Context Sensitive Health Informatics: AI for Social Good
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Implementing EHR Suites: Lessons from a Norwegian Configuration Process

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Abstract. The implementation of electronic health record (EHR) suites is a complex process that involves configuring the EHR suite for local healthcare practices. In this study, we investigate the process of configuring Epic's EHR suite for Norwegian healthcare practices. From the point of view of the interviewed subject-matter experts (SMEs) and super users, this EHR implementation has struggled with managing and processing the input from the highly prioritized user participation in the configuration process. In addition, the SMEs have been in a difficult in-between role. These struggles and difficulties are evident in three main issues. First, SMEs and Epic's developers tended to negotiate rather than collaborate. Second, SMEs tended to contribute their personal expertise rather than represent their peer groups. Third, the specialty-specific groups for doing the configuration work tended to optimize the EHR for each specialty rather than for teamwork.

Keywords. EHR suite, configuration, subject matter experts, implementation

1. Introduction

Electronic health record (EHR) suites provide a range of functionalities to meet the needs of diverse user groups, and they are extensively configurable to make it possible to tailor them to diverse local practices. The rich functionality and extensive configurability make EHR implementation a complex process. It is common with yearlong preparations prior to go-live—the point at which a system becomes available for use [1,2]. Yet, the period following go-live is often one of trouble and unforeseen incidents [3–5]. Insights into the reasons for emerging problems are an important means to learn from past projects and build better practices. In this study, we investigate the ongoing implementation of Epic's EHR suite in Norway. We specifically focus on the configuration process leading up to go-live. Unless this process is well-executed, problems are exported to the users.

In 2019, Trondheim Municipality and the Central Norway Regional Health Authority signed a contract with the US-based vendor Epic to implement its EHR suite in Central Norway. The implementation includes the hospitals, the municipal health services, and the general practitioner (GP) clinics [1]. As a suite, Epic aims to offer most of the needed functionality in one integrated EHR system. In Norway, it replaces more than 80 existing systems [6]. A thorough configuration process was necessary to adapt all this functionality to the particulars of Norwegian healthcare. This process involved

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substantial user participation from subject-matter experts (SMEs) and super users selected among the healthcare staff. It is their experience of the configuration process we investigate in this study. The fully implemented system will have 40,000 users and serve a population of 720,000 inhabitants.

When the contract was signed in 2019, the budget for acquiring, configuring, and implementing the system was NOK 4.1 billion in 2023-prices (EUR 345 million). In October 2024, the costs had reached NOK 6.7 billion, a 63% budget overrun, and the implementation was still ongoing [7]. Trondheim Municipality started using the system in May 2022, St. Olav's Hospital (in Trondheim) in November 2022, Helse Møre and Romsdal in April 2024, and Helse Nord-Trøndelag in November 2024. These go-live dates were 6, 12, 17, and 31 months later than planned [7]. In addition, the go-live in the GP clinics has been postponed to an unknown future date [6]. The Office of the Auditor General of Norway issued strong criticism of the Epic implementation in late 2024, concluding that it has "threatened patient safety and reduced treatment efficacy" [7].

2. Method

We adopted an interpretive research approach [8], which considered the implementation of Epic from the perspectives of SMEs and super users. During the spring of 2022, we interviewed nine physicians and midwives who were assigned to the Epic implementation full or part time. Six of them were SMEs (Interviewees #1, #2, #4, #5, #6, #7), three were super users (Interviewees #3, #8, #9). The interviews revolved around the interviewees' involvement in the implementation process, their experience of this process, and their thoughts about the qualities of the resulting EHR system. The interviews were conducted before the system went live at the interviewees' workplaces and, thus, concerned the preparations leading up to go-live. All interviews were audio-recorded and transcribed for analysis. During the analysis, the transcripts were first coded in a bottom-up manner. This open coding resulted in 138 codes, each consisting of a short descriptive phrase or extract from the interviews. Then, the codes were grouped into categories. The categories provided the structure of the following section, the codes outlined the subsection contents. We acknowledge that more interviewees would have strengthened the study.

3. Results

The SMEs described that their role was to provide the input to the configuration process about the clinical needs, workflows, and other requirements. They explained these requirements to the analysts and developers responsible for technically configuring the system. The super users' main role during the preparations was to train the users, but to be ready for this task they needed training themselves. As part of their role, both SMEs and super users contributed to testing the system.

3.1. Flexibility Issues

Several interviewees emphasized that the configuration process suffered from limitations in the technical flexibility of the system. They, for example, said: "The problem is that it

is such a rigid system" (Interviewee#1), "Much of what we want just cannot be done" (Interviewee#8), and "We are ending up with a poorer solution than if the system had been more flexible" (Interviewee#2). The technical limitations meant that even though the SMEs experienced that their input was being taken seriously by the analysts and developers it was often impossible to adapt the system to Norwegian healthcare practices. Instead, the SMEs found themselves explaining to their colleagues that they had to adapt their workflows to an EHR system invented for a healthcare system other than the Norwegian. In some situations, these adaptations concerned issues that were far from trivial. For example, the communication between physicians and nurses "will become considerably different from how it is today" (Interviewee#4) because the system could not be configured for the current and preferred workflow.

3.2. Process Issues

While the limited technical flexibility was an issue, process issues were a much larger concern. All interviewees commented critically on the process. Several of these comments were about insufficient testing and training, but we will focus on issues related to the configuration process.

3.2.1. Need to Push for Changes

When the configuration process started, Epic's EHR suite was already available in a default configuration. Thus, the configuration process was about changing a system that was already there in a functioning version. Epic's developers and the interviewees experienced this situation quite differently. An SME expressed it like this: "All the time, we have heard that there is this default configuration, and it is much easier for everybody if we use that" (Interviewee#3). According to the interviewees, the developers did not understand – at least not fully – the need for changes, and the SMEs felt that "we had to spend a lot of time defending ourselves and our ways of working" (Interviewee#8). In this climate, the SMEs often got the response that their configuration requests could not be met because of technical limitations but later discovered that the reason was more about willingness and resources. Some interviewees found this provoking; others were more pragmatic and appeared to view the process as a negotiation:

> We have learned not to take no for an answer but instead look into why it can't be done. And then we often learned that it actually could be done. (Interviewee#2)

A super user feared that only some of the SMEs had been "prepared to take that fight" (Interviewee#3). Another interviewee expressed a similar concern: "You can get the impression that a few people get a lot of influence on the decisions" (Interviewee#7).

3.2.2. Insufficient Local Anchoring

The concern that too few people were involved in the decisions also reflected a broader issue about insufficient involvement of the users at large. Some interviewees felt that the SMEs' input to the configuration process had not been sufficiently anchored in discussions with their peers: "The SMEs have not been good enough at involving the people around them. They should to a greater extent have been out among their users" (Interviewee#3). This criticism did not question the SMEs' influence on the configuration process but their attention to represent their peer group as opposed to contribute their personal expertise. The risk of becoming somewhat dissociated from

their peers was probably largest for the SMEs who were full-time assigned to the Epic implementation because they no longer had daily duties in the clinic.

Insufficient local anchoring was also an issue in relation to the Epic developers. They rarely visited the clinic to observe work practices and talk with users. The interviewees would have welcomed more visits but got the impression of limited interest:

> It helped when they came and observed our work, but I would have wished that they had done that earlier. I would have wished that they had expressed an interest in coming here to observe our work, rather than us having to encourage them to do so. (Interviewee#8)

On several occasions, the Epic developers had argued that they could not observe activities in the clinic because doing so would expose them to competitors' products and potentially lead to lawsuits. This reasoning, reflecting a strong focus on legal liability, was perceived as distinctly American by interviewees.

3.2.3. The Big Picture Has Been Lost in Silos

The configuration process was organized in a large number of specialty-specific groups. To make the work in these groups efficient, they were small and often restricted to people within the specialty or from a single staff group. This way of organizing the process underrecognized the many crosscutting workflows and interconnections among the specialties. A super user remarked that "Everybody has been busy with their own small part, but it feels as though they haven't talked together" (Interviewee#8). One of the SMEs confirmed this remark: "We have worked in silos with almost no contact, so very little information has flowed from one to another. There has been no overall management that coordinated the different silos" (Interviewee#2). With little cross-group communication, many workflows were insufficiently understood and, consequently, "some quite central configurations have had to be changed at a late stage" (Interviewee#4). The communication bottlenecks also made it difficult for those involved to know whether a quirk in the system had already been discussed and decided upon or whether it was an error that should be reported.

3.3. Product Quality Issues

The issues experienced during the configuration process left the interviewees uncertain about the quality of the fully configured system, which they had not yet seen. A super user stated that "It is starting to look good" but went on to say that there were "many unnecessary options, much clicking, and much use of different colors" (Interviewee#3). Several commented that the system would require a lot of training because it was "illogical" (Interviewee#1) and introduced "many concepts that are new to us" (Interviewee#9). Finally, there were concerns about the decision to customize the user interface to each staff group: "We work a lot in teams, and it will be a challenge that the user interface looks different just because you have a different job title" (Interviewee#8).

4. Concluding Discussion

Many studies stress the importance of user participation in EHR projects [e.g., 2]. In the present project, a large number of users have participated, but they constitute only a small

fraction of the prospective users of the EHR. To manage the input from the SMEs, super users, and other participating users, a structure with many groups and meetings has been set up. While this structure recognizes the importance of user participation, the process issues described by the interviewees show that *the project has struggled with managing and processing the user input*. Greenhalgh et al. [4] put it quite bluntly: "eHealth programs unfold as they do partly because no one fully understands what is going on". In the Norwegian project, the reasons for the struggling include that the SMEs had lots of input to the configuration process and that the group structure provided little opportunity for coordination and synchronization across the groups. Thus, the groups became silos in which the SMEs optimized the EHR for their own specialty. The different user interfaces provided to closely collaborating clinicians depending on their job title illustrates the insufficient attention to also optimizing the EHR for teamwork and issues that cut across specialties.

In addition, *the SMEs have been in a difficult in-between role*. On the one hand, they had to make the analysts and developers appreciate the details of the clinicians' work. It complicated this task that the developers were reluctant to visit the clinic to observe for themselves how work was done and that the climate between the SMEs and analysts/developers tended to be characterized by negotiation rather than collaboration. On the other hand, the SMEs were to consult and discuss with their peers to be able to include and represent their views in the configuration process. However, the contact between the SMEs and their peers was often limited because the peer groups were large, because time was limited, and because some SMEs saw their role more as contributing their personal expertise than representing their peers. Previous studies have pointed out that the kind of double pressure experienced by the SMEs may contribute to late revisions, hard-to-use systems, and frustrated staff [1].

The implementation of EHR suites is dauntingly complex [5]. There are no simple solutions to the flexibility issues, process issues, and product quality issues described by the interviewees. However, unless these issues can be successfully managed, it is risky – to project timelines as well as treatment efficacy [7] – to embark on such projects.

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