Analysis of the Failure of the Epic EHR Implementation in a Hospital System in Denmark

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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I. Introduction

Electronic Health Records (EHR) are tools used within hospital systems to keep track of patient data. They are useful tools in health care as they ensure the continuity and quality of care, and utilize data for clinical studies. A particularly well-performing and popular EHR is Epic. Epic EHR is most beneficial when its configurable software is utilized fully. Epic allows for "builds," which are tools that health systems can create at a macro or micro level to use within the interface. These builds aid in medical workflows and can increase efficiency due to their customizable nature that can be tuned to a specific system, specialty, or departmental needs (Häyrinen et al., 2008).

Due to the complexity of health systems, as well as the customizable software of Epic, implementing this EHR takes significant consideration and monetary investment. These implementations do not end when the software goes live but constantly change and require consistent optimization. This paper examines a case study to understand the complexities of EHR implementation. The study is on the adoption of Epic in the specific health system in Denmark. This case demonstrates the flexibility required to utilize the EHR in a dynamic industry. Previous writers have individually explored disjoint social factors in implementing EHRs, but have not analyzed how multiple actors may support or hinder each other. This paper aims to connect different social factors to create a comprehensive understanding of the social network created by EHR implementation and apply it to a specific case of Epic adoption in a hospital system in Denmark (Bansler, 2021).

The Danish EHR case study aids in understanding why the implementations of these systems succeed or fail. Health systems that transition poorly to an EHR system stand the risk of the shortcomings, such as poor training or configuration, that overshadow the positive

functionalities that Epic can bring to the table. The Epic implementation in Denmark is an example of this, where social problems left unaddressed upon installation diminished the utilization of this powerful tool (Bansler, 2021).

I will argue that the Epic EHR network in Denmark did not operate successfully due to the health system's organizational concentration on standardization in contention with physicians' objective for localized builds, along with a hierarchical culture that hindered the utilization of the configurable software. I will use Actor-Network theory (ANT), a framework designed to highlight particular actors or players as part of a larger system. The analysis helps improve the understanding of a complex system (Cresswell et al., 2010). Following the ANT framework, I will identify a network builder and better understand how the various human and non-human actors in the Epic EHR network interact to accomplish the goal of successful system implementation. I will use the case study by Bansler (2021) as the source of information to analyze the original process of the hospital system's Epic implementation, and the further actions initiated after the transition. Applying this framework to the specific case of the hospital system in Denmark will aid in understanding what social aspects led to the failure of optimally implementing the Epic EHR system.

II. How Electronic Medical Records are Utilized

Accessible and quality patient information is the foundation for providing care. The information that is necessary for providers to access is copious. The system for organizing this data needs to be systematic, functional, and of optimal quality. An electronic health record (EHR) is defined by the International Organization for Standardization (ISO) as a "repository of patient data in digital form, stored and exchanged securely, and accessible by multiple authorized

users," to maintain the continuity of care. EHRs allow for free text notes, where providers can include pertinent information for future reference. They also contain coded data fields that create standardized information storage to access, which helps providers understand patient care across health systems and standard practices and provides the basis for clinical research (Häyrinen et al., 2008).

This paper will specifically look at the EHR from the company, Epic. Their system allows for real-time data comparison due to its predetermined data input requirements, which improves healthcare as it can help in data analysis of clinical outcomes. It also fulfills the EHR objective of accessible information on individual patient data (Johnson III, 2016). Epic is a highly configurable EHR, where no implementation is the same. They have utilized "physician builders" to aid in creating customizable EHR builds to fully match a health system's needs. These physician builders are physicians within the health system that attend training courses to understand Epic implementation and ongoing optimization. Physician builders are an appreciable resource for the EHR transition as a whole because the physicians understand both the medical needs that the EHR needs to fulfill and the background of Epic to utilize it fully (Bansler, 2021).

III. State of Literature

A literature review on Epic EHR systems and implementation was conducted. While several scholars have examined the success or shortcomings of EHR implementation in various health systems, no consensus has emerged concerning the steps that yield a complete utilization of the technology.

A study focused on Operating Room (OR) efficiency before and after Epic implementation at the Brigham and Women's Hospital in Boston, Massachusetts. This study

found that there was a significant decrease in the efficiency of the OR, even with a 20% reduction in patient caseload after implementation. After six months, the efficiency returned to baseline, then increased after about a year. The researchers postulate what may have caused this initial decrease in efficiency, but there was no in-depth analysis of why this happened. Additionally, this study only followed the OR efficiency for 12 months after implementation (McDowell et al., 2017). The EHR technology is ever-changing and needs consistent evaluation for areas of potential optimization. This paper will seek to fill this gap by identifying initial pitfalls in Epic implementation and understand why this happens, with the purpose of helping health professionals utilize Epic to its full extent.

Other studies that are important have a focus on the users' experience. A longitudinal study took survey data from the academic healthcare system in southeastern Louisiana that had transitioned to Epic. The surveys asked healthcare providers about their perceptions directly after implementation and after a long-term follow-up. The metric used in the results discussion was the change from initial roll-out to long-term experiences. In setting up the study to examine this metric, it differentiates between initial perceptions that may be due to transitional pains versus long-term system utilization failure. The change in perceptions had mixed results. Notably, the positive perceptions were on functionalities, while more subjective and social perceptions remained negative. For example, positive functional experiences were communication with patients and other health care personnel, access to clinical information, preventative care functions, and system reliability. Social perceptions were widely negative, including better patient care, access to patient information, direct patient care quality, and overall satisfaction. Concerning the purpose of this paper, it is important to understand why perceptions are impacted more negatively than others (Krousel-Wood et al., 2017). This study does not explore this, thus

once again indicating a gap where there is not an exploration of causality for success or failure. ANT becomes an applicable framework because it inspects social relationships and interactions with human actors and the technical, non-human actors.

These two studies provided a sampling of the academic literature. One was chosen to represent the case-specific research that focuses on the quality of care after implementation. The second piece of literature represented studies that have been done specifically on perceptions and satisfaction of health care providers interacting with the technology regularly. These are both key parts of providing efficient and quality care after a significant change in technology systems. There is a clear gap in the available research where the relationship between user perception and healthcare quality while using the Epic EHR. This paper seeks to close this gap by analyzing these aspects in application to a specific case of Epic implementation and optimization in a hospital system in Denmark.

IV. Actor-Network Theory

My analysis of the failure of Epic implementation in a hospital system in Denmark draws on Actor-Network theory (ANT), which allows for the inspection of relationships within the complex systems of healthcare actors. ANT is a framework for analyzing the interactions of components, or actors, within sociotechnical systems. These systems are created via a "network builder." Network builders are the lens through which other actors are viewed. Actors within the network can be human or non-human, and interact with each other in a variety of ways. Viewing technology through this framework allows an understanding of the technical and social aspects. This is especially beneficial when understanding a technology currently in flux, wherein it is consistently optimized and has not reached its final state (Cressman, 2009). This framework

examines the technology that is shaping and being shaped by society. Thus ANT is a functional choice to help analyze the Epic EHR system as a player within a complicated social and technical healthcare system.

ANT is also a unique framework in that it is in conjunction with the idea of "translation." Actors shape and change the technology in a process called Translation (Cressman, 2009). Callon (1986) describes translation as a four-step process: (1) problematization, (2) interessement, (3) enrolment, and (4) mobilisation. Problematization is the process of a primary actor defining the network and recruiting other actors. The actor's links to the primary actor and what they desire from the network create their identity. The primary actor will become the "obligatory passage point" (OPP), where all actors must form a relationship to achieve their goals. Interessement is when the links between the actors begin to be tested, and will validate the relationships established in problematization. A successful interessement phase will lead to enrolment. Enrolment is the phase where actors will fall into a role within the network, often based on the needs of the primary actor. Mobilisation is the final phase, where the primary actor becomes the spokesperson for the network and the relationships between actors begin to work and become functionally viable (Callon, 1986).

Drawing on Actor-Network theory, in the analysis that follows, I begin by outlining the network present in the Denmark health system, defined by the Epic EHR as a network builder. Then I explore the actors within this network and their complex relationships. Specifically examining the problems of standardization versus customization and hierarchical relationships between actors.

V. Analysis of the Epic EHR Network

a. The Network

The Epic optimization failure in Denmark was due to the higher level management of the rollout that disregarded concerns from health providers and the antagonistic relationships within the system. First, the network and relationships between actors are discussed to demonstrate this point. Figure 1 shows the designated actors, which were determined based on the information given in the case study about Epic optimization in Denmark by Bansler (2021). In this analysis, Epic EHR is the network builder, as it was recruiting actors in relation to its implementation. Connections between actors are denoted with an arrow or a dotted line. The dotted line represents an interaction between actors, but these actors do not necessarily impact how the other works. For example, the other health providers within the health system interact with the Epic EHR day-to-day but cannot affect its configuration. Arrows are used to denote cause-and-effect relationships. The direction of the arrow represents the actor acting on another in some way. For example, the existing health technology will affect the success of the Epic EHR and impact its configuration, and Epic implementation will also determine the utilization of the existing health technology.

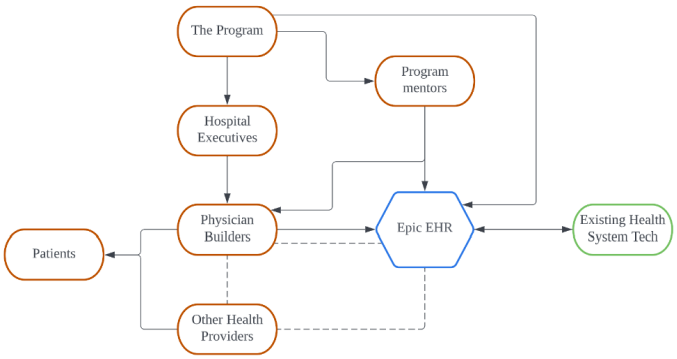

Figure 1 - A visual representation of the Epic EHR network. The blue border designates Epic as the network builder. The red and green borders represent human and non-human actors, respectively.

Another important aspect of the network is defining each actor and their objective in Epic optimization. The first important actor is the Program Organization, colloquially referred to as "the Program," which was responsible for managing the implementation of Epic. Members of the Program have the objective of utilizing the Epic EHR for standardizing practices, according to

the testimonials of individuals involved in the case study. Their goal is to maintain quality assurance, risk management, and standardize data that is accessible for clinical research (Bansler, 2021). Notable is that the Program is not the network builder in this analysis, as it was formed to support the transition to Epic and recruited in response to the builder. Physician builders also play a crucial role in this network. They are unique to Epic implementations and are physicians that also know how the Epic software works. These physician builders can create tools within the Epic software, taking advantage of the customizable configuration of Epic. They want to utilize Epic to make particular processes within their local department more efficient. Lastly, it is necessary to define "the Program mentors." These are IT professionals paired with physician builders to help them build tools within Epic (Bansler 2021).

The next step in understanding why this network failed is pinpointing the incomplete step of translation. The network of the Epic EHR optimization failed at the enrolment stage of translation. Problematization and interessement occurred because the formation of network organization and communication pathways was successful. The problem that I will analyze occurs at the enrolment stage, where actors are pushing and pulling against each other to achieve their own goals. This is the failure of actors to fall into place in their defined roles as agreed upon by all parties. This led to the failure of the Epic optimization, where high-level actors such as the Program and mentors became antagonistic with the physician builders due to conflicting objectives.

b. Standardization versus Customization

The Epic EHR optimization failure in the Denmark health systems was due to the Program's inability to see past the need for standardization, where the health professionals pushed back against this idea. Looking at the Program as an actor unable to fit into its defined

role will demonstrate the failure of translation. In a perfect network, the Program would work as a purely organizational body that oversaw the Epic implementation at a high level. Due to the Program's steadfast commitment to standardization, they made decisions that jeopardized the success of the implementation.

The first example of this is during initial rollout, when the Program decided they would not use Epic's physician builder program because they believed that the physicians would push for tools that would risk the goal of a standard EHR across the hospital system. They worried that these tools would be more focused on adapting to the specific specialization of the physician and would not apply to the wider health system. Instead, the Program wanted tools that applied to any department to ensure the standardization of the data the EHR is collecting (Bansler, 2021). This created problems because when physicians or other healthcare professionals are not included in the customization of the software, there is a great risk of it lacking clinical applicability (Rozenbaum et al., 2011). This caused the initial rollout of the EHR to be a challenge for health workers. According to an interview with a physician builder, the initial interface was so unusable that they could not even create a new patient record within the system. Due to the large dissatisfaction among users, the Program moved to a pilot program of the physician builder program (Bansler, 2021).

The Program's campaign for standardization still continued, even after the physician builder conflict. This is evident when the Program implemented a required approval process for any tools that physician builders wanted to introduce. This process was cumbersome and overly bureaucratic, according to physician builders interviewed in the case. The new policies still hindered the clinicians' ability to create builds relevant to their workflow needs.

This section has argued that the Program's concentration on standardization at odds with the physicians' objective of localization led to the failure of the Denmark Epic implementation. It is important to acknowledge that this is about a specific case. There are cases for and against standardization across EHR systems. In other case studies, they found that physicians were less efficient when using localized builds. An example of this was a study that looked at an array of factors when implementing an EHR, one of them being standardization. When using standardized workflows, the system experienced a smoother transition (Brokel, 2011). That said, the way the network in Denmark handled the need for standardization was in a way that discounted other resources that were necessary for successful implementation. It is possible to implement a successful standard EHR system with multiple tools available across the specializations in the health system. It would take more consideration and communication than this network's actors had. For example, The Christ Hospital in Cincinnati, OH achieved standardization successfully. It was a smooth implementation attributed to the aligning viewpoints of stakeholders and was a uniquely quick transition (Blake et al., 2010). This acknowledgment emphasizes the advantages of analyzing this in the framework of ANT. The relationship between actors and disagreeing objectives with the implementation led to the failure, not necessarily the technology itself.

c. Hierarchical Culture

The Epic EHR implementation in Denmark did not operate successfully due to a network with actors of opposing objectives, exacerbated by the hierarchical relationship between physician builders and Program IT mentors. This contention can be seen within the pilot physician builder program in the form of the Program sponsored mentors. These mentors were employed by the Program, and had an IT background which meant they looked at Epic through a

technical software lens. This is in contrast to the physician builders that used the EHR as a clinical tool and intended to create more efficient workflows in their daily tasks. The mentors were meant to be partners with physician builders and help them build viable tools in the software. However, these mentors also had the authority to act as another actor of approval for builds. This hierarchy caused the development of mentors into the antagonists of the physician builders instead of creating a collaborative partnership (Bansler, 2021).

The adversarial relationship between physician builders and mentors was detrimental to the ability of physicians to create builds. This can be attributed to the principle of self-efficacy, where the individual does not feel in control and can inhibit motivation (McAlearney et al., 2012). The physicians would have to go to the mentors for approval, and often felt that they were rejecting builds based on malignance instead of solving actual problems (Bansler, 2021). This led to the physicians struggling with self-efficacy and they felt that there was nothing they could do to get their builds approved since they believed that the mentors were rejecting proposals based on things that were not problems within the technical specifications. Due to this demoralization, physician builders would not be motivated to build tools within Epic.

Physicians are key stakeholders when transitioning an EHR system. Many issues that arise in a network around an EHR can be tied back to the level of physician support. This support may be on the level of user resistance to using the technology, to the championing of technology by physicians, or the willingness to create builds within the software to fully utilize the EHR. When physicians are not supportive of the system, it tends to fall victim to common pitfalls when implementing an EHR (Palvia, 2015). The importance of physician support shows how damaging this relationship between physician builders and Program mentors is to the overall success of the EHR. In this specific case, the clearest consequence of this negative relationship is

the lack of builds by physicians. A valuable utilization of the Epic EHR is its customizable builds that allow physician builders to create configurable tools that fit within their specialized workflows (Johnson III, 2016). Without these builds the EHR was not being fully utilized, indicating a failure of the implementation.

VI. Conclusions

This paper utilized Actor-Network theory to examine the failure of an Epic EHR implementation in Denmark. The ANT analysis demonstrated that this failure was due to adversarial relationships between the actors, presented in two clear examples. One negative relationship was the contention between the higher-level Program organization pushing for standardization despite physicians' clinical needs. Second is the lack of independence of physician builders due to a hierarchical relationship with the Program mentors, leading to physicians having a demoralizing lack of self-efficacy. The deterioration of this network is a case where the interessement phase of translation was not achieved. It demonstrates the need for a network to have actors form alliances working cooperatively towards a common goal. The analysis of this network has furthered the understanding of the importance of strong relationships between actors, and mutual alignment of expectations. In an EHR implementation project, the analysis of this case in Denmark has shown that success depends on the collective network and how well it works as one cohesive unit.

Word Count: 3445

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