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Combining Social Service and Healthcare as the First Country in the World: Exploring the Impacts on Information Systems

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***Abstract*—The Finnish government has decided to implement a reform in the social and healthcare system by combining the two in the future. There are several drivers for this change that have been identified. Large number of information systems that are not interoperable, challenges in data management and isolated service offering are the most significant ones. In the government's strategy for the future the digitalisation will provide tools to solve these challenges. In this paper the landscape is outlined and the architecture choices are discussed. The enterprise architecture is applied for the largest county comprising of over 1900 social service and healthcare related information systems. The target is to design one joint system with maximum of 300 supporting information systems resulting in 3 B EUR savings.**

***Index Terms*—healthcare reform, welfare system, enterprise architecture, information systems, data driven**

I. Introduction

The welfare reform in Finland paves the way for future combined social and healthcare system. One needs to define a robust and cost-effective implementation of system enabling municipalities to run the service and citizens to utilize it. The concept is novel and the reform is due to come into force on 1st January 2020. The current social and healthcare system and local government services relies on municipalities, sometimes with very small populations. A similar structure can be found in other Nordic countries. There are 5, 5 million inhabitants in Finland, one third living in Helsinki-Uusimaa region. After the regional reform there will be 18 larger counties in Finland, which are responsible in organizing all social services and public health care in their area. Some other duties will be transferred to the counties as well, from Centres for Economic Development, Regional State Administrative Agencies, Regional Councils and other joint municipal authorities and municipalities. The aim of regional reform is to provide Finland with a modern, cost-effective public administration that serves all inhabitants. The reform will ensure key services and streamline transactions. The reform will help to bridge a large part of the sustainability gap in general government finances. The Government's aim is to save EUR 10 billion, of which approximately EUR 3 billion should be covered through the reforms in the branch of government of the Ministry of Social Affairs and Health [1].

Building an integrated system is complex task. The massive amount of depencies and number of non-integrated systems make it inherently such. As the digitalization has progressed a number of steps to right direction have been made. Today, the documentation of patient data in Finnish healthcare system is 100% digitalized. In public hospitals, the electronic patient record availability has been 100% since 2007. In public primary health care centers, the 100% availability was reached in 2010 and in private health service providers even earlier than that. Patient information created by health care service providers is transferred to the National Patient Data Repository - Kanta [2]. All public and private healthcare providers are linked to Kanta services. Kanta data archive stores and transmits providers' medical records and the central repository already contains more than 600 million documents (situation 12/2016). Electronic prescription is mandatory since the beginning of 2017 for all physicians prescribing medicines and currently about 5.35 million ePrescriptions are issued monthly, with 170 million ePrescriptions cumulatively to date [3].

There are several studies related to the healthcare IT reform in the literature [4]-[9]. However, studies are generally qualitative and do not describe the complexity of the field in terms of concrete data regarding the systems and their connections. Our research aims at demonstrating the complexity of social and healthcare information systems by case study with actual system configuration.

The first author is acting as a reflective practioner [10] in the field. Research methods that he used were participating observation, professional survey and a case study. In this article, we focus on determining the information systems used in Helsinki-Uusimaa region in social service and healthcare areas. We answer the following particular research question: How systems can be classified, identifying systems that are replaced with

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Epic system [11] delivered by Apotti project, and reducing number of parallel systems. The remainder of the paper is organized as follows: First section introduces Finnish regional reform and Kanta system. The following section describes used enterprise architecture methodology. Finally, last section focuses on the Helsinki-Uusimaa region, and examines the system map of the medium-sized municipality and information systems dependencies.

II. Enterprise Architecture Is an Essential Part for Execution of the Finnish Regional Reform

ICT reforms in support of larger public sector reform have been ineffective and unsustainable, although many ICT reforms have been successful in a narrower context. Enterprise Architecture (EA) has seen as an important tool for reducing information management silos that successive governments have unsuccessfully tried to reduce. The EA can be used as an approach to ICT governance but it can also be applied as a more wide–ranged and strategically oriented method to serve growing organizational needs [12]-[14]. Effective communication is essential in sharing knowledge, achieving a common understanding, agreement and a shared view of the enterprise architecture scope, vision, and objectives, as well as of the developed models and other artifacts. Furthermore, communication is an important means of gaining commitment to the enterprise architecture effort [15]. EA is part of the strategic work of an organization, its management process and financial and operational planning. Fig. 1 shows the dependencies of the EA of the public sector in Finland. EA is structured view of a functional entity including the relations, dependencies, principles and guidelines [16].

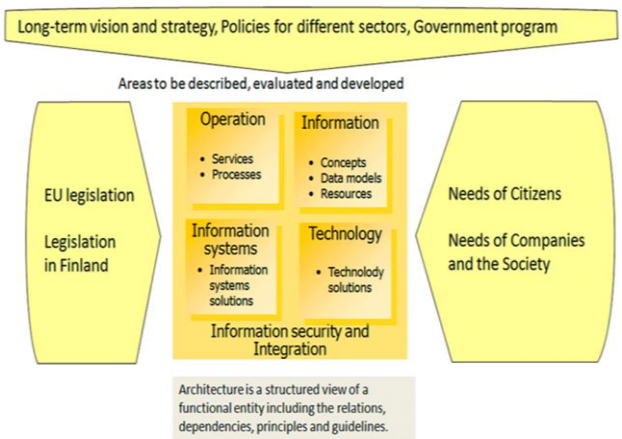

Figure 1. Enterprise architecture in public sector.

In Finland, the use of EA has recently been mandated by the newly passed Act on the Direction of Public IT Governance [17]. EA has been promoted as a key tool for transformation and modernization of government [18]. EA work follows the enterprise architecture method, Public Administration Recommendation JHS179 [19], which is based the international, open and most widely used enterprise architecture framework, TOGAF® [20]. JHS179 provide information management guidelines for public administration, both governmental and municipal. The JHS179 system aims to improve the interoperability of information systems and the compatibility of data in them, to facilitate cross-sector process development and to make the use of existing data more efficient. Information systems that are intended to be attached directly to the Kanta services are classified to category A systems. Supporting information systems used in social and healthcare are classified to category B systems. Table I describes classification of social and healthcare information systems [21].

TABLE I. Classification of Information Systems

Category	Connection to Kanta	Examples
A	Directly connected	Patient data information systems, social service data systems, oral healthcare data systems
B	Not connected	Specialized hospital systems, patient classification systems, laboratory systems, X-ray archive, analytics

III. Case: Helsinki-Uusimaa Region (Uusimaa2019 Program)

The largest new county is Helsinki-Uusimaa region. It is situated on the south coast of Finland, and it is home to around 1.7 million inhabitants, which is about 30 percent of the country's total population. Fig. 2 shows Helsinki-Uusimaa region geographical position in Finland. In the Helsinki-Uusimaa region, the social and healthcare services of 26 municipalities and specialized medical care from HUS (Hospital District of Helsinki and Uusimaa, Helsinki University Hospital) and about 55,000 employees will be transferred to the county to be formed. At the same time, the province is also responsible for the transfer of 25 different governmental activities that have been either state activities or statutory activities organized by municipalities. The Epic system delivered by Apotti project has been selected as a social services and healthcare system supplier in Helsinki-Uusimaa region. Apotti is an extensive Finnish change project of the social services and healthcare field. Apotti project is building the world's first information system that integrates social services and healthcare services [22].

Figure 2. Regions in Finland.

Helsinki-Uusimaa region council set up Uusimaa2019 program [23] in early 2017. Uusimaa2019 program contains two tracks. Main project focuses to operational changes, service concept development and ramp up social and healthcare services. Second track is ICT project that aim is build ICT functionalities, information systems and infrastructures that are needed for running services that Helsinki-Uusimaa region will provide starting at 1st January 2020.

Typical medium size municipality in Helsinki-Uusimaa region has about 100 information systems, which about 20% are social and healthcare systems. Fig. 3 shows information system map for city of Kerava. Kerava is a medium sized municipality with 35000 inhabitants and is located in the middle of the Helsinki-Uusimaa region. The aim of the system map is to describe the impact of the reform on the Kerava information systems portfolio. Kerava has 95 systems, 18 of which are social and healthcare systems, including 3 category A systems. Information systems are classified and visualized according to operational units, as each unit has its own budget to cover the purchase and maintenance of systems.

Figure 3. Information systems map for typical medium sized municipality.

Classification of systems by operational units makes it easy to figure out which services, related information systems and interfaces are going to Helsinki-Uusimaa region. City of Kerava has five operational units. The units are Social and Healthcare services, Education services, Culture and Sports, City Infrastructure and Administration unit. In the upcoming reform, all social and health care services will be transferred to Helsinki-Uusimaa region, whereby the systems used to produce the services will be removed from the municipal information system portfolio. Information systems are connected with various application and system interfaces. Patient Data Management Systems (PDMS) is a good example of a critical information system with 9 interfaces to other systems. Another important system is Financial Management system, which has interfaces to 13 different systems. The problem is if one system is changed, it will effect a number of other system. All municipalities has different set of systems and integrations.

The ICT project started in the spring 2017 with pre-screening phase. The target of pre-screening was to find out what kind of information systems municipalities are using in social and healthcare services. The survey was conducted with a questionnaire addressed to municipalities, which was used to identify the systems used by municipal social and healthcare services. Results of the pre-screening survey shows that municipalities are using currently 1902 different information systems, 43000 workstations, 10700 mobile devices (tablets etc.), 1250 servers and over 6400 networking devices. There are large number of critical social service and patient data systems (category A). The problem is that the same information system has been tailored to municipality-based versions, causing uneven data structures and migration requires special attention and extra work. Category A information systems will be replaced with Epic delivered by Apotti project. The Epic will also replace also most of the social and healthcare services supporting information systems that are not directly connected to Kanta (category B). The aim of the reform is to reduce the number of systems in use. After the reform, there is one class A system, and 100-300 general and social and health care support systems. Specialized hospital systems will be mainly remain and only small fraction of those systems can be replaced with Epic. The first launch of the Epic is in November 2018 at city of Vantaa and gradually being expanded to other municipalities and is in use throughout the Helsinki-Uusimaa region in 2022.

During the autumn 2017 ICT project was projected to sub-areas whose mission was to form detailed project plans for project implementation. ICT projects followed EA guidelines and ICT roadmap that was created based for the JHS 179. The ICT project is time critical because the Helsinki-Uusimaa region Interim Administration will start operating in the summer of 2018, decision making and archiving systems must be in place in early summer 2018. The next step is create infrastructure and general systems like HR, Payroll, ERP, CRM and Financial management. Those systems rely on current HUS information systems and contracts, which are extended to cover the entire Helsinki-Uusimaa region. One important part of the project planning is risks management. This very comprehensive reform directly affects 55,000 people. When completed, Helsinki-Uusimaa region is the largest employer in Finland. Because of the scale of the project, risk management requires a great deal of attention. Table II shows information systems classification.

TABLE II. INFORMATION SYSTEMS CLASSIFICATION (2018)

Category A			Category B		General
Health care	Oral health care	Social service	Specialized hospital systems	Social and healthcare supporting systems	HR, payroll, logistics, CRM, financial management
6	3	5	536	476	876

The risks are shared to cover the operating environment, technologies, organizations, timetable, budget and system vendors. There are about detailed 80 risks identified that are regular evaluated during the project. Two largest risks are out of the project control and changes will effect entire ICT project structure and schedule. Largest risks are legislative incompetence, and size and complexity of the project. The project involves dozens of organizations and system vendors, as well as hundreds of different information systems whose are integrated or replaced with Helsinki-Uusimaa region systems. Individual employees with their personal IT capabilities is difficult take into account in the risk evaluation in this phase of the project. For example, the Epic system requires end users an average of 2 days of certification training. This means over 110,000 training days in Helsinki-Uusimaa region area.

IV. Conclusions

The reform in social and healthcare systems in Finland has been described in this article. The complexity in terms of information systems has been outlined. Clearly, the needs that vary between the regions and the wide spectrum of services call for modular and scalable architecture that should be based on unified approach in defining the data structures, interfaces and interoperability. In this study, a number of parallel systems is reduced and replaced with Epic system defined by Apotti project.

It is evident that the social and healthcare system chosen will impact a large number of individuals being part of the end-to-end process including the professionals and user or customers alike. The change should improve the experience of individuals in all aspects of the process taking advantage of the digitalization that is fundamentally changing traditional mechanisms and ways of working. Part of solution is based on customers using electronic self-service tools. The professionals would utilize new digital interfaces that would provide added value being integrated across the domains and containing the accurate up-to-date information provided by end-to-end EA system. The basic building blocks of the reform are Data Lake and Data Warehouse solutions that can be used to utilize massive raw data in operational use, service optimization and research purposes.

The client's freedom of choice, the use of personal budgets and the service vouchers in health and social services [24] need a new information architecture and systems. A long transition period is needed before all municipal systems are replaced by the Helsinki-Uusimaa regional systems pose challenges to the project. Municipalities continue to develop their operations, digitalize their services and make system development, as a result of which systems and interfaces are changing. An interesting question is how massive operational and technological reform can be deployed to a heterogeneous end-user most efficiently within a tight project deadline. Also, it is an interesting question to future work to research how clients use and experience the new services. For example, the transfer of health records between municipalities is being developed and this from user perspective is substantial change in the process flow.

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