Building for the Next Generation: Practical Challenges for Platformization at a Norwegian Hospital

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Introduction

The current discourse of development of the next generation of electronic health records (EHRs) is to a large extend driven by a fascination of potential new uses of data. This includes use of big data analytics to further care of individual patients, for instance through precision medicine (Jameson et al, 2015), and improved diagnostics, and secondary uses of data, for instance to detect outbreak and to support clinical trials (Raghupati and Raghupati, 2014; Cahan et al, 2017). A fundamental premise for this is, however, availability to complete health data for the individual patients and at a population level.

In most healthcare systems, including Norway where this study reports from, the information infrastructure of the healthcare system is currently characterized by the existence of information silos that prevent generative reuse of data (Bygstad, 2015), due to a pronounced lack of integration between the EHRs at the individual hospitals and other information systems. To improve system interoperability and data exchange, the Health South-East (the largest health region of Norway) in 2013 initiated the Digital Renewal program. With an investment of more than 1 billion euro, the goal is to consolidate the existing portfolio of health information systems by standardizing all major health information systems (same product, same version) across all hospitals in the region, including the EHR, medication management system, the charting system,

radiology, and lab system, and to improve interoperability and data exchange between the large-scale systems and third-party applications. A central part of the strategy is to establish an integration platform that relies on BizTalk servers which through variously standardized adapters is to enable seamless communication of clinical and administrative data across hospitals and IT systems the region in a safe and secure way. The platform consists of three main

- The *application* platform: user interfaces and devices, database services, server and storage solutions, integration platforms, and a sand-box environment for testing.
- The *security* platform: analytics platforms, anti-virus tools, authentication services and authorization protocols (access control systems).
- The *network and datacenter* platform: secure monitoring of ICT infrastructure, server and computer rooms, network solutions, access to critical data and back-up protocols.

The Digital Renewal strategy represents an evolutionary approach to the development of the next generation of the information infrastructure in Health South-East. In line with information infrastructure theory this entails that the new information infrastructure is not developed and implemented from scratch, but intentionally grown as an extension of the existing installed base (Aanestad et al, 2017), that design and development does not only take place before the first implementation, but continues for the full lifespan of the infrastructure (Karasti et al, 2010), and that the core infrastructure can be expanded through modular implementation of lightweight IT (Øvrelid, 2016).

Analytically, we see this as an example of *platformization*. A platform in this context refers to *"the extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with it and the inter-faces through which they interoperate"* (Tiwana et al, 2010 p. 675). Platforms hereby allow the core functionality of a software-based product to be extended through add-on software, or *modules*, while ensuring interoperability. This approach is increasingly moving into the healthcare setting, as exemplified by the American EHR developer Epic's recent launch of the 'App Orchard' app store.[1] As argued by Tiwana et al (2010) platformization requires close attention to the design, architecture, governance, and environmental dynamics of the emerging platform. While the majority of research draw attention to the architecture and governance of emerging platforms, this study investigates the challenges that platformization entails for health professionals at a Norwegian hospital and how these align with strategy of the region.

[1] http://www.mobihealthnews.com/content/epic-launches-long-planned-app-orchard-app-store

About the study

This paper present preliminary findings from an ethnographic field study conducted at Sykehuset Østfold Kalnes (SØK), a hospital in south-eastern Norway. To investigate the practical challenges of platformizastion for health professionals, we study the information work that takes place along the care trajectories of patients admitted to the emergency unit with suspicion for pulmonary embolism (blood clot in the lungs) through all care activities, including admission, triage, diagnosis, treatment, transfer to other hospital units, and discharge. The data collection is currently ongoing and is conducted through 2 months of fieldwork carried out in February and April 2018. The data collection comprises participant observation, interviews and informal conversations with health professionals, and document studies (clinical guidelines and information systems). In total, the study will comprise 100+ hours of observation, and interviews or conversations with 40+ health professionals and patients.

Digital Renewal at Østfold Kalnes

The Østfold Kalnes hospital opened in fall 2015 and was built as a pioneering hospital with regard to innovative uses of new clinical technology and ICT. As a result, the hospital in currently rated at level 6 out of 7 on the HIMSS EMR Adoption Model (EMRAM), as the only hospital in Norway.[2]

Following the Digital Renewal program, a central aim of the digital strategy at SØK was to improve clinical logistics and information flow by incrementally integrating a variety of the information systems in use, including the EHR through use of integration platforms. As platforms, two systems were chosen: IMATIS Visi (an electronic whiteboard used to integrate information of relevance for clinical logistic and patient flow) and Metavision ICU (a charting system used to integrate physiological data on patients). Both systems are partially integrated with the EHR (DIPS) and several other information systems.

At the emergency unit, both IMATIS and Metavision serve important roles for ensuring efficient in the often very rapid and dense care trajectories that take place when patients are admitted with (suspicion of) severe and acute disease. In these cases IMATIS and Metavision scaffold collaboration between the various health professionals involved, also when the patient is transferred to other hospital units: As soon as the patient is referred to the unit by a GP or an ambulance a nurse create entries in both systems, in addition to writing a admission note in the EHR. During the full stay at the hospital, these entries are monitored and updated by the involved health professionals, either through manual entry or through data

[2] https://www.dips.com/no/sykehuset-ostfold-er-vurdert-til-niva-6-pa-emram-skalaen

automatically extracted from other systems (for instance a heart rate monitor). While the initial findings in this study in general confirm the value of these platforms, it also surfaces the many new workarounds required by the health professionals required to continuously keep the platforms up to date. As a typical example we observed a health care assistant who was responsible for taking basic measures of each patient's physical condition in the morning and during the day (e.g. heart rhythm, blood pressure, body temperature, and respiration rate). While some of this data was automatically transferred to Metavision, she had developed a routine of writing everything down on a paper sheet for two reasons: First, a few of the devices used to take the measured were not integrated yet, why this information had to be entered manually. Second, she experienced frequent errors in the data transfers, why she had to verify the information in Metavision. In contrast to the intension, the platformization process had therefore created a new task of data verification.

While the practical problems and workarounds observed in this study to a certain extend are the products of an emerging but so far incomplete platform, they also illustrate a fundamental challenge that must be accounted for if the next generation of the EHR development through incremental evolution of the information infrastructure: In addition to the strong focus in research on the governance and architecture of platforms, it is also crucial to take into account how incremental growth of the platform possibly entails a long period of incompletion, with potentially harmful effects on clinical practice. To become a viable approach to development of the next generation of EHRs, a core challenge for platformization is therefore to create mechanisms for rapid identification and solving of the problems that emerge, either through redesign, new integrations or development of additional modules.

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