Ellingsen, Gunnar, and Hertzum, Morten (2019): User participation in the implementation of large-scale suite systems in healthcare. 7th International Conference on Infrastructures in Healthcare, DOI: 10.18420/ihc2019_002

User participation in the implementation of large-scale suite systems in healthcare

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Abstract. Currently, much software in healthcare is introduced as large-scale suite systems that aim at covering needed functionality for different institutions, wards, and professionals. With these systems, the software is already in place and development is largely replaced with the activity of configuration. Configurable suite systems create new conditions for user participation in healthcare software projects. We want to explore these conditions further, and we ask the following research question: What is the users' role in the implementation of large healthcare suite systems? In this study, we discuss four ways in which user participation in implementing large-scale suite systems are different from smaller-scale software projects.

Introduction

The importance of engaging users in the development of information systems is well-recognized (Johannessen & Ellingsen, 2012; Markus & Mao, 2004). Users are expected to provide designers with valuable insights into the users' work practice and they also need to get an understanding of the technical possibilities and limitations of the new system. This may be achieved through agile methods (Cockburn, 2007; Silsand & Ellingsen, 2014), such as Scrum, which emphasize short iterations to make the design receptive to changes in the environment. An agile approach implies that the developer gives high priority to satisfying the users' needs through early and continuous delivery of valuable software, where changes of requirements are welcomed. In these processes, the users have a direct role in decisions about the development of new systems. Such bottom-up processes are

supposed to ensure "empowered" and satisfied users, on the basis of a general belief that user participation leads to better systems (Howard, 2004, p. 41). It also aligns well with design strategies in the information infrastructure field where the aim is to make simple IT capabilities that are initially useful (Hanseth & Lyytinen, 2010).

A key challenge in healthcare is that much software is introduced as large-scale suite systems that aim at covering needed functionality for different institutions, wards, and professionals. Examples of such systems include the US-based systems Cerner, Epic, and InterSystems, which all have been implemented in several European countries. With these systems, the software is already in place and development is largely replaced with the activity of configuration (Pollock & Williams, 2008). While configuration makes some functionalities easy to set up, it also restricts the space of possible functionalities to those envisioned by the designers of the configuration facility. In addition, configuration facilities make it possible to shift some design work from the vendor to the users because it is less complicated to configure systems than develop them from scratch (Hertzum & Simonsen, 2019). While the process will not be bottom-up, the configuration facilities may present opportunities that stimulate the users in thinking in new ways about what it could be like to work with the system. This way, configurable suite systems create new conditions for user participation in healthcare software projects. We want to explore these conditions further, and we ask the following research question: *What is the users' role in the implementation of large healthcare suite systems?*

Empirically, we investigate the ongoing preparations for the implementation of the EPR from the vendor Epic in the whole region of Central Norway, including all its hospitals, general practitioners, home-care services, and nursing homes. Epic is promoted as a platform with infrastructural capabilities, such as being able to connect a wide range of heterogenous users and enable new functionality (Star & Ruhleder, 1996).

Method

The study adheres to an interpretive research approach (Klein & Myers, 1999; Walsham, 1995). Data were gathered in the autumn of 2018 and consist of interviews and publicly available documents. We have conducted six interviews with top management in the Health Platform program, which is responsible for the Epic implementation in Central Norway. The interviews include two interviews of the Director of the program. The interviews were audio-recorded and transcribed for analysis. Media coverage provided supplementary input. In quotes, the interviewed directors are denoted Director-1, Director-2 etc. where the numbers indicate the order in which they are quoted in the text for the first time.

Case

The EPR implementation is run by the Health Platform program, which is owned by the Central Norway Regional Health Authority and Trondheim municipality. The cost of the program amounts to NOK 2.7 billion (EUR 270 million). Out of eleven prequalified EPR vendors in 2016, Epic, in 2019, is the only contender.

Project background

Epic is an integrated suite of software that originally was developed for the US market, but is now also in use in Europe. Its functionality ranges from patient administration, through systems for physicians, nurses, pharmacists, radiologists, lab technologist, and other care providers, to billing systems, integration to the primary health sector, and a facility for granting patients access to their own data. The Epic system offers extensive configuration possibilities to fit the system to existing work practices or to facilitate new and optimized ways of working. Configurations may be made during the initial setup of the system as well as after the system has entered into operational use.

Negotiations are currently underway concerning the content of the Norwegian solution and the plan for its implementation. The signing of the contract is planned for 2019 and the first implementation for 2021. Trondheim municipality will be in the first implementation, while the rest of the 84 municipalities in Central Norway have the option to opt in after that. In total, the Central Norway region has a population of approximately 720,000 citizens, including 44,000 healthcare professionals.

The vision that mobilizes the users

A major motivation for implementing the Epic system in the entire health service in Central Norway is to provide complete and up-to-date information about the patients' condition and their prescriptions and use of medication. This information would make it possible for the municipal health service to take more responsibility in the treatment and care of patients in their homes or in nursing homes. It would also ensure that clinical specialist teams have access to the EPR information when they visit outpatients. Overall, it is envisioned that fewer patients will need to be hospitalised. Sometimes it is believed to be safer to monitor patients in their homes than admitting them to hospital. For the clinicians in the specialist health service, this is a central motivation for participating in this project. One of the directors put it like this:

> *"If this program had only been aiming for the hospital sector, it would have been really demotivating (...) but since the aim is to procure a system for the whole healthcare service in Central Norway with its future potential, it warrants taking a risk like this" (Director-1).*

An argument for the municipalities to participate and, thus, get the system is that it will automate several of the existing work processes. Once a solution for automating a work process has been devised in one municipality it will also be deployed in the other municipalities, thereby increasing the returns on devising such solutions:

> *"We must do a sales effort and show them what they get. We have already uncovered many areas we can simplify (...) Through the new solution, we will have much more automated actions instead of punching everything yourself. So, there will be less pressure and less time spent. In Trondheim municipality, I believe that there is now an agreement on four service-oriented standardized pathways related to homecare and institutions. This will also be deployed in the other municipalities" (Director-2).*

For the GPs, it may be a bit more difficult to find the key argument for participating in the program given that they already have quite good GP systems, but the Health Platform management has argued that there will be fewer phone calls from other employees in the municipal health service to get updates on the patients' status, such as their diagnoses, last visit, regular medication and so forth. At present, it is not entirely clear whether this will be sufficient to persuade the bulk of the GPs:

> *"Today there is a high workload among the GPs and, therefore, they are terrified of implementing something new that makes things worse, but they lean toward being positive. I tell them: 'we cannot force you, we will have to tempt you. This solution must be better than what you have and the economy must not worsen" (Director-3)*

A diverse user community

From early on, extensive user participation and top management anchoring in the line organizations have been identified as crucial to the success of the program. They are necessary to create ownership of Epic as well as to ensure a well-working functionality. This point was underscored by one of the managers who pointed out that they had involved 400 clinicians from the entire healthcare service in Central Norway, including small and large municipalities as well as hospitals. Through 101 workshops these clinicians described what was good about the current ICT systems, their current challenges and what was missing. The outcome of these workshops became the basis for the requirements specification, which included 4000 specific requirements. In addition to clarifying the functional requirements, user participation is also intended to ensure the legitimacy of the new system:

> *"We need to have a plan for the implementation in such a way that all categories of personnel experience that they own the solution" (Director-4).*

Achieving buy-in from all categories of personnel is a challenge because several of the stakeholder groups have quite different needs in relation to the system. For instance, the required functionality for the municipalities is just a fraction of the total functionality. For this reason, the user representatives from the municipalities are aware that it will take some effort to ensure that their perspective is maintained:

"Even though Trondheim municipality owns part of the program, the main work is to procure an EPR for Central Norway [meaning the hospitals]. We, therefore, feel that we must ensure that the municipalities are taken into account" (Director-2).

"As a municipality representative, I feel that the hospitals are dependent on our participation and they must give us 'space' for this. On our part, we must establish legitimacy in the municipal sector for the program" (Director-2).

Users as configurators

According to Epic policy, key users (and not the vendor) will be responsible for configuring the system. One of the managers put it this way:

"You are actually building this system yourself. Its configurability enables you to set up and decide a lot of things" (Director-5)

If successful, this approach is an efficient way of achieving working functionality as well as reducing dependence on the vendor. One of the managers remarked that this approach was very different from the systems development processes they had previously been involved in:

"This represents a completely different division of responsibility between us and the vendor [than what is traditionally the case]. Until now, we have produced a requirements specification and sent it to a vendor who has developed it. This will occur to a much smaller extent because this is a very configurable system" (Director-5)

To be able to do the configuration themselves a group of key users will have to be formed and trained. In Epic terminology, these clinicians are called "physician builders" and "clinical builders". They will become responsible for configuring the layout of the system, its information flows, and its support of workflows. During the configuration of the initial Epic setup the physician builders will work together with Epic personnel. In a subsequent regional organization the physician builders will continue to work on optimizing and streamlining work processes. To prepare for this task, the physician builders will attend a six-week training course in the US and will subsequently work full-time as physician builders in Central Norway. They will constitute the core team with respect to effecting changes in the system in the foreseeable future. In a recent implementation of Epic at twelve hospitals in Denmark in 2016-2017, there is now around 70 physician builders. The other group, the so-called clinical builders, will have this as a part-time job in combination with their full-time work as clinicians in their respective healthcare practices. The role of clinical builder is to ensure effective communication between the clinical line organization and those who configure the system.

A user-led decision process with tight deadlines

After signing the contract in March 2019, there will be a 2-year preparation phase including development, recruitment and training of physician builders and some configuration. In 2021, the actual implementation will be initiated and will

according to the Epic implementation strategy be accomplished in a period of 2 months. This makes it a tightly run project as argued by one of the managers:

> *"They have a very rigid and tight project plan. They have the philosophy of: let's just get the solution up and running and let's build the capability in the organization to understand the solution and its possibilities" (Director-5)*

It is imperative that the customer has allocated resources for participating in this process and that the allocated clinicians have the competences and decision-making power to make decisions about what the configured system shall look like. The compressed time schedule necessitates a formal decision-making structure. According to the Epic implementation strategy, decisions must typically be made within a 10-day deadline. If the customer fails to meet one of these deadlines, Epic will set up the system with a default functionality for the area in question (so-called foundation functionality):

> *"Now we are in the process of establishing a decision structure (...) that is, involve people from the line organizations who can contribute to responding to all the questions that need to be responded to on a very short notice [10 days]. Epic will probably raise something like 8000-12000 questions when they start the implementation" (Director-1).*

The regional strategy for establishing this decision structure involves relying on (and extending) existing regional networks within different clinical specialties. For instance, within the area of cardiology there is a network of 40-60 experts. Each network will constitute the formal decision structure for its disciplinary field. The networks will be led by a clinical authority from St. Olavs hospital.

The formal decision structure also reflects that it will be impossible to involve all the future users of the system in the implementation process, partly due to the sheer number of people but also because the day-to-day operation of the healthcare services must be sustained. Thus, the management has to strike a balance between participation and decision capability:

> *"[we] need to ensure sufficient participation of health personnel of all categories without turning it into a general assembly, because we will not achieve consensus among the 44000 healthcare workers in Central Norway" (Director-4).*

Responsibility for the final product

The implementation strategy entails that the system is to a large extent configured by its users. As a consequence, the current draft version of the contract stipulates that it is the customer who is responsible for major parts of the resulting product. This issue is a cause of concern among the interviewed Health Platform managers:

> *"I am very skeptical that Epic transfers all the responsibility for delayed delivery or non-delivery to us as customer, while they have very little responsibility" (Director-1).*

It is a key point for the Health Platform program to negotiate the division of responsibility for the product between the customer Health Platform and the vendor Epic and to stipulate this issue clearly in the contract. Particularly, it is important

for the Health Platform program to have the option of terminating the contract if the solution is not deemed acceptable.

Concluding discussion

Large-scale suite systems such as Epic require considerable configuration before they are ready for use in any specific healthcare setting. This makes user participation essential but at the same time quite different from user participation in bottom-up, and normally smaller-scale, software projects. In this study we focus on differences in the preparations for EPR implementation; the post-preparation stages of the process will see further differences in the conditions for user participation. We point to four differences in particular.

First, the vision of a complete solution for the whole healthcare service in Central Norway serves as a means to mobilize users and resources (Borup, Brown, Konrad, & Lente, 2006; Swanson & Ramiller, 1997). User representatives and future users are attracted to the Health Platform program because they want to take part in the process of changing healthcare services in Central Norway at a grand scale. This is well illustrated when Director-1 argues that it is the potential for a transformed healthcare service that really is the motivating factor for participating in the program. The overall vision also allows for flexibility in the interpretation of the end result in order to attract stakeholders with different needs (Swanson & Ramiller, 1997). The vision may then serve to mobilize user groups for whom participation is optional (e.g. the municipalities) or the immediate benefit is not always obvious (e.g. the GPs).

Second, the users' involvement consists to a larger extent of responding to opportunities provided by the vendor. In bottom-up development the users have a primary role in specifying requirements to the vendor; in the Norwegian preparations for implementing Epic a central user task will be to respond to queries from Epic. Otherwise the system will be delivered with preexisting default functionality. We are not claiming that requirements specification is no longer important but that its main role is in vendor selection. After the vendor has been selected the preparations for implementing the system are strongly shaped by the product already available from the vendor, including its configuration possibilities. In this process the requirements specification may face considerable competition and initial requirements may be revised on the basis of descriptions and demonstrations of the vendor's suite system (Finkelstein, Spanoudakis, & Ryan, 1996, p. 1). Consequently, it is not only the resulting system that is being shaped by the product, but also the user base that increasingly is being homogenized within the boundary of what the system can offer (Pollock, Williams, & Adderio, 2007).

Third, the customer needs a decision structure that can withstand the pressure from a vendor that already has default functionality available. The presence of default functionality means that the vendor is ready to deliver quickly; the temporal

pressure is consistently on the customer. The vendor may even see an interest in keeping the customer under a temporal pressure that makes it difficult to formulate coherent requests that deviate substantially from the default. At the same time, the customer organization needs to obtain buy-in from its users, who will likely be concerned about a plethora of local particulars and have little patience for default functionality that does not meet their needs. While the Health Platform program is well-aware of this tension, there is no easy fix (Fleron, Rasmussen, Simonsen, & Hertzum, 2012).

Fourth, many configuration tasks are, fully or partly, shifted onto the physician builders. An important upside of this shift is that the customer gets improved possibilities for evolving the system after go-live. Such possibilities are central to large-scale EPR systems, which have a long operational lifetime (Pollock & Williams, 2008, p. 83). However, the physician builders' considerable involvement in configuring the system is also the basis for the vendor's stipulation that the customer should be contractually responsible for major parts of the resulting system. This stipulation is a very clear indication that the users' role in the process has changed compared to traditional software projects.

At present, it is too early to say anything about how user participation will play out in the long run, for instance how the expert networks will manage their formal decision power in between the vendor and the users they represent, whether the configuration facilities will enable the physician builders to make robust functionality, and to what extent the users will be satisfied with their role in the implementation process and with the system that results from it. It is, however, predictable that the scope and speed of the Health Platform program will necessitate extensive mutual negotiations among the various user groups and other stakeholders, for example to clarify functionality for supporting standardized patient pathways that span multiple clinical practices.

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