we do all these new things and we want to have this [the PDMS] as well.’”
(Anonymous Interviewee 2013b, Chief physician/translated)

Reinforcement

While the initial motivation is already provoked by external factors, the challenge is to maintain this willingness. We now evaluate the influence of reinforcement measures. Reinforcement in PDMS projects means that the systems are applicable as envisioned, and each alternative is eliminated (e.g. take away paper if you do not want people to use it anymore). From a human standpoint, applying the systems must indeed result in a higher value than previous manual processes.

There is general acceptance in literature that each technology adoption is accompanied by an initial extra effort and time has to pass until systems gain momentum (Leonard 2004; Peppard and Ward 2005). But end users do not necessarily tolerate this in the case of PDMS implementations. Several interviewees strongly emphasize that a PDMS is accepted only if it does not pose any extra effort on end users. In general, it is easier to convince nurses than physicians because a successful implementation reduces their documentation effort and relieves them directly from rather annoying tasks. If these advantages are understood, nurses are willing to learn how to use the system. In contrast, benefits for physicians are often qualitative in nature and not noticeable immediately (e.g. quick access to and a higher availability of required information).

“[…] as soon as they [nurses] notice that blood pressures can be easily transferred; that they do not have to enter each change of ventilators themselves. These advantages are the only way to convince them.”
(Anonymous Interviewee 2013d, IT department/translated)

“[…] PDMS simplify the work for nurses on ICUs, but this is not true for physicians. Whether I insert my examination findings by hand or with the help of a computer – this does not make a huge difference. I cannot argue it is all about reducing the amount of work.”
(Anonymous Interviewee 2013b, Chief physician/translated)

“Many physicians want to have a PDMS and they have also heard a lot about it. Vendors promise a lot. But as soon as it is implemented disappointment occurs quickly: ‘That’s different from what I have expected.’ You have to remind physicians that there are also benefits for them.”
(Anonymous Interviewee 2013d, IT department/translated)

The expert interviews reveal an approach to handling the challenge presented above: The success of their PDMS implementations is based on simplicity. In their successful projects the PDMS was accepted by
users because it did not cause profound changes. In the described projects the processes almost stayed the same; the only change was their transfer to a digital medium.

“[…] We adjusted the system to our workflows. We added nothing, no additional information that was not already in the previous [paper based] documentation. It is tempting if you have the possibility to map thousands of pieces of information […]. But we tried to map the process in the way people already handled it before.”

(Anonymous Interviewee 2013b, Chief physician/translated)

“We had paper. And then we successively replaced the paper based processes by the PDMS.”

(Anonymous Interviewee 2013d, IT department/translated)

If everything that was once on paper is steadily displayed digitally, transition becomes a lot easier. The experts therefore recommend changing step-by-step away from paper-based processes. If processes have to change, each additional step has to be outweighed by an eliminated one elsewhere. It becomes obvious that users’ acceptance is paramount and more important than process improvement at the beginning.

**Ability**

Taking the findings from above into account, an overlap to the dimension ability is obvious: The closer the systems are to the reality the employees are used to, the shorter the learning process, the lower the personal effort and the higher the chance for acceptance. Even if a PDMS offers more functionality, experts recommend focusing only on familiar information at the beginning. The goal is to minimize the risk of any mental overload at the beginning.

As the previous section has shown, most of the time people believe in the usefulness of a PDMS. However, the interviews have shown that at the beginning they lack the notion that it can really work.

“[…] Partially, they are afraid: ‘If the system fails, then I am totally screwed.’ Often, they cannot image that they can really trust the system.”

(Anonymous Interviewee 2013c, Consultant/translated)

Hence, user training should not only care about increasing ability, but even more importantly also consider the willingness dimension. The obstacle is not teaching staff how to use a PDMS, but convincing them that it will really work. Working with key users seems to be a good starting point. Having learned to use the system, they are able to train the others in dedicated training sessions. Furthermore, they are important contact persons for troubleshooting on the wards especially during the first weeks. It is important to find key users from every occupational group. This is due to different processes, mindscapes and hierarchical structures.

“It is hardly possible to teach another profession. There are communication hurdles […]. There are walls that can be higher or lower. Having someone from nursing personnel facilitates the process. We had three nurses who configured the whole thing for the others in their team […].”

(Anonymous Interviewee 2013b, Chief physician/translated)

Since shift work and irregular working hours constitute a challenge, PDMS projects should be designed based on a huge flexibility right from the outset. Forming small training groups of people aligned with different working hours solves the problem. This demands a high flexibility from vendors and close coordination with the personnel about possible appointments. Still, the interviews show that the train-the-trainer principle constitutes a hurdle with reference to physicians. Most of the time they are neither willing to perform the trainer-role nor to dedicate time to training.

“Training for physicians went very, very badly. Simply because no one was there at all.”

(Anonymous Interviewee 2013d, IT department/translated)
It is helpful to declare training as a duty so that there is a common understanding of the importance. Beside the initial user training for everybody, structures have to be developed when somebody new is recruited and joins the group later.

**Leadership Support**

Our interviewees particularly referred to the role of leadership in the context of overcoming resistance hurdles in PDMS projects. Hospitals are characterized by a strong hierarchical organizational structure. Therefore, in some cases it is helpful if people who demonstrate power push decisions. In PDMS projects, this person is ideally represented by a chief physician. It is crucial to have the highest rank support the implementation, because he or she can then intervene in case of resistance. According to the interviews, this is a very effective way to deal with resistance from other physicians.

“You have no chance as long as you do not have the boss behind your project, in this case the chief physician. There will always be problems, and opinions collide.
Someone has to say: ‘We’re going to do it now’.”

(Anonymous Interviewee 2013a, Consultant/translated)

**Communication and Participation**

With reference to participation and communication, there are two groups of users that demand different strategies: key users and end users. The former constitute an important communication channel for the latter. Ideally, key users become part of the core project team. Their participation should start with the selection of the system so that they can identify themselves with it early. It is frustrating having to configure and apply a system that was not the first choice of the users.

“Bring the key people in early, preferably even in the selection process. I think this is actually the most important factor. So that they can test the alternatives and see which one they prefer; where they have a better feeling.”

(Anonymous Interviewee 2013c, Consultant/translated)

One of the main concerns of key users is that they do not have time for this role in addition to their day-to-day work. Consequently, it is important to make sure that they are available during the parts of the projects in which their involvement is urgently needed.

Key users represent the requirements from their peer group and configure the systems according to their specific needs. Vendors need to provide support for the key users. Here, irregular working hours in a hospital collide with ordinary working hours of the vendors’ employees. Vendors who demonstrate understanding and offer measures to overcome these hurdles are highly appreciated.

Communication and participation with end users is less intensive and reaches its peak with the start of the training. Such training should be scheduled three to two weeks before the actual go-live. However, constant, short messages about the progress and next steps should be delivered throughout the course of the project. Nevertheless, the amount of communication and also the channel need to be carefully chosen. An ordinary team meeting is already a good occasion to spread information.

“We must not forget that time is always tight here. Scheduling a weekly status meeting will definitely backfire: After the third time people will say: ‘I’m not coming again, I can better spend my time on the patient’.”

(Anonymous Interviewee 2013e, IT department/translated)

**Critical Debate and Discussion of the Results**

Like many IT systems, PDMS have to walk a tightrope: Their implementation is associated with a certain benefit that requires changes. On the other hand, based on our interviews it is important to gain users’ acceptance by just implementing minor process changes while implementing the PDMS. However, this goal might have a negative impact on the benefits reaped by PDMS implementation (compare figure 3).
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Figure 3: Trade-Off between Users’ Acceptance and Value in a PDMS Project

The majority of the interviewees initially pursue the goal of becoming paperless. Rethinking and totally redesigning processes in depth was not a priority. A very reserved approach to changes was prevailing. This probably prevents the occurrence of end user obstacles mentioned in literature: Where there is no extensive change, nobody will complain about it.

The question is whether this approach already realizes the entire potential of the system. Current literature states that mainly high costs in combination with unclear cost-benefit statements prevent hospitals from acquiring a PDMS (Euler 2007; Röhrig 2011). Taking into account the results from the interviews, this study raises the question whether the precautious handling of changes in current projects might not intensify this obstacle.

Customized solutions that map the current processes prevent providers from transferring knowledge between their different customers. A high degree of customization prevents long-term oriented product development. Cost-effective standard software – applicable for a majority of customers – cannot emerge under such conditions (Röhrig 2013). The cost-benefit hurdle remains unsolved.

Thus, we argue that at the moment, the prevailing handling of changes in PDMS projects secures users’ acceptance but interferes with cost-benefit considerations. The acceptance gained could be used in a second step to generate real process improvements and thus meet cost-benefits expectations. But the projects that we analyzed do not appear to have reached the second phase yet. This might have an indirect negative influence on the diffusion of PDMS on the German market. Bearing in mind these critical remarks, it becomes obvious that the interviews outline an effective but not efficient management of changes.

Summary and Recommendations

Derived from the results presented above, we provide the following conclusion: Change management measures are needed to balance the trade-off between user acceptance (based on minor process changes) and gaining the full merits of the PDMS implementation (based on major process changes). An adequate management of changes in PDMS projects facilitates changes that are beneficial, but are also accepted by users. In order to place stronger emphasis on the economic goals of PDMS projects, we suggest a bottom-up approach in which a detailed identification of the existing problem in the respective hospital forms the starting point. System implementation must be aligned with addressing as many facets of the problem as possible. If processes represent the problem themselves, decision makers also have to consider process changes. Even though this might be to the disadvantage of acceptance.
This is where software providers can stand out. They need to become advisors whose responsibility is not only to install the PDMS but also to support customers in bringing the best out of the system. They must take over their role as process consultants and process optimizers even more strongly. Hospitals that are able to standardize their practices along the lines of recommendations from industry recognize PDMS projects as an opportunity for learning and improvement.

The interviews have revealed what end users demand from a PDMS; little personal adaptation effort, an individual incentive and technology that supports them effectively. All three aspects need to become the core content of communication towards end users. If benefits realization is more accentuated, this might probably also increase the likelihood of personal incentives. This improvement can be used to compensate the inherent disadvantage of a higher adaptation effort, e.g.: ‘*There might be additional time effort, but you can expect several benefits from the new way things are done!*’ Not all required process changes demand support from the PDMS. Hence, they can be implemented as soon as they are defined long before the ‘go-live’ of the system. This approach has various advantages. On the one hand, people will have time to get used to the new processes. When they are finally prompted to apply the PDMS they are already acquainted with the changes and the implementation can be designed more familiarly. The interviews showed that familiarity supports users’ acceptance. On the other hand, in this approach people cannot blame the PDMS for additional effort.

As long as vendors continue to tailor their products only to the present processes of their customers, they fail to work out a convincing value proposition for their products. On the contrary, they should understand their products as a means to solve problems. Based on an increasing pool of experience, vendors are able to transfer knowledge and share best practices between different customers. So we conclude with the finding that hurdles for PDMS projects on the German market can only be overcome if industry and hospitals start working more closely together in order to reap full benefits of PDMS implementations.

While the choice of dialogue partners (chief physicians, consultants, IT professionals, etc.) from different areas provides insights from multiple perspectives, the sample size of our study is clearly a limitation. Moreover, our results only constitute a snapshot in time. Due to changes in technology some of the problems identified might vanish while new problems might occur in the future. We would like to stress that the context of each project needs to be considered. Hence, our findings might not be transferable to other countries. The recommendations listed in this paper might not be complete and should rather be seen as some general guidelines for the German market.

Future research in this area could focus on failed projects or projects with unsatisfied end users. Experts from less successful projects might be able to identify additional obstacles and problems faced by end users that were not detected in the course of our study. Further studies could also elaborate on projects that clearly achieved end user acceptance and a positive cost-benefit ratio. This could help to understand success factors of PDMS projects in this specific industry in more detail. Focusing on the different motives of stakeholders is absolutely necessary for the definition of adequate change measures.

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