

Large-Scale EHR Suites and Path-Dependence

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Abstract. Large-scale electronic health record (EHR) suites are expected to cover a broad range of use scenarios for healthcare workers in hospitals, nursing homes, home-care services, and general practitioner (GP) clinics. However, preparation for the implementation of EHR suites requires years of detailed planning and consumes considerable financial and human resources. A key problem, then, is that there is less room for decision-makers to consider promising alternative solutions both before and after the implementation of EHR suites. On this basis, we explore how past decisions on EHR suites limit future technological alternatives. Empirically, we focus on the Health Platform program in Central Norway, where the goal is to implement the U.S. Epic EHR suite in 2022, following similar implementations in Denmark in 2016 and Finland in 2018.

Keywords. electronic health records, EHR suites, Epic, path dependence

1. Introduction

Large-scale electronic health record (EHR) suites are expected to cover a broad range of use scenarios for healthcare workers in hospitals, nursing homes, home-care services, and general practitioner (GP) clinics. The use of a common system is also intended to greatly improve the information flow among the various user groups. However, large EHR suites have been increasingly criticized for their substantial consequences for the various organizations involved, all of which must adapt to the same system [1,2]. Its implementation also involves replacing most of the existing ICT portfolio. This means that preparation for the implementation of EHR suites requires years of detailed planning and consumes considerable financial and human resources. A key problem, then, is that there is less room for decision-makers to consider promising alternative solutions both before and after the implementation of EHR suites. On this basis, we ask the research question: *How do past events and decisions on EHR suites shape and limit future technological alternatives?* Empirically, we focus on the Health Platform program in Central Norway, where the goal is to implement the U.S. Epic EHR suite in 2022 [1,2], following similar implementations in Denmark in 2016 and Finland in 2018. Central Norway includes three hospitals and 64 municipalities, and the number of healthcare workers totals around 44,000. While many of the municipalities have decided to

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participate, others are considering an emerging ecosystem alternative, which for some core areas (i.e., the shared medication list) serves some of the same purposes as the Epic EHR suite. Theoretically, this paper draws on the path-dependence concept from network economics and the information systems field [3]. The concept emphasizes how past events and decisions shape technology outcomes and, in some cases, lead to a lock-in [4] where potentially superior technologies are dismissed.

2. Method

Our study takes an interpretive research approach, which considers a phenomenon from different viewpoints [5]. In accordance with this, we study the Health Platform program from different stakeholder perspectives. In total, we conducted 22 one-hour semi-structured interviews in Central Norway: four interviews with informants from three different municipality consortia during spring of 2021, three interviews with senior healthcare-segment managers from the vendor industry during 2020/2021, nine interviews with GPs in 2019, and six interviews with Health Platform managers in 2018. In a broad sense, the focus in the interviews was on potentials and challenges with Epic. All interviews were transcribed for analysis.

3. Results

3.1. *The Health Platform program in Central Norway*

In November 2012, the Norwegian Government launched whitepaper no. 9 (2012-2013): One Citizen – One Record: Digital services in the healthcare sector [6]. The whitepaper outlined the ambition of establishing a national solution that ensures access to a patient's health-related information regardless of the patient's location. As one of the possible strategies for achieving this, the whitepaper pointed to a national solution where database and software were common for all actors. In accordance with this, the Central Norway Regional Health Authority decided in 2012 to procure a new EHR where the regional perspective was emphasized. A pre-project in 2014 concluded that a common procurement between the tertiary care and municipal healthcare services in Central Norway would be beneficial. The Health Platform program was then created as a joint venture between the Central Norway Regional Health Authority and the Trondheim municipality. In 2016, Minister of Health Bente Høie confirmed the Health Platform as a pilot for the national goal of “One Citizen – One Record” [7]. The invitation to tender was announced in August 2016. After a vendor prequalification in 2016 and a dialog phase with selected vendors of large-scale suite systems in 2017/2018, the Health Platform signed a EUR 270 million contract with Epic Systems Corporation to purchase and implement the Epic EHR suite in Central Norway. This included all hospitals, GP clinics, nursing homes, and home-care services. Epic is largely self-contained. Most of the functionalities needed by health personnel are supposed to be provided by Epic, either as ready-for-use functionality or through configuration. The Health Platform has identified 80 current information systems that will be replaced by Epic; this includes EHRs in the hospitals, at the GP clinics, and in nursing homes and home-care facilities. The Central Norway Regional Health Authority and the Trondheim municipality will start implementing Epic in the three regional hospitals and in the Trondheim municipality

April 30, 2022. Thereafter, the implementation process will continue in the other municipalities and GP clinics that choose to participate in the program.

3.2. A national trend toward ecosystems

After the troubled reception of Epic in the other Nordic countries [1] and a shift in the public discourse on national ICT strategy in healthcare [2], the national health authorities are increasingly promoting a platform-based ecosystem approach in the rest of Norway. This strategy is supposed to support the presence of various components and systems from different vendors by having the platform itself ensure effective integration mechanisms among different domains. In this regard, the national health authorities have made several initiatives to improve the integration and collaboration in the Norwegian healthcare sector. This is done through the state-owned company Norwegian Health Network (NHN), which is responsible for offering national ICT infrastructure services through its interaction platform to the actors in the healthcare sector. Especially, there are three national components that have been developed, and are in various stages of implementation. The three components are the summary care record, the shared medication list, and the national welfare technology hub. They are all provided through the platform services of NHN. First, the summary care record enables sharing patients' health information across the health sector. By using it, healthcare professionals have access to patients' critical information, pharmacy-dispensed medication, discharge letters, and laboratory results regardless of whether they work in a hospital, a GP clinic, or in the home-care services. Second, the shared medication list is currently being piloted in Norway's second-largest city, Bergen. The shared medication list gives an overview of a patient's complete list of medications and is one of the most asked-for services in the sector. Third, the national welfare technology hub ensures integration between the municipal EHRs and welfare technologies in use in patients' homes. This integration ensures an efficient information flow among welfare technologies, EHRs, and response-center solutions. The vendors of the existing EHRs in the municipal sector are all committed to these three national components and have adapted their systems to them.

3.3. Stakeholders in Central Norway consider their options

Initially, many stakeholders responded very positively to the goal in the Health Platform about creating a comprehensive health service that connects hospitals, nursing homes, home-care services, and GP clinics. However, as go-live approaches, politicians in the municipalities are increasingly realizing that transitioning to Epic will require a huge effort, and the investment and operating costs will total much more than the cost of the municipalities' current EHRs. Given the size and ambition of the program, there are concerns about whether the municipalities have the necessary competences and resources to participate. Therefore, some municipalities are exploring the ecosystem alternative outlined in the previous section. For the municipalities, this would imply continuing to use their current EHR systems while upgrading these systems with national integration modules from the NHN interaction platform. Such a solution would then serve as an alternative to Epic, like it is in the rest of Norway. The GPs for their part are skeptical toward Epic because it represents a "closed" large-scale suite system. Several of the GPs we have interviewed emphasize that it might be better to have several small EHRs that can communicate with other parts of the healthcare sector through messages (like the eco-system strategy). As examples of such EHRs, the GPs mention their present EHRs.

These EHRs stand in contrast to Epic, which is perceived as big and all-encompassing. The GPs find their present EHRs intuitive and user-friendly. Typically, new employees do not need much training before they can engage with these systems. The vendors of the existing EHRs in the region have expressed a positive attitude toward the eco-system approach and have invested considerably both in upgrading their existing EHRs and in making them compatible with the national services from NHN to give the use domains a viable alternative. This has been received positively by the municipalities and GPs.

4. Concluding discussion

Path dependence emphasizes that past events impact future developments [3]. In turn, this may lead to a lock-in where a certain technology becomes dominant, so that later, superior alternatives cannot gain a footing [8]. In our case, whitepaper no. 9 from 2012 [6] outlined a strategy where database and software were common for all actors. This may have shaped the Central Norway Regional Health Authority's decision to purchase a large-scale suite system. The fact that Denmark and Finland signed a contract with Epic in 2013 and 2016, respectively, may also have contributed to the course of action. Moreover, the ambition of the program, the price tag of 270 million euros, and the size of Epic speak volumes about the resources that have been invested in the process. Given the early choices and the resources spent, there is less room for the program to consider alternative courses such as the ecosystem approach that is emerging in other parts of Norway. Thus, the program finds itself in a lock-in [4]. The lock-in is enforced by how the success of the Health Platform program depends on the participation of all stakeholders, which requires that the ecosystem approach must be fended off even if some GPs and municipalities want to explore it. Currently, many consider the ecosystem approach the superior technological alternative [8] because it invites a modular strategy where different vendors and technologies can interact "seamlessly". While this alternative shows promise in the rest of Norway, the switching costs in Central Norway would be prohibitive [3]. As a result, Central Norway will enforce an "old-fashioned" strategy in the foreseeable future at odds with the development in the rest of Norway.

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