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Managing complex systems: The Labdata case

Master's thesis

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Erik Tallang and Mads W. Pettersen, May 2014.

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Abstract

The aim of this master thesis is to explore the organization of a program within Digital Fornying, namely Labdata. The goal of Labdata is to introduce a common, standard, laboratory system for the South-Eastern Norway Regional Health Authority. We compare the organization of Labdata with theoretical concepts from adaptive co-management, Weill & Ross, project and program management. In order to manage this, we have developed the following research question:

> *What are the challenges involved in the management of large scale & complex ICT systems and how can existing theories help us cope with the challenges?*

Our findings reveal communication problems in the initial phase of the project, and problems with parallel execution of deliverances. However, Labdata have been reorganized. We compare this new organization with the old in order to discuss how they position themselves according to the theory mentioned above. As our discussion indicate, the new organization of Labdata can be argued to accommodate the theory of Weill & Ross, adaptive co-management and program management. We have found that the establishment of the new organization in Labdata was crucial in order to improve collaboration, trust and learning, which is consistent with the theory of adaptive co-management.

2
Introduction

In this thesis we are investigating the organization of a program within Digital Fornying, which is an initiative from the South-Eastern Norwegian Regional Health Authority to improve and standardize the processes and technology in all the health firms in the region (Helse Sør-Øst RHF, 2014). Our goal is to help the reader get a better understanding of the nature of complex IT projects. Our theories rely upon concepts from Information Systems theory, especially IT Management and IT Governance, using qualitative research methods.

2.1 Structure of the thesis

The structure of this thesis follows traditional layout of a master thesis. As a rule of thumb, we have taken inspiration from "This is not an Article" by Carsten Sørensen (Sørensen, 2002) and drawn a few helpful remarks from it on how to write a good master thesis. In this chapter we will give an introduction to our thesis, in addition to our motivation, and background information regarding the authors of this thesis. In chapter 3 we will take a closer look at the case description, where we first present an overview of the Norwegian health sector, before we give an insight into the South-Eastern Regional Health Authority (HSØ) and Sykehuspartner. We continue by explaining Digital Fornying (DF) before venturing deeper into our main focus, which is the Labdata program. Chapter 4 explains our research method which includes our methodological approach, the methods we have been using, and how we have been collecting and analyzing our data. In chapter 5 we present the theory we have used, in order for us to be able to embed information about Labdata. In addition, a discussion follows where we discuss the relevance of the theory to our case and how we may apply

it. Chapter 6 describes our findings before we finish off with discussion in chapter 7 where we apply the selected theory to our findings.

2.2 Motivation

The large technological development over the past decade has enabled us to develop more advanced systems, which in many cases may be a large benefit for the users. However, with the rising development comes complexity, especially when dealing with information infrastructures that may provide several challenges, such as bootstrapping and adaptability (Hanseth & Lyytinen, 2010). Complexity is not only a challenge within the field of information infrastructures but may also appear in many other fields, such as project- and program management.

Over the past years there has been an increased focus on issues regarding errors in our health systems, errors where some have been more dramatic than others (Vedeler & Eggesvik, 2013). These headlines have drawn our attention towards this subject, which have made us curious of how such errors may occur. Initially this sounded like a straightforward subject, but the field of health care proved to be a challenging subject, mostly due to the complexity of the South-Eastern Norwegian Regional Health Authority. This complexity consists of several parties, which are involved in DF, and all its programs. This will be described in depth later in this thesis. There are several IT projects that have been tried implemented at HSØ over the past years, whereas some of them have been more successful than others.

Our initial motivation for this subject was the issues in the Norwegian Health Care, but as we dived further into its organizational structure, it was soon obvious that our initial understanding of it was limited. Through meetings with our master thesis supervisors and other staff here at Department of Informatics we decided to take a look at one of the projects conducted within Digital Fornying (DF). However, DF consists of several programs, so a selection was necessary in order to limit the scope of the thesis. Our strategy was to conduct several interviews with staff throughout several layers of the HSØ and DF to hopefully reveal possible problems for our master thesis. However, we did not reveal any good subjects that could be used to formulate a research question. Through new meetings with our co-supervisor Margunn Aanestadand supervisor, Ole

Hanseth we were able to discuss the situation, and formulated an interesting research question which is presented later in this chapter.

2.3 Background

The authors of this thesis, Erik Tallang and Mads W. Pettersen are both students from the Systems Development professional study, with affiliation to the Global Infrastructures (GI) group at the Institute of Informatics here at the University of Oslo. During our five years here in Oslo, we have both been taking courses mainly in the field of Information Systems (IS), including IT Management, Information Infrastructures, Health Management information systems and system development. Throughout our studies we have developed a keen interest in the IS field of study, and the variety of the courses we have taken and completed have helped give us a broad perspective into that matter. The field of informatics is vivid; where new opportunities and challenges arise quickly, and we believe the ability to have an open mind, considering new methods and approaches would be essential for anyone wishing to venture deeper into the aspects of informatics.

2.4 Research question

When we began writing our master thesis, our research question was different from the one we have today. At that point, we wanted to know how the communication and interplay between Sykehuspartner and HSØ was working. However, we soon realized that we needed to narrow down our research question, and pinpoint a smaller part to focus on. In order to achieve this we decided to have a look at one of the programs in DF. Many of our interview subjects were associated with the Labdata program and mentioned several challenges they had in the opening phase of the program, and we followed their advice to have a closer look at it. By narrowing down our research question, and have a main focus on Labdata instead, we got the opportunity to formulate the following research question:

What are the challenges involved in the management of large scale & complex ICT systems and how can existing theories help us cope with the challenges?

Through this research question, we aim at highlighting the challenges involved in the management of large scale & complex ICT systems by looking at the case of Labdata. Within Digital Fornying there is a dedicated program named *Infrastructure Modernization* (Infrastrukturmodernisering) that has as a sole purpose to establish a standardized infrastructure for all the programs in DF. However, since DF is in its early phase, the programs are responsible for establishing their own infrastructure until the standardized infrastructure has been developed. This is therefore a suitable time to observe the internal organization of Labdata. We will use this case to highlight how the organization of the program has changed over time, and how this organization has resolved challenges related to the program. Further on, we discuss the organization of Labdata by applying relevant theory, namely Weill & Ross, adaptive co-management and program management. Our research approach is empirical with an analytical result. Details regarding our research method are described in chapter 4.

3
Case description

The aim of this case description is to identify the different parties that are both relevant and applicable for our thesis. We will start by describing the structure of the Norwegian Health Sector, followed by HSØ, Digital Fornying, Sykehuspartner and the external software supplier Software Point. While describing Digital Fornying and all of the programs within DF, we dispose most of this case description to Labdata, since this program is the target for our thesis. In addition to an overview of the mentioned parties, there is also a brief description of the architectural practice in HSØ, namely TOGAF. A short description of the collaboration model between HSØ, Sykehuspartner and the health firms is provided towards the end.

3.1 The Norwegian Health Sector

The South Eastern Norwegian Regional Health Authority is a part of the Norwegian Health Sector and was established in 2007 (Figure 1). Prior to this, every health firm[1] was owned by its associated county. This fragmentation of responsibility resulted in each of the health firms doing what was best for them, without looking at the bigger picture. This resulted in an increased heterogeneity of the IT systems in use at the different health firms in Norway. Through a mapping of the IT situation in Norwegian health firms counted over 3500 different systems spread across 12 different platforms and 3500 severs (Helse Sør-Øst RHF, 2012). This is when a draft was sent the 18th of February 2001, which suggested a new health reform and a reorganization of the health firms. The motivation for this reorganization was that the heterogeneous systems made it difficult for different health firms to cooperate, for instance in moving a patient from

[1] Health firm is used as a thesaurus for a hospital/hospital trust within the South-Eastern Regional Health Authority

one hospital to another. It was also a question of following the technological advances that had been made since many of their old systems had been developed and implemented. Because of this decision of reorganization of the Norwegian Health Authority, all of the health firms were grouped into The Northern Norwegian Regional Health Authority, The Western Norwegian Regional Authority, The Southern Norwegian Regional Authority and The Eastern Norwegian Regional Authority. In 2007, the Southern- and Eastern Norwegian Regional Authority were merged to improve coordination of health services and resources. The Health Authorities and the Health Trusts Act of 2001 are responsible for regulating the Norwegian public health, while each of the health regions illustrated in figure 1 has their own Health Trust that own and operate the hospitals. These Health Trusts are organizations and are overseen by boards appointed by the regional health authorities (Truong Le, et al., 2013).

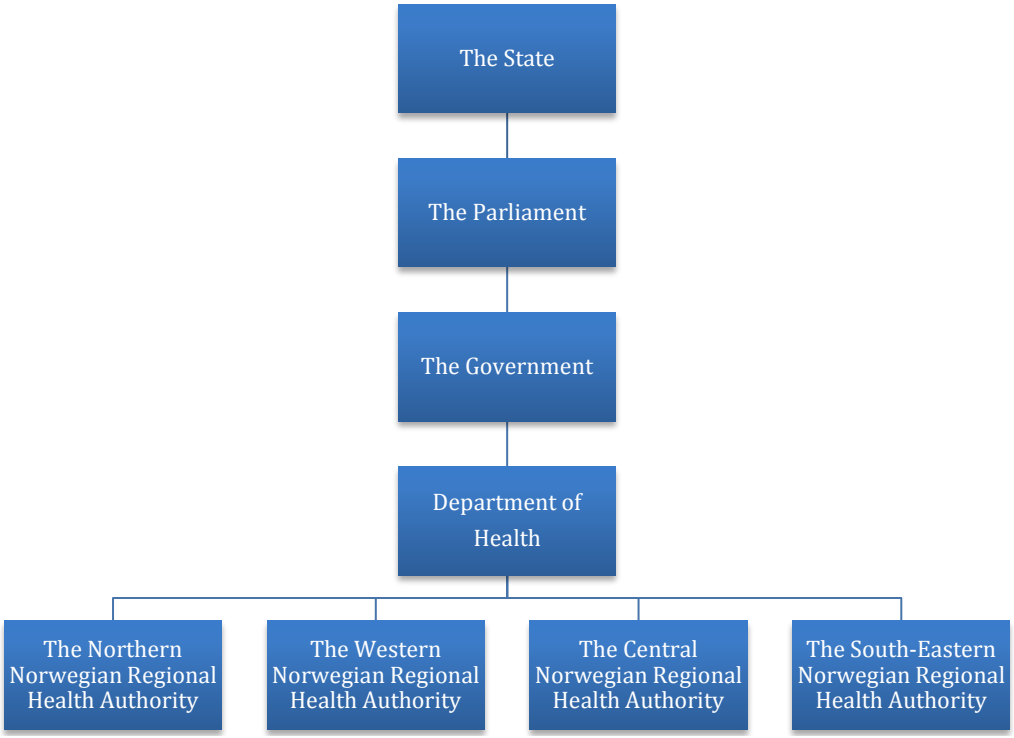

Figure 1: The organizational hierarchy of The Norwegian Health Authority

3.2 HSØ

As mentioned in the previous section, The South-Eastern Norwegian Regional Health Authority (HSØ) is a sub section of the Department of Health. It consists of 10 hospitals, namely *Akershus University Hospital*, *Oslo University Hospital*, *Sunaas hospital, Vestfold*

Hospital, Innlandet Hospital, Telemark Hospital, Østfold Hospital, Sørlandet Hospital, Vestre Viken and finally Sykehusapotekene . Of all of these health firms, OUS is by far the biggest, as it includes several hospitals, namely *Aker University Hospital, Ullevål University Hospital and Rikshospitalet*. These hospitals were merged into OUS in 2009 in an attempt of strengthening the role as a local hospital, uniting regional functions, adapting resources to a reduced catchment area and establishing good pathways of patient care (Oslo Universitetssykehus HF, 2014). Because of this, a realignment process had to be initiated to make the hospitals able to share information seamlessly. The current provider of IT services to HSØ, Sykehuspartner, did therefore become responsible for this realignment. Sykehuspartner was created in 2003 and is a unit of HSØ that is being run as a separate business from HSØ, and are responsible for running and maintaining IT applications and infrastructure for the hospitals of HSØ.

In order to standardize the technology and the following IT infrastructure, decisions had to be made regarding which platform to adopt as a regional standard. DIPS has been adopted as a regional standard as a PAS/EPJ (Patient Administrative System/Electronic Patient Journal) system. However, DIPS covers only the area of PAS/EPJ, so other systems must be adopted as regional standards to support the other areas of expertise that are provided by the health firms. All in all, HSØ does not only provide hospital services, but does also contain psychiatric institutions and other sorts of drug treatments, ambulance service, emergency service, patient transport, training institutions for people to recover from injuries, hospital pharmacies and laboratories (Helse Sør-Øst RHF, 2010). In 2013, the HSØ provided specialized health care for more than 2,8 million patients in the region, there were more than 75 000 employees working in HSØ and the budget for HSØ in 2013 was a total of 68 billion Norwegian kroner (Helse Sør-Øst RHF, 2010).

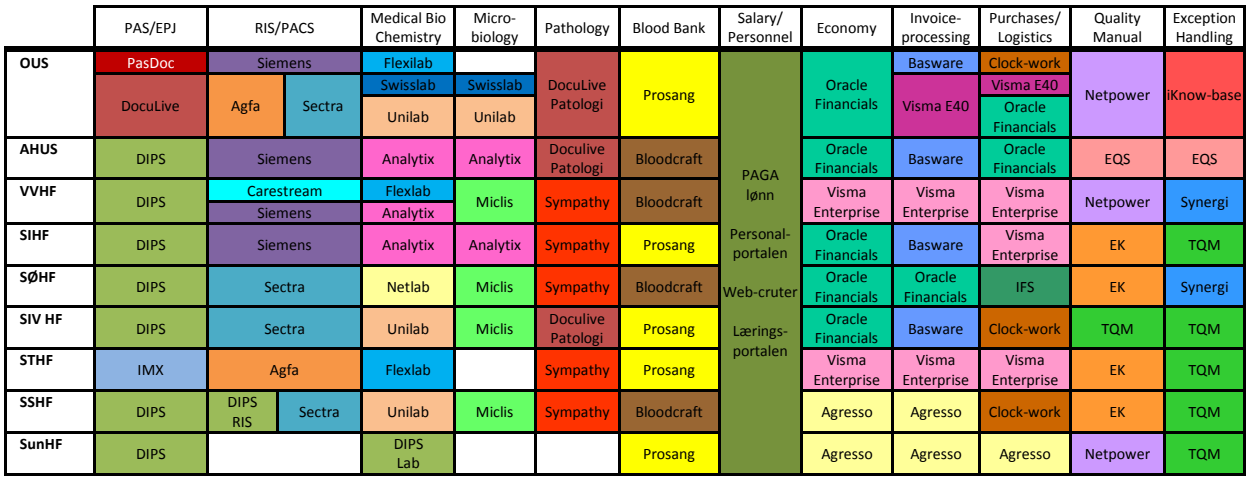

Figure 2: The initial health applications mapping of the region (Sykehuspartner, 2012)

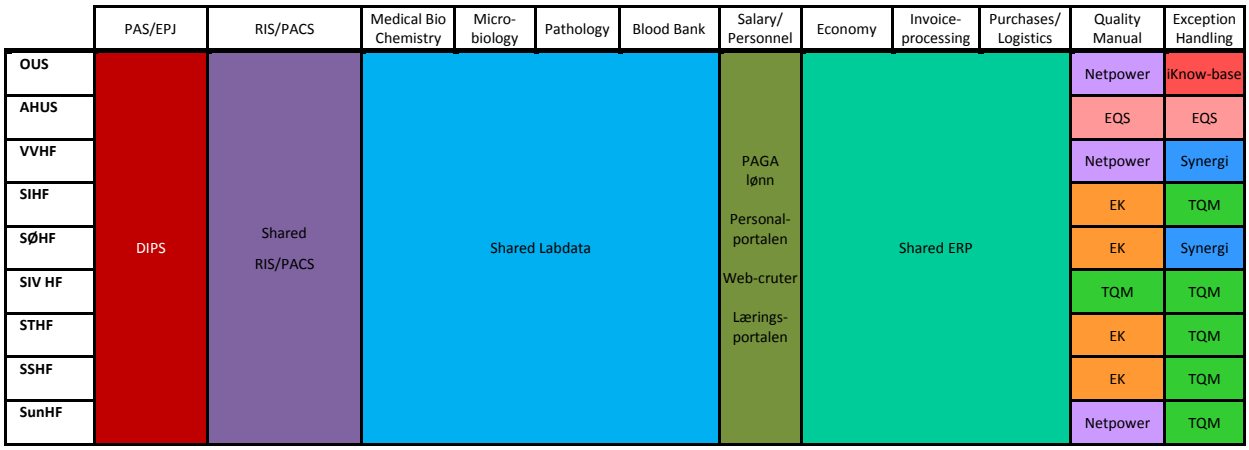

Figure 3: The envisioned health application overview (Sykehuspartner, 2012)

3.3 Digital Fornying

When the merging of the health firms into the four health regions presented above was complete, it was concluded that an upgrade of the technological equipment was necessary, and that it would improve the efficiency of the patient treatment. When this was decided in 2013, *Digital Fornying* (DF) was established. DF is a program for renewal and standardization of the technology and its following IT infrastructure in HSØ (Helse Sør-Øst RHF, 2014). As figure 4 illustrates, DF consists of several modules, where our focus will be in one of the regional programs, namely Labdata. More details around Labdata, Fornyingsstyret (The Renewal Board) and the other five regional programs is given below.

Fornyingsstyrets task is to manage the implementation of the regional standardization programs and to ensure that the health firms benefit from the changes(Helse Sør-Øst RHF, 2013). In order to divide the final goal into manageable tasks, there have been established six different programs. Within each of the programs, there are internal projects that the program manages internally. The programs are *Klinisk dokumentasjon (Clinical documentation), Digital samhandling (Digital interaction), Radiologi (Radiology), Virksomhetsstyring(Governance), Infrastrukturmodernisering (Infrastructure moderinization)*and finally *Laboratoriedata (Laboratory data, also referred to as Labdata).*

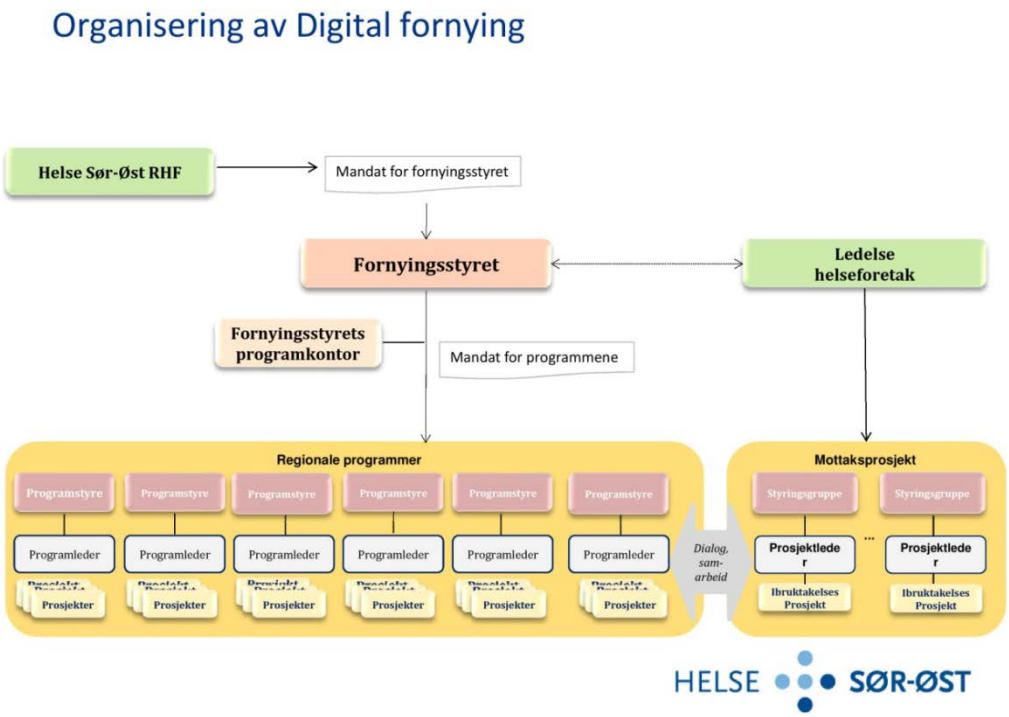

Figure 4: The organization of Digital Fornying

3.3.1 Klinisk dokumentasjon

The purpose of Klinisk dokumentasjon is to establish standardized solutions within clinical documentation. This involves that all the necessary patient information is available when it is needed, which may help increase the efficient flow of patients in the hospitals. Another goal for this program is to make sure patients who are expecting requests from their hospital receives these in time. This program's scope includes e.g. an electronic patient journal, curve functionality, children- and youth psychiatry, ePrescription, and birth journal (Helse Sør-Øst RHF, 2013).

3.3.2 Digital samhandling

This program's main priority is to maintain a good and reliable interaction between e.g. patients, doctors, NAV, pharmacists and the hospitals. A part of this consists of providing updated patient information at all times where ever the patient may be, and enabling efficient further development of digital interaction. This will also provide the patients with a digital journal they may access easier than their current journal (Helse Sør-Øst RHF, 2013).

3.3.3 Radiologi

Through the radiology program which also is referred to as RIS/PACS (Radiological information system)/Picture Archiving and Communication System), DF hope to improve the quality of health services through simplified exchange of health related pictures between hospitals and radiological institutes. This will be done through a regional solution for referral of patients, visualization, diagnosis and storage of radiological and nuclear medicine- pictures, such as x-ray pictures, MR- and CT-pictures(Helse Sør-Øst RHF, 2013).

3.3.4 Virksomhetsstyring

This program differs from the others by the fact that its purpose is to establish good use of resources in the organization, and does therefore not affect the patients in a direct manner. This is accomplished through the implementation of a regional ERP system and a regional data warehouse, which may provide new and updated data, which may help the organization in making the correct decisions. It will also provide better support regarding management decisions, and more efficient operation of economics- and logistics functions.

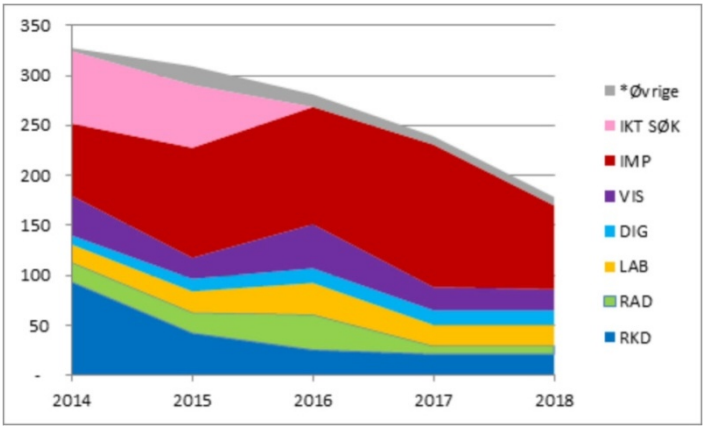

Figure 5: Resource needs in the programs

3.3.5 Infrastrukturmodernisering

The purpose of "Infrastrukturmodernisering" is to modernize the underlying infrastructure used in HSØ. This includes data centres, network, IKT-platform, telecom, application environment and operation- and deliverance concepts. Data centres include all regional and local computer rooms; network includes all network- services and components in addition to wireless networks. The IKT-platform is a part of the operation of application services. Telecom includes among others telephony, mobile, videoconference, paging, closed radio net and intercom. An application environment consists of categorization of production models, consolidated centralization of production- and storage solutions, facilitation for consolidation of applications, security solutions and information management. The last category, operation- and deliverance concepts consists of among others governance, deliverance- and operation models, cost models, service orientation and architecture(Helse Sør-Øst RHF, 2013). As figure 5 illustrates, IMP is the most resource-intensive program.

3.3.6 Labdata

The main priority of Labdata is to implement a new regional laboratory system as a standard for all the hospitals in the region. This system should cover general laboratory medicine, which is medical biochemistry, clinical pharmacology, hormone analysis and immunology. It also includes microbiology, pathology and a blood bank (Helse Sør-Øst RHF, 2013). This system is first to be implemented in the new hospital in Østfold (PNØ), before it later on will be implemented at OUS where the larger complexity of OUS has to be considered. This strategy prevents them from dealing with the complexity of OUS immediately. When Labdata has been successfully implemented at OUS, the changes done to Labdata from the version implemented at OUS is to be implemented at PNØ, before this version of Labdata is to be used as a regional standard and will be delivered to all the remaining health firms in HSØ.

Within Labdata there are five software development projects done by an external software company, and two active delivery projects, which consists of software implementations at the health firms mentioned above. There will be initiated a new delivery project for each implementation of Labdata at each health firm. However, the implementation at the other hospitals other than PNØ and OUS is so far ahead in the future, that projects for these hospitals will be delayed until the implementation at OUS

and PNØ are complete. In figure 6 the old organization of Labdata is displayed with all the elements that constitutes the organization. The previously mentioned development projects are located in the orange box to the left. Below is a description of what the main purposes of the different projects are. Each projects is marked with a letter that corresponds to the letter given to the project in the architectural map given below.

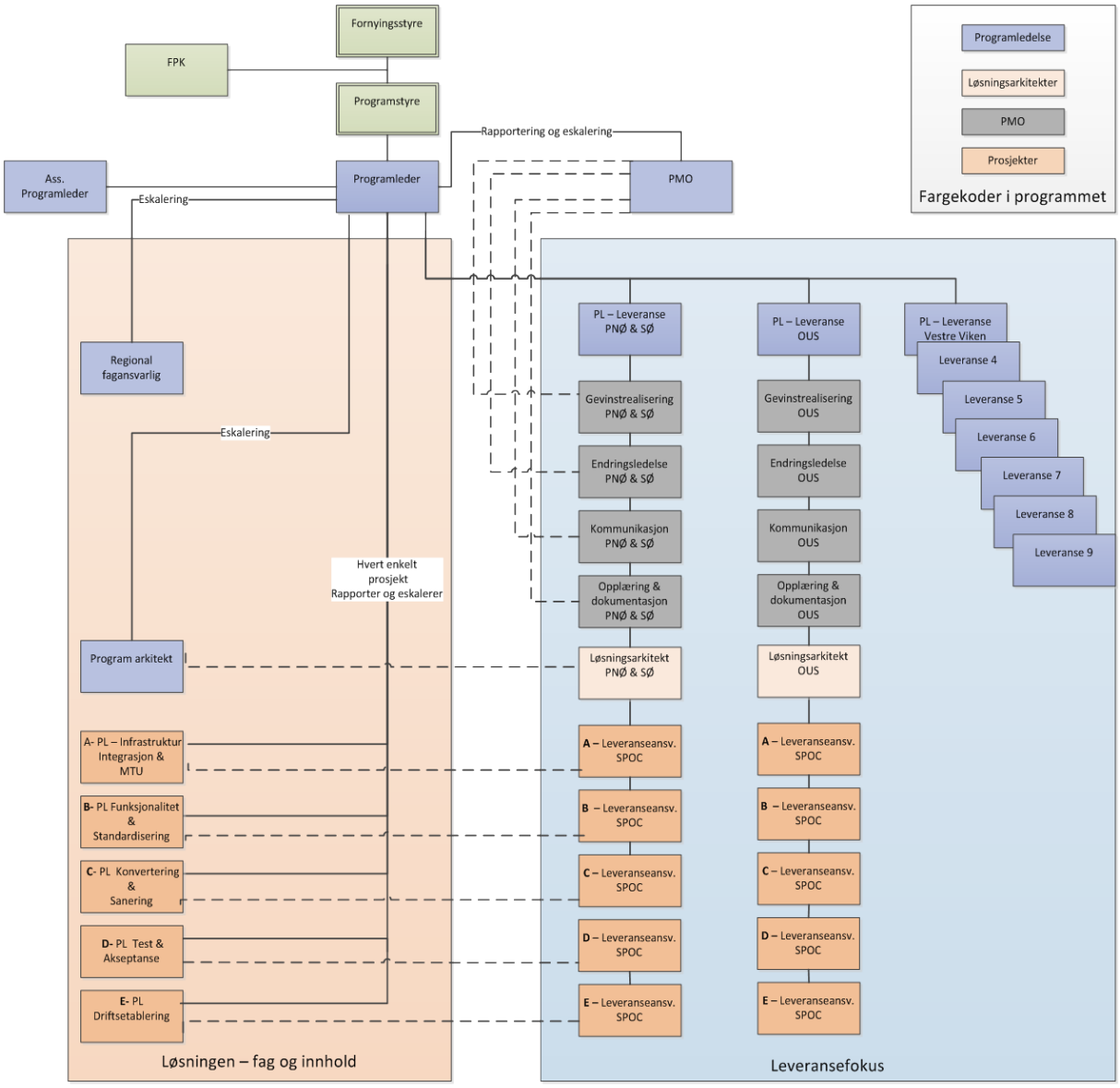

Figure 6: The old organization of LAB

- *Infrastructure and integration* (A): The responsibility of this program is to establish the environment that the application will be running on. In practice, this means to implement all sorts of hardware, such as printers, label makers, and other equipment. In addition, this project has the responsibility of configuring the fileservers that the

database is to be implemented on. This does also include responsibility regarding opening firewall ports, so that communication with other servers is possible.

- *Functionality and standardization* (B): This project is not as technical as the infrastructure and integration-project, as its main area of focus is regarding terminology and standards within the field of chemistry. Since every health firm within HSØ is supposed to use the same standardized application so that they may share patient data, the health firms also need the same definitions for medical terms. If an employee from one health firm writes in a patient's journal, employees from the other health firms need to be able to understand what is written. Primarily, this involves, as previously mentioned, standardization of medical terms, but does also involve standardization of procedures during analyses and standardization of analysis codes. Even reference values (which is values the doctors use in order to see if e.g. the blood test of a patient was within normal parameters) have previously not been standardized between health firms, and needs to be standardized.

Conversion project (C): In the previously used lab systems, the data was stored in a custom data format, which was different for each of the systems in use in the health firms in HSØ. When the transfer from the old system to the new takes place, the data from their old system needs to be converted so that it is compatible with the new database which is shared for all health firms. This is a challenging task, as there are several different systems in use at the health firms. The data from the old systems must therefore be updated to fit the new standard upon the deployment of the new platform.

Test/acceptance project (D): The main purpose of this project is to test the application while it is being developed. This includes test management and acceptance tests to make sure that the delivered product meets with the requirements that have been established through the contract with the supplier Software Point. The testing is conducted by running different kinds of test cases where the functionality of the system is tested to meet desired requirements.

Operating establishment (E): This project differs from the other projects since it does not deal with the new lab application in any direct manner. However, this project's main responsibility is management between the projects to make sure that dependencies are

resolved in a best possible way and that the interaction between the projects in Labdata goes as planned.

3.3.7 The Delivery Projects

The delivery projects on the other hand are located in the blue box to the right in figure 6. As the figure illustrates, the first delivery is to PNØ. After PNØ comes OUS, before the delivery to all the other hospitals within HSØ are visualized by the boxes called "*Leveranse 4-9"* to the very right in the delivery box. Each of the software development projects has a corresponding project within the delivery project of each of the hospitals. Whenever a software-development program has a delivery, there is therefore a corresponding project at the hospital that is implementing the software. The sum of all the delivery projects A-E within a hospital is therefore a complete Labdata system for that hospital. Within each delivery project, there are also projects regarding e.g. *change management* and training for the employees that are about to use the new software. The LAB program does in other words not only involve the development and implementation of a laboratory system, it also provides training and change management to handle the organizational changes of the new system. All of the projects mentioned report to the program manager that is positioned at the top of the program and reports to the program board. Both the Project Management Office (PMO) and an assisting project manager assist the program manager. The main purpose of the Project Management Office is to establish the cooperation model for the program in addition to continuously regulating how the parts in Labdata cooperate.

3.4 Sykehuspartner

In an attempt of centralizing the South Eastern Norwegian Regional Health Authority in 2003, all employees in the HSØ related to IT was moved to a new firm that was called Sykehuspartner, which is a unit within HSØ. The idea was that a modularization of the health firms was desired, which meant dividing IT expertise and patient care. Naturally, this implies that the main purpose of Sykehuspartner is to perform non-medical shared services for the health firms by offering support in a more efficient manner than the single health firm can manage themselves with a satisfactory quality (Helse Sør-Øst RHF, 2010). As Sykehuspartner is a part of HSØ, and one of the main priorities of HSØ is organizing and development of shared services, this has become an important part of

the agenda of Sykehuspartner as well. In practice, this implies DF, which is described above.

The responsibilities of Sykehuspartner may be divided into five business areas, namely *IKT-Facilities*, *HR-Services*, *IKT-Services*, *Project Services* and *Purchases and Logistics*. The largest of these are IKT-Facilities that was established in the beginning of 2006, which of operation of infrastructure and all the applications of the health firms in HSØ, in particular EPJ systems. They are also responsible for project management and counselling. HR-services (Human Resources) involves salary and employee services. In addition to this, there are other responsibilities such as reimbursement of travel costs for the employees and an E-learning portal. IKT-Service consists of a help desk service for the employees in the health firms in HSØ. If anyone experiences problems with any of the applications supported by Sykehuspartner, they may call IKT-Service at Sykehuspartner to get help resolving the issues. This business area is also responsible for technical support, logistics and a department dedicated to process improvements (Helse Sør-Øst RHF, 2014). The purpose of Project Services is to devote resources to the many projects that are being developed at SP. This business area has been growing due to the large resource requirement of DF. The last business area, purchases and logistics, has the responsibility of all of the procurements to HSØ. In 2010 and 2011 several other responsibilities was added to the business area, such as contract management, logistics and IKT-procurements.

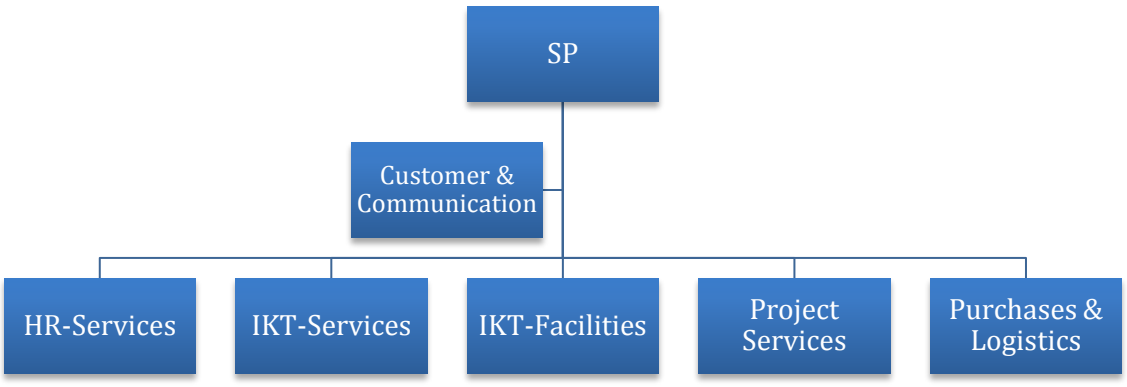

Figure 7: The organizational structure of Sykehuspartner

Today, the business area consists of four departments; Procurement Purchases, Operation Purchases, Contract Management and Logistics. Along with the five business

areas, there is a new module called Customer and Communication, which was very recently added due to organizational changes within SP.

3.5 Software Point

When the decision of developing a new standardized laboratory system was made, a bidding had to be conducted in order to follow Norwegian law. Software Point has been a customer for HSØ at previous occasions, and since their offer was considered the best, they won the bidding and became the provider of the new lab system for all the health firms in HSØ.

Software Point is a Finish company established in 1992. From their establishment, they have specialized themselves within the field of Laboratory Information Management Systems (LIMS). This does however not only involve clinical laboratories, but does also include bio banks, food-, pharmacy-, steel-, oil- and chemical-industry. They consist of approximately 80 employees, which make them the largest software company delivering LIMS. They provide LIMS to more than 500 laboratories in the Nordic. They mainly provide consultant services, but do also provide services around implementation, training and support for their LIMS. Their headquarters is in Espoo in Finland, however they have also established offices in Stockholm, Lund, Linköping and Oslo (Software Point, 2008).

Within the field of healthcare solutions, Software Point delivers several products where one of them is LABVANTAGE Medical Suite. This is the foundation of the system that is about to be implemented at all the health firms in HSØ through DF. However, an out-of-the-box implementation is not desired, as there is custom functionality that is required by the Norwegian health firms. The LABVANTAGE Medical Suite is a platform with all required functionality in one system, namely clinical chemistry, microbiology, pathology, digital pathology, bio banking and blood banks. This is originally a browser-based platform and consists of functionality to e.g. perform request and result management of analyses, quality management, sample validation, and management of tests and methods (Software Point, 2008). In addition to this functionality, Software Point gives full support of the application for the entire lifetime of the specified product.

3.6 TOGAF

Recently, Sykehuspartner changed their architectural practice towards TOGAF. This was to meet with the new regional requirements that said that all parts of HSØ are to use TOGAF as their architectural practice, which meant that Sykehuspartner had to change their architectural practice as well(HelsIT, 2011). TOGAF is developed by The Open Group from the United States and consists of four interrelated enterprise architecture domains, namely *Business architecture*, *Applications architecture*, *Data architecture* and *Technical architecture*. The *Business architecture* domain consists of defining the governance, business strategy and key business processes of the organization. The *Applications architecture* domain on the other hand should provide a blueprint of the applications in use in the organization, in addition to the interaction between the different applications. It should also provide an overview of these applications relation to the core business processes in the organization. *Data architecture* targets the organizations data layer, and should give a good description of the logical and physical data assets in the organization. The final domain, *Technical architecture*, can be viewed as the bottom layer of the infrastructure, providing hardware and software platforms for the other layers to rest upon. This domain should describe this hardware and software; in addition to network which all should provide support for the deployment of applications on top. As proclaimed by The Open Group, TOGAF effectively address critical business needs by ensuring that everyone speaks the same language, avoiding lock-in to proprietary solutions by standardizing on open methods for Enterprise Architecture, saving time and money and utilize resources more effectively, and achieving demonstrable ROI (The Open Group, 2014).

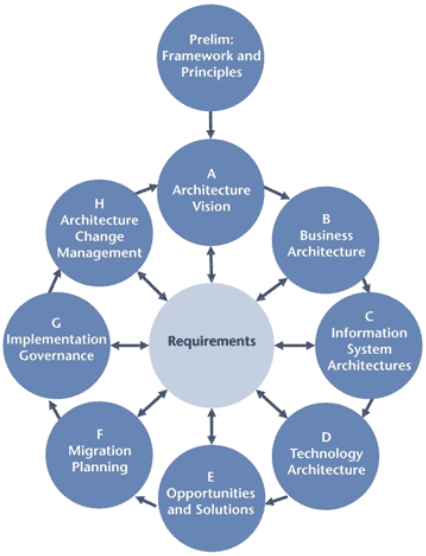

Figure 8: The TOGAF Architecture Development Method

3.7 The Governance Model (Y-model)

There exists a connection between Sykehuspartner, HSØ and the health firms and its users. This connection is often referred to as *the Y-model*. The purpose of this model is to divide the areas of responsibilities into three distinct roles, namely "premise establisher" (HSØ), buyer (Health Firms) and lastly the supplier (Sykehuspartner). These are all represented in the figure below. The purpose of this division is to clarify the roles, the different areas of responsibility, and division of tasks. This model also establishes interfaces between them(Helse Sør-Øst RHF, 2010).

The first interface lies between HSØ and the Health Firms. The health firms report to HSØ about their current situation regarding systems, and inform whether they are in need for new services, while HSØ report to the health firms about guidelines and plans for the future. Between HSØ and Sykehuspartner there is also an established interface. HSØ report their quality requirements regarding the systems, in addition to safety requirements and frameworks. Sykehuspartner on the other hand inform HSØ of which technological solutions that are available. The final interface exists between the health firms and Sykehuspartner, where they exchange agreements and partnership. As previously mentioned in this thesis, there have been several headlines in newspapers regarding problems with IT as different Norwegian health firms during the past years(Holm, 2011). Many of the issues discussed in these articles relates to the Y-model,

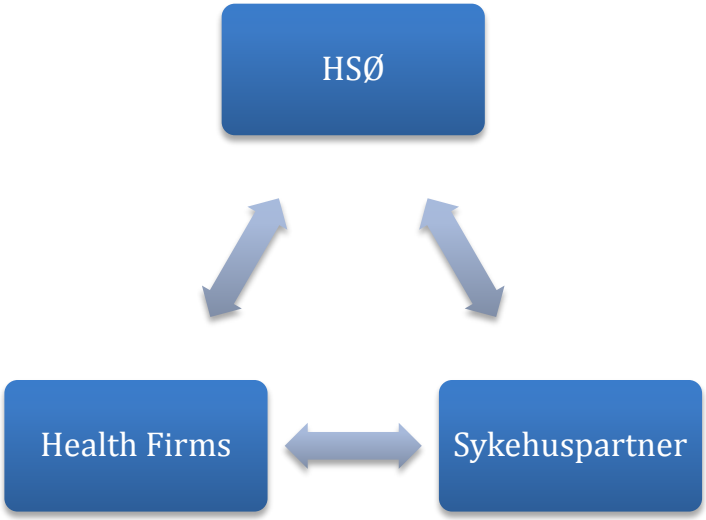

Figure 9: The Y-model, consisting of SP, HF and HSØ

as Sykehuspartner contains all the IT-employees and is responsible for the IT-solution at the health firms, while the health firms consists of strong academic environments with strong links to the practice of good health care, but has limited knowledge of IT. Through the delivery of new systems to the health firms, there have also been known challenges between the users at the health firms and Sykehuspartner, which delivers the new systems. This was the case during the development and deliverance of Klinisk Arbeidsflate (Sannes, 2011). Klinisk Arbeidsflate had many struggles, before the project got canceled at the end. Before this, some health firms had been testing the unfinished product, with great difficulties. Because of the challenges the health firms had to deal with while using the unfinished system, a feud occured between the research groups at the health firm and Sykehuspartner.

4
Research Method

The first phase was our master essays, which we completed last spring. The essence of this essay was to simply describe our main area of focus. This essay also included which parts we wanted to learn more about and dwell deeper into. Most of our research was done by simply finding reliable sources on the Internet, in addition to consulting our supervisors, so we could learn more about how the Norwegian health-care system was working. This gave us an understanding and insight into the Norwegian health sector and the different programs that existed within DF, which we found very interesting and decided we wanted to have a closer look at this.

Since this was just the preliminary phase of our work, more of a short description of our upcoming master, there was no need for us to conduct interviews at that point. A simple document analysis, where we studied existing material contributed by the South Eastern Regional Health Authority, would be sufficient.

As for our final thesis, we started our research by conducting interviews with employees that had different background and roles within Sykehuspartner, HSØ, OUS and DF, to both serve as a mapping of the field of study and to help us get a better understanding of areas that we could have a closer look into. Data from these interviews were mostly information about the different organization within the Norwegian health sector, presented in our case description. When the introductory interviews was completed, we started to narrow down our field of interest and planned in-depth interviews to be held with representatives from the relevant field of work.

The focus of this chapter is to describe the research methods that we have been using, in addition to justify why those particular methods are applicable to our case. We will also highlight which research methodology that has been used for our thesis, and argue why

that particular methodology is appropriate for our case. We will also describe how the research have been carried out in practice, especially the interviews, how we collected our data, and the strategy we chose for how to analyze the data collected.

4.1 Philosophical perspective

“All research (whether quantitative or qualitative) is based on some underlying assumptions about what constitutes ‘valid’ research and which research methods are appropriate. In order to conduct/or evaluate qualitative research, it is therefore important to know what these (sometimes hidden) assumptions are.” (Myers, 2014)

The three main philosophical perspectives that Klein and Myers discuss are:

1. Positivist research

When research is positivist, they generally assume that reality can be described by measurable properties and it is objectively given and independent of the observer and his or her instruments. IS research has been classified as positivist if there was evidence of formal propositions, quantifiable measures of variables, drawing of inferences about a phenomenon from the sample to a stated population and hypothesis testing. (Orlikowski & Baroudi, 1991)

2. Interpretive research

When conducting an interpretive research, one can start out with the assumption that access to reality is only given through social constructions like language, shared meanings and consciousness. Generally interpretive studies attempt to understand phenomena through the meanings that are assigned to them. Interpretive methods used in IS research has a goal that is "aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context"(Walsham, 1993).

3. Critical research

When doing a critical research study, you assume that social reality is something that is constituted historically and is produced and reproduced by people. Even though you can act to change your social and economic circumstances, Klein and Myers continue by saying that their ability to do so is constrained by various forms of social, cultural and

political domination. They continue by stating that the main task of a critical researcher is seen as social critique, whereby the alienating and restrictive conditions of the current status are brought to light.

We would argue that an interpretive research is the perspective best suited for this thesis. This is because interpretive research can be related to the nature of our research question; what are the challenges involved in the management of large scale & complex ICT systems and how can existing theories help us cope with the challenges? We do not have an assertion we want to verify, we have a question we want to answer and interpret with our collected data.

4.2 Research Methodology

The research methodology best suited for this thesis is an explorative case study approach. The research focus of our master is to have a closer look at the challenges involved in organizing and managing large-scale ICT systems, which is a typical qualitative research question.

Case study

A case study is described as an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. (Yin, 2002) To explain this with other words, one can say that the purpose of a case study is to try and understand the case, with a point of view from the case itself. One needs to find out what is important within the specific case. The usage of this type of study is highly applicable when a case is unique; there is a large focus on local meanings and specific activities.

There are no specific technique for information gathering attached to case study. The most common techniques are studying existing texts and interviews, which we will be using.

4.3 Techniques for information gathering

Our data collection is based on an approach of exploration and comparison, where we compare the information from studying existing texts and material, then compare and complement this information with data from our interviews.

4.3.1 Studying existing texts

To gain a better understanding of our topic, we have studied work that had already been done within this field. This gives us additional resources and ideas for the future data collection. Additionally, we have looked at forums and online articles to develop a general understanding of people's opinion about the matter. However, information found online is treated with reserve, because of our intention to use this for the initial work and not in our actual thesis. We have been using public reports and available statistics from HSØ as a supplement.

4.3.2 Semi structured interviews

Our interviews have been semi-structured in order to maintain a flowing conversation with the interviewee and make them feel like it's more of a conversation, rather than an interrogation. Since the interviews lasted for approximately an hour each, we prepared between 10 and 20 questions in advance, some questions to be asked all the interviewees and others customized to fit their specific role. People we interviewed were mainly chosen because of their affiliation and role they had in their respective organization.

4.4 Data Collection

Our data collection can be divided into two different categories. As previously mentioned, our data collection started through our ten preliminary interviews. However, this data was used merely for mapping the field of study. These interviews were conducted before we had a specific research question for our thesis. The questions we used during these interviews were therefore more of a general nature, only to serve as a tool for understanding the area of research, possibly stumbling upon issues or interesting problem areas we could have a closer look at in our master thesis. Initially we were four students who had developed a keen interest on this matter, which all participated in these preliminary interviews, namely the authors of this master, in addition to Dan Truong Le and Joachim Ådnanes. These interviews were also semi structured where we only had a few questions ready in advance. This was a means to engage a dialogue and using the prepared questions for highlighting issues we knew were relevant for our master. The interviews lasted for about an hour, and included

employees from different parts of the Norwegian health care, including for instance Sykehuspartner and OUS.

During the second phase of our interviews, we had acquired a better knowledge of the field, and were able to formulate the master issue that is presented above. We both understood early on that we needed to have a lot more knowledge about how the different parties were involved in the Labdata program, in order for us to be able to ask the relevant questions. So we started studying documents and other useful information that was available on the different parties websites.

We soon discovered that only knowing how Labdata was working would not be sufficient. We also had to learn how the other parties such as Sykehuspartner, HSØ, DF and the Norwegian Health Sector were operating. We used the same approach for acquiring the required knowledge, by studying their respective websites for information. During our interviews, we also made sure to ask if they had more information when that was not available on their websites, to help us get a better understanding. This made our job much more straightforward, since we were able to tailor the questions for each single interview. The interviews from this point and forward did therefore include more specific questions. The interviews were still semi structured, but the scope of the interview was narrowed down to better fit our specific research question and their role in the program. Since we already had established contact with some subjects through our first cycle of interviews, we tried to keep the connection with some of those we found particularly relevant, and invited some of them to a second interview, which now would be a part of the second cycle of our interviews.

When conducting our interviews we started by presenting ourselves, our motivation, and what we were dealing with in our master thesis. We then handed out our consent-forms, which was approved by the Norwegian Social Science Data Services (NSD), containing information about participation in our project, permission to tape-record the interview and ensuring that no sensitive information or patient information would be collected. There were no problems with the interviewees signing and agreeing to our consent form. Questions used during this phase of interviews included their general perception on DF and Labdata, and explicit questions about challenges they had encountered. Our approach was to ask each individual the same question regarding possible improvements in organisation, management and communication after DF was

introduced. Although the interviewees' subjective opinion on the matter came to light, but the general opinion of each individual were the same, which improved the validity. Challenges they had experienced with Labdata had a large focus in our interviews, and most of the interviewees answered there had been challenges with Labdata in several ways. These challenges are presented in our findings chapter. Other activities taking place during our interviews included filling out and explaining input/decisions in the Governance Arrangements Matrix with a representative from Labdata.

In order to answer our master issue to the best of our efforts, we have also attempted to get access to meetings between representatives from Sykehuspartner and the Labdata program of DF. It was not easy to get access to this meeting, since the parties involved have a very busy schedule and other important matters that needed attention. The reason we wanted to do this observation was to get a closer look at how the communication between the different parties actually was. Sadly, we never got to observe the weekly meeting we were supposed to attend, for reasons that are unknown to us.

Interviewee #	Role	Affiliation	Gender
1	Manager, Technology Development	HSØ	Male
2	Project manager, system management	HSØ	Female
3	CEO, OUS	OUS	Male
4	Assisting Manager, DIPS at OUS	Sykehuspartner	Female
5	Manager, Technology Development	HSØ	Male
6	Section manager, IKT and interaction	Sykehuspartner	Female
7	Manager - ICT Sourcing- and Service Management	OUS	Male
8	IKT Manager	SI HF	Male

Figure 10: Key Information about interviewees from the first phase of interviews

Interviewee #	Role	Affiliation	Gender
1	Chief Physician, Radiology	Rikshospitalet	Male
2	Director of Project Services	Sykehuspartner	Male
3	Program Manager LABDATA	HSØ	Male
4	Manager Process improvement	Sykehuspartner	Male
5	Program Manager LABDATA	OUS	Male
6	Project Manager ICT Infrastructure	PNØ	Male
7	Program Manager IKT SØK	Sykehuspartner	Male
8	Program Architect LABDATA	Sykehuspartner	Male
9	ICT Manager	HSØ	Male
10	ICT Sourcing & Services MGMT	OUS	Male
11	Assisting Director ICT Services	HSØ	Male

Figure 11: Key Information about interviewees from the second phase of interviews

The list of our main interviewees is consisting of eleven people, all with different background. The reason we did this many interviews was mainly because of the large number of parties that were involved in the Labdata program. Additionally we also wanted to talk to people working with different aspects of Labdata, meaning the customer, developer and users. By doing this we hope to get a better view of the whole picture and not just one side of the story. Our selection of informants is based on their role at different stakeholders for the Labdata program.

4.5 Own reflections

Since the project we are studying still is a "work in progress", we knew in advance that the people we needed to get in touch with would have a very busy schedule. Even though they had a lot of work to do, we still had the impression that our master thesis was something they were interested in and always found the time to participate when asked about doing an interview. The observation, or meeting, we asked to attend was

postponed until mid April, and later cancelled, for reasons unknown to us. But having in mind that Labdata had just gone through a reorganization period, which may be a predominant factor. That was something we needed to respect, but luckily for us they still had time to answer our calls and e-mails when we needed help.

5
Theoretical Perspective

Since the focus of this thesis is on the organization of Labdata in DF, theories regarding organization and IT are useful for analysis. The theoretical perspectives introduced in this thesis are therefore project management, program management, theory from Weill & Ross and adaptive co-management. The first theory presented in this chapter is program management by Michel Thiry. This theory involves both categorizing the program within the program dimensions developed by Thiry, and describes the life cycle of a program and challenges related to those phases. Well functioning program management may help link strategic decisions with business benefits and create value in organizations (Thiry, 2010, p.1). The second theory presented is the theory of Weill & Ross, which is familiar to the authors from previous courses at Department of Informatics, namely IT and Management. IT projects is known to have a high rate of failure, and their theory aims at explaining why. They argue that how IT decisions is governed and where decisions are being made, is the main factor in order to increases the chance of success. The final theoretical perspective, adaptive co-management was introduced to us through the PhD thesis of Espen Skorve, a postdoctoral at Department of Informatics. Adaptive co-management has over the past years become an increasingly used model for multi-level governance, as it combines the theory of adaptive management and collaborative management. By encouraging collaboration for trust-building and social learning, this theory provides a different point of view on decision making which is an interesting comparison to the theory by Weill & Ross. The start of this chapter is introduced with a description of the field of traditional project management and its key success factors before presenting the theories mentioned above.

5.1 Project management

A project is defined as "a temporary endeavour undertaken to create a unique product, service, or result". (Project Management Institute, 2004)

The organization of a project is described by (Thiry, 2010, p.26) with a set, limited scope that has clear deliverables. The main tasks in a project are to negotiate scope first, then define a work-breakdown-schedule (WBS), adverse the risks, and manage the delivery of the product. Monitoring tasks and project parameters, retrospectively against the baseline, is done to control the project. The leadership is described as authority-based directive style, and reporting is done to the project sponsor.

There are several ways to decide whether or not a project has been a success or a failure. The outcome is based on how success or failure is perceived, and the most common ways are presented as:

1. **The project met scope, time, and cost goals.** This definition is a bit simple, and is more applicable to smaller scale projects.
2. **The project satisfied the customer/sponsor of the project**. If the customer/sponsor of the project were unhappy with important aspects of the project, it would be seen as a failure. Even if the project met its goals on scope, cost and time, it does not mean that the customer is happy with the results. Additionally, a project can also be seen as a success even though it did not meet its goals on scope, cost and time. To measure the success of a project in this way, one example is to implement a customer satisfaction rating system.
3. **The results of the project met its main objective, such as making/saving a certain amount of money, providing a good return on investment or simply making the customer/sponsor pleased with the result**. For example, if the project cost more than estimated, but the customer/sponsor was happy with the result, the project would be seen as a success according to this criterion. If the customer/sponsor approved the project in order to improve workflow, or to speed up the work, the project would be deemed as a success it those goals were met, regardless of other factors. (Schwalbe, 2010)

According to Schwalbe, the top-ten list that is presented below contains, in order of importance, the factors that contribute most to the success of IT projects. Executive

support is listed as the most important factor. The reason is that executive support has a strong influence on many of the other factors: executive managers can encourage user involvement, define clear business objectives, assign an experienced project manager etc.

1. Executive support.
2. User involvement.
3. Experienced project manager.
4. Clear business objectives.
5. Minimized scope.
6. Standard software infrastructure.
7. Firm basic requirements.
8. Formal methodology.
9. Reliable estimates.
10. Other criteria, such as small milestones, proper planning, competent staff, and ownership.

Additionally, Schwalbe continues by presenting some key points for best practice that organizations should follow, as they can improve the project performance. These four best practices are described as following:

Use an integrated toolbox: The companies that often succeed in project management have a clear definition of what needs to be done, by whom, when and how. They do so by using an integrated toolbox, including project management tools, methods and techniques, which is then aligned with project and business goals.

Grow project leaders: Project managers are crucial to a project's success, and a good project manager needs to be a good business leader with interpersonal and intrapersonal skills as well. The companies that stand out with the best project managers often "grow" their own managers internally, giving them opportunities, mentoring and training.

Develop a streamlined project delivery process: The companies that excel in project management have examined every step in the delivery process, to create a repeatable process of delivery. All projects include clearly defined milestones, project managers use

a shared roadmap, focus on key business aspects of their projects, and integrating goals across the whole organization.

Measure project health using metrics: Metrics is used by the winning companies to quantify their progress. The focus is on a small amount of important measurements, which is applied to all the projects. As an example, these metrics can include customer satisfaction and/or return on investment. (Schwalbe, 2010)

5.2 Program management

The previous theories we have described are mainly developed around the organization of businesses. We have therefore decided to include the program management theory developed by Michel Thiry.

According to Thiry, projects differ from programs in that they generally deliver single products or single services. The purpose of the project is generally well defined and they are usually not very complex, even though they can be complicated. Programs on the other hand are generally more complex than projects. This involves delivering several products or services. Programs are commonly coordinated with business strategies and are business focused. Through this description, Thiry formulates the definition of programs as *"The governance and harmonized management of a number of projects and other actions to achieve stated business benefits and create value for the stakeholders"* (Thiry, 2010, p.3).

Projects that should have been arranged as a program is often struggling with the challenges of uncertainty and ambiguity. The uncertainty is often linked to the lack of information and the difficulty predicting a cause-effect relationship. It hinders the ability to predict outcomes, based on identified objectives. Ambiguity on the other hand, is characterized by a number of possible solutions and stakeholders without a clear path (Thiry, 2010, p.16).

Programs can be divided into two dimensions; what type of activity they manage and how the program was established. Within the first dimension there are three different groups; incremental programs, portfolio programs and strategic programs. The first category, incremental programs, can be considered a sub-portfolio of the organization's portfolio. These programs are ongoing, generally highly predictable and focus on

continous improvement; their objective is the maintenance of the organization's performance through a mix of operations and small short-term projects (Thiry, 2010, p.38). The second category, portfolio programs, consists of projects which are managed together to increase tactical benefits, improve performance or deliver new business capabilities. Typically, they are medium- to long-term and limited in time, are reasonably predictable and focus on organizational efficiency (Thiry, 2010, p.38). The last category, strategic programs, aim to transform the organization or the way it does business, their final outcome can be unpredictable, they deliver medium- to long-term benefits, support strategic level initiatives and aim to deliver strategic objectives (Thiry, 2010, p.38).

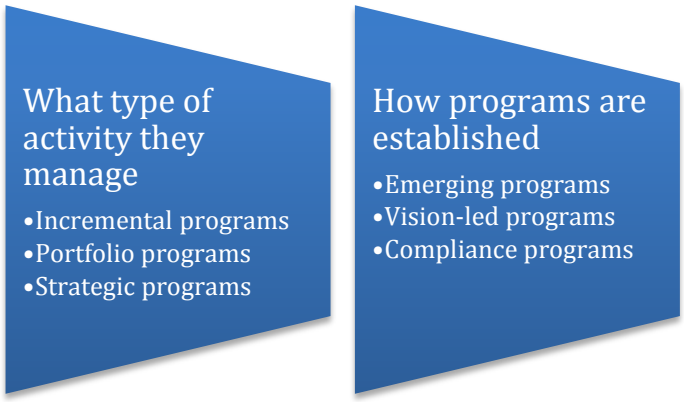

Figure 12: The two dimensions of program management (Thiry, 2010)

The second dimension is as previously mentioned about how the program was established. As with the previous dimension, Thiry divides this dimension into three categories; vision-led programs, emergent programs and compliance programs. The vision-led programs are the most mature type of program where a strategy is defined, a number of objectives are identified and programs are shaped out of these strategic objectives. Vision-led programs are difficult to define early on, and therefore to control in a traditional way (Thiry, 2010, p.39). Emerging programs evolves from existing initiatives when a potential sponsor realizes that these initiatives can be better managed in a coordinated way. This type of situation can lead either to the setup of a sub-portfolio or a program (Thiry, 2010, p.40). The final category, the compliance programs, is programs where the business forces laws, regulations, or market forces upon the program.

Thiry defines three different main program components: decision management, program governance and benefit management. The decision management occurs through a context of high uncertainty and ambiguity. In these situations, a decision is hard to make, and is often done based on intuition and experience because of the underlying data being partial and uncertain. Within the field of decision management

there exist a decision process, which can be split into two phases: a decision phase and an implementation phase. The decision phase are based on analysis and learning where the main priority is to identify the needs, describing the problem, creating alternatives, evaluating options and finally performing a choice based on these options (Nordheim, 2013).

Further on, Thiry has developed a five-step implementation of program management, consisting of a formulation phase, an organization phase, a deployment phase, an appraisal phase and finally a dissolution phase (Thiry, 2010, pp.99-100).

- *Phase 1:* In the first phase, the formulation phase, consists of defining the expected benefits of the program. This is done through a stakeholder analysis and the agreement on the program purpose and objectives, which can include a functional blueprint. This is an iterative phase.

- *Phase 2:* The second phase, the organization phase, deals with the development of the program's detailed business case and technical blueprint as well as operational procedures and structures (Thiry, 2010, p.99). As with the previous phase, this phase is iterative.

- *Phase 3:* The next phase of program management is according to Thiry the deployment phase. This may be considered the most active stage, as it deals with delivery of capabilities through the program's constituent projects and other actions. This phase differs from the previously mentioned programs by that it is a cyclic process.

- *Phase 4:* The appraisal phase is self explanatory, as the main purpose of the phase is an assessment of the benefits realization. It also deals with the evaluation of the success of the transition to operational benefits (Thiry, 2010, p.100). As with the previous phase, this phase is cyclic.

- *Phase 5:* The final phase of the program management consists of closing the program and dissolving the projects within the

program. This is done by agreeing on the timing and grounds for dissolution and implementation of the closing process (Thiry, 2010, p.100). In order to assure a realization of the strategic goals, this needs to be an iterative phase rather than a linear one (Nordheim, 2013).

Figure 13: The five phases of program management (Thiry, 2010)

5.3 Weill & Ross

The first theoretical framework presented is the governance arrangement matrix developed by Weill & Ross. There will be provided an introduction to the theoretical concepts and a discussion, which reflects on how to make use of the theory by Weill & Ross to benefit this thesis.

5.3.1 Introduction to the theoretical concepts

Weill & Ross is well known for their theory within IT Governance, and have released several articles and a book describing their theory, namely *IT Governance; How Top Performers Manage IT Decision Rights for Superior Results*. According to Weill & Ross, IT Governance may be defined as specifying the decision rights and accountability framework to encourage desirable behaviour in the use of IT (Weill & Ross, 2004). Within their theory there are three core components, namely *IT Decision Domains*, *IT Governance* and *Implementation Mechanisms*. The first, *IT Decision Domains* takes into consideration where IT decisions are being made within an organization. Weill & Ross divides this into five interrelated IT decisions. These are presented below, with a detailed description of each of them following.

- *IT Principles:* Clarifying the business role of IT. This means deciding the role of IT and how IT will be used within an organization.
- *IT architecture:* Defining integration and standardization requirements

- *IT infrastructure:* Determining shared and enabling services
- *Business application needs:* Specifying the business need for purchased or internally developed IT applications
- *IT investment and prioritization:* Choosing which initiatives to fund and how much to spend

The first IT decision, *IT principles* consists of a set of high-level statements, which works as a guideline on how IT is to be used in the enterprise. It is developed at a high level in the business and usually works as a part of a management lexicon for the managers in the business. It does not necessarily consist of specific rules, but may include guidelines, which may be discussed and debated. The IT principles that are established may also be used for educating executives in the business' technology strategy and investment decisions (Weill & Ross, 2004, p.28).

While the purpose of the IT principles is to propose requirements for process standardization and integration for an organization, the *IT architecture* serves as the organizing logic for data, applications, and infrastructure, captured in a set of policies, relationships, and technical choices to achieve desired business and technical standardization and integration (Weill & Ross, 2004, p.30). In other words, the IT architecture should function as a model for the organizations infrastructure and different applications. However, deciding on the data standardization is no simple task and must be planned carefully.

The third IT decision mentioned above is *IT infrastructure.* This was briefly mentioned in the previous section, as for instance infrastructure is relying on a good IT architecture. The IT infrastructure in an enterprise may be compared to the roads that the cars drive on, where the cars represent different applications relying on a good road. As Weill & Ross defines it, IT infrastructure is the foundation of planned IT capability available throughout the business as shared and reliable services and used by multiple applications (Weill & Ross, 2004, p.34). The trick regarding IT infrastructure is to be able to establish the right infrastructure at the right time. This will enable fast implementation of future business applications. On the other hand, the wrong IT infrastructure may have disrupting effects as it may cause inefficient use of resources, delays, and incompatibility with business partner systems.

Even though all of the five IT decisions mentioned above may help towards a better business value of the IT in the enterprise, the *Business Application Needs* is the only IT decision which directly generate value. The key issue regarding business application needs is to balance the two major conflicting challenges, namely creativity and discipline. Creativity enables the enterprise in developing business applications that generate customer value through IT, while discipline revolves around architectural integrity while integrating new business applications. Even though a new application may generate value, it is important to prevent the application from affecting and changing the IT architecture of the business. The key is therefore to ensure that the applications build on the architectural principles of the enterprise, rather than undermining them.

The last IT decision mentioned is *IT investment and prioritization*, which is the IT decision that is the most visible and most controversial one in an enterprise. As the name suggests, this field of decisions has to do with deciding where to invest the resources of an enterprise in order to generate the most value. Organizations that do this well tend to focus their investments around their strategic priorities, where they manage to differ between what is a 'must have' and what is 'nice to have'. Within IT investment and prioritization there are three main dilemmas, namely how much to spend, what do spend it on, and how to reconcile the needs for different constituencies (Weill & Ross, 2004, p.45).

As Weill & Ross explains, all of these IT decisions are linked. The IT Principles drives the IT architecture, which supports the IT infrastructure. Further on, the IT infrastructure enables the organization to develop business applications, while IT investments are driven by all the previous IT decisions. Naturally, an enterprise needs to assign these IT decisions to a group or person, which are in charge of making these decisions. This leads to the second key element of Weill & Ross' theory, namely *IT Governance.* By IT Governance, Weill & Ross refer to those that are responsible for both input and output within the IT decision areas defined above. They define six different archetypes, which may be assignable for a certain IT decision. These archetypes are:

- Business monarchy: Top managers
- IT monarchy: IT specialists
- *Feudal:* Each business unit making independent decisions

- *Federal:* Combination of the corporate centre and the business units with or without IT people involved
- *IT duopoly:* IT group and one other group (for example, top management or business unit leaders)
- *Anarchy:* Isolated individual or small group decision making

As with the different IT decisions, a detailed description of the different archetypes is given below, sited from the theory of Weill & Ross. A detailed description is necessary in order to categorize the different actors within Labdata.

A *business monarchy* consists of senior business executives, which make IT decisions that affect the entire organization. Typically, a business monarchy has a great need for input in order to make decisions, preferably from many sources. En example would be that a business monarchy needs input from both the CIO in the form of a report, the IT leaders, the enterprise-wide IT budged management process, the service-level agreements and chargeback and an activity-tracking system showing all IT resources and how they currently are deployed.

This is opposed to an *IT monarchy* where IT professionals within the organization do the decisions. The exact way an enterprise implements IT monarchies differs between enterprises, however it often involves IT professionals from both corporate teams and business units. An example here would be an IT monarchy where there are representatives from all regions in the organization, all strategic business units and all competency centres. The role of this group is to propose management rules to the senior IT managers.

The *feudal* archetype on the other hand may be compared to a traditional kingdom where the king and queen make their optimal decisions for their local need. Within an organization the business unit, region, or function represents this. According to Weill & Ross, this model is not commonly observed within real-life organizations. The reason for this is that the feudal archetype does not take into consideration synergies across business units, which most enterprises strive for.

The archetype with the longest tradition within IT governance is the *federal* archetype. This archetype attempts to balance the responsibilities and accountabilities of several governing bodies, such as country and states and may therefore be considered a contrast

to the feudal archetype. Weill & Ross defines the federal model as coordinated decision making involving both the centre and the business units. Unit representatives in a federal model could be either or both the unit leaders and business process owners. Business unit and/or corporate IT leaders might also be involved in federal governance as additional participants (Weill & Ross, 2004, p.61).

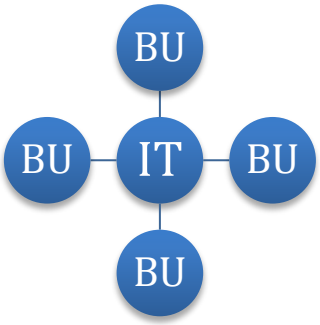

Figure 14: A 'bicycle wheel' version of IT duopoly

The *IT duopoly* is an archetype where the decision right is divided between two parties, preferably IT executives and one other group. The IT executives may be a group of central IT employees while the other group may be e.g. CXO's (Chief experience officer), business process owners or business unit leaders, or groups of key system users. Upon the use of IT duopoly, the duopoly can either take shape of a 'bicycle wheel' or a 't-shape'. The bicycle wheel is illustrated in figure 1 where IT means IT executive while BU represents the business units. There would in most cases also exist a business/IT relationship manager between each business unit and the IT executive. A t-shaped version of IT duopoly consists of two overlapping committees, namely business managers and IT managers. The Business managers represent the horizontal line in the 'T' while the technical managers represent the vertical line in the 'T'.

The last archetype, *anarchy*, is rarely observed in real life enterprises. Anarchy means that each person within the enterprise does what suits him best, without considering what's best for the environment. This does often lead to large expenses regarding security and support because the enterprise needs to cover a broad field of different IT equipment etc. However, anarchy does have its area of appliance. This is when the organization is in need of great flexibility and very rapid responsiveness.

In the different IT decisions, there may exist more than one of these archetypes. In order to present these two components in a structured manner, Weill & Ross have created a matrix of the IT decisions and IT Governance, with IT decisions on the y-axis and IT governance on the x-axis.

	IT Principles		IT Architecture		IT Infrastructure		Business Application		IT Investments	
	Inp	Dec	Inp	Dec	Inp	Dec	Imp	Dec	Imp	Dec
Business Monarchy										
IT Monarchy										
Feudal										
Federal										
Duopoly										
Anarchy										

Figure 15: The Governance Arrangement Matrix

By creating the matrix illustrated above, Weill & Ross enables businesses to create a map over what decisions are being made, and what parts of the organization that performs the given decisions. The input (Inp) and decision (Dec) column describes which archetypes that have inputs to IT decisions, and which archetypes that has the decision right. In this way, a complex architecture may be mapped to a matrix that gives a great overview over all the decisions being done. By using this matrix, Weill & Ross gives managers not only a way of mapping the current situation, but by making another matrix with the desired outcome one can easily see where changes should be made. In this way, Weill & Ross proposes a series of steps in order to create effective IT governance:

> (1): Use the Governance Arrangement Matrix to map the current situation in the organization.
> (2): Define the desired situation.
> (3): Decide what IT Governance that is required in order to reach the desired objective.
> (4): Define a set of goals regarding performance in order to measure improvement.
> (5): Start making organizational changes, moving from the current situation to the desired situation.

As mentioned, this easy-to-use list gives a good clue on how to go from the existing IT governance situation, to the desired situation through the Governance Arrangement

Matrix. The last component, *Implementation Mechanisms,* helps to implement the desired IT governance by identifying the structures, supporting structures and processes. Weill & Ross proposes three different governance mechanisms that enable the enterprise to implement their governance arrangements:

- *Decision-making structures:* Organizational units and roles responsible for making IT decisions, such as committees, executive teams, and business/IT relationship managers.
- *Alignment processes:* Formal processes for ensuring that daily behaviours are consistent with IT policies and provide input back to decisions. These include IT investment proposal and evaluation processes, architecture exception processes, service-level agreements, chargeback, and metrics.
- *Communication approaches:* Announcements, advocates, channels, and education efforts that disseminate IT governance principles and policies and outcomes of IT decision-making processes.

Of these mechanisms, the most visible one are the decision-making structures. This is because it locks the different decision areas in the enterprise to a certain archetype. As for the alignment processes, Weill & Ross describe it as the IT management's techniques for securing widespread involvement in the effective management and use of IT (Weill & Ross, 2004, p.97). The alignment processes should bring every employee on board so that they may be a part of both decision inputs and disseminating the IT decision outputs. Through communication approaches, the management of an enterprise should broadcast their IT governance decisions so that all of the employees in the enterprise are aware of their IT governance. Through several case studies, Will & Ross has experienced that the more the employees know about the IT governance decisions being made, the more efficient the IT governance becomes.

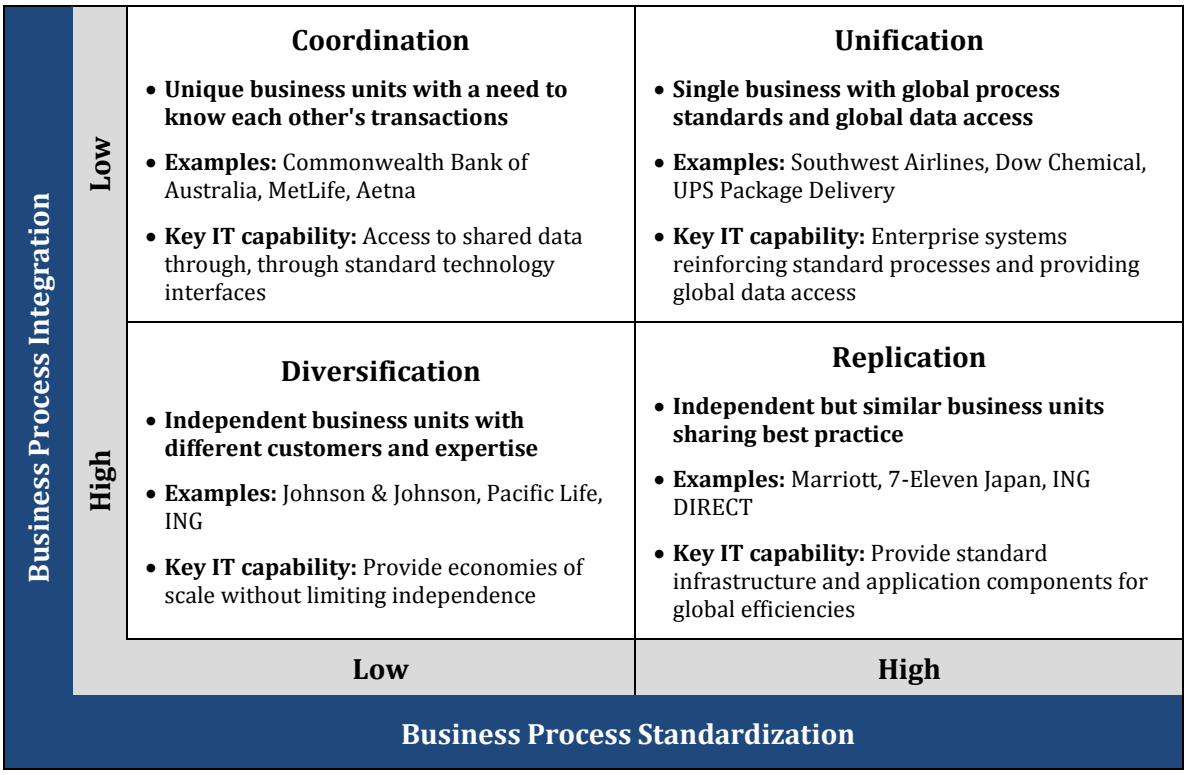

Figure 16: The four operating models **(Ross et al., 2006)**

There exists several other theories and models related to Weill & Ross' theory. The four operating models matrix illustrated in figure 16 is an example of another theory developed by Weill & Ross. The key concept of this figure is to illustrate the enterprise's position, whether it is high or low on business process standardization, or high or low on business process integration. As they describe it: *An operating model is the necessary level of business process integration and standardization for delivering goods and services to customers* (Ross et al., 2006). However, through our research we have decided not to focus on these theories, and only use the governance arrangement matrix. We will therefore not go into more detail regarding this or other theories of Weill & Ross.

5.3.2 Discussion

As described in the introduction to the theoretical concept of the governance arrangement matrix, the relevance of the Governance Arrangement Matrix in this thesis may be discussed. Primarily, the Governance Arrangement Matrix provides a tool for managers to control the use of IT in an enterprise so that the use of IT becomes an efficient tool, rather than an obstacle. Our master thesis on the other hand, focuses on the organization of a program aiming at developing a new lab system for the health

firms in HSØ, more specifically PNØ as the first hospital. The differences between the main area to apply the theory of Weill & Ross and our area of focus are therefore apparent, as the governance design framework is designed for enterprise governance, while the case of this thesis is the challenges related to the organization of a program. However, there is still possible to apply the Governance Arrangement Matrix to our case, even though the model was not intended for this area of practice. This is done by mapping where the different decisions within the program are taken. We may then compare this matrix to the most common input/decision for all enterprises. This will be done in the discussion later in this thesis.

Weill & Ross is not the only theory applied to our findings in this master thesis. The second theory applied in this thesis is adaptive co-management. The reason for choosing two theoretical perspectives, is that it provides analyzes from different perspectives where pro's and con's for each of them may be discussed. In the following section an introduction to the theory of adaptive co-management is given.

5.4 Adaptive Co-management

In the following section we will give a more detailed explanation of the two theories of adaptive management and collaborative management, before we give a description of the theory behind adaptive co-management.

5.4.1 Adaptive management

The so-called *new ecology* was introduced as a paradigmatic change within the field of ecology science during the 1970s. Because of the paradigmatic change, it was necessary to comprehend the increase in complexity and uncertainty in the field of ecology science. As a consequence, resource managers started searching for a new management models. Their old models weren't able to deal with the uncertainty, and a new field of research called adaptive management arose from this lack of management models. This new management model would have to take into consideration uncertainty and would therefore have to be flexible. Learning by doing did therefore become an essential key attribute for adaptive management to deal with the uncertainty. The last key aspect of adaptive management is the concept of resilience. The previous perspective on resilience was to construct management models that were balanced. However, through

the new perspective of the new ecology, the goal was to design management models that were resilient. This means to design a flexible architecture where learning is highly prioritized. In this way, the learning mechanism within the organization may make the organization more adaptive to change (Skorve, 2014).

5.4.2 Collaborative Management

Collaborative management has been around for many years, acting as a tool for organizations to make decisions in collaboration with other parties such as stakeholders. The main goal of collaborative management is therefore to enhance democratic decisions and to resolve conflicts whenever they may occur. Because of the focus on conflict resolving, a new line of research has developed because the old theoretical perspective was more in the line of command-and-control. The new line of research focuses on the making of resilient organizations. This was also mentioned as an important aspect of adaptive management, however they differ by the fact that that the goal is rather to give the organization system diversity. This is a contrast to the earlier perception of co-management where the theoretical perspective was command-and control and the idea was that environmental problems were responded to by applying even more command-and-control, which in the long term is assumed to be the reason for a self-reinforcing pressure on system diversity. As for the new theoretical perspective, sense-and-respond, the focus has moved towards adaptability and learning (Skorve, 2014). Because of the shared interest between collaborative management and adaptive management regarding learning by doing, these two theoretical perspectives have naturally merged into the theory of adaptive co-management. A description of the result is given below.

5.4.3 Adaptive Co-management

Adaptive co-management is a merger between adaptive management and collaborative management. This theoretical perspective has been studied for decades, through field research of cases within the field of primary industry, one of which is mentioned in the discussion below. The key features of adaptive co-management are collaboration, learning and multi-level governance (Armitage et al., 2007). All of these features are linked in some way. For instance, the best way to achieve learning within an organization is through collaboration with others. Learning is also the best tool for

adaptability. However, neither collaboration nor learning is achievable unless the correct organizational architecture is at place, because the effects of the learning will not be able to flow through the organization if the organizational structure does not support it. The last key concept of adaptive co-management, multi-level governance, revolves around establishing linkages both horizontally and vertically through the organization. This is not only to establish learning paths through the organization, but also to establish the concepts of feed-back and feed-forward. These are essential to the concept of multi-level governance.

Even though adaptive co-management may seem to be a great improvement over the previously perceived theoretical perspective, there are challenges related to adaptive co-management as well. The most important challenge is competition, which may have a disrupting effect on organizations. In an environment of teamwork, there is a possibility for individuals to promote their personal interests by pursuing them and promoting their personal interests by making their personal interests into the groups interests. This would cause fragmentation within the group, which would disrupt the learning-process, due to the fact that collaboration is a key factor to achieving learning. It is in these cases the horizontal linkages within an organization comes into play, because the horizontal linkages reduces the chance of an silo architecture taking shape between the groups in the organization, which is an architecture where interaction between the groups in the organization is non-existing.

5.4.4 Discussion

The overall picture indicates that the theory behind adaptive co-management is suitable for this thesis, as it emphasizes the importance of horizontal and vertical lines of communication between groups in an organization, and the fact that learning by doing is a core concept. Labdata is after all a program that was established last year within DF, and a natural assumption is therefore that the concept of learning-by-doing from adaptive co-management enables Labdata to improve their organization simply by observing their current organization and performing modifications to resolve issues. However, the core concepts of adaptive co-management is more of a tool of guidance in order to envision an improved organizational architecture, and does not provide a direct tangible framework like Weill & Ross does. Armitage et. al. does however propose ten

conditions for successful adaptive co-management which is far more tangible than the general core concepts of adaptive co-management. The ten conditions are:

- Well-defined resource system
- Small-scale resource use contexts
- Clear and identifiable set of social entities with shared interests
- Reasonably clear property rights to resource of concern (e.g. fisheries, forest)
- Access to adaptable portfolio of management measures
- Commitment to support a long-term institution-building process
- Provision of training, capacity building, and resources for local-, regional-, and national-level stakeholders
- Key leaders or individuals prepared to champion the process
- Openness of participants to share and draw upon a plurality of knowledge systems and sources
- National and regional policy environment explicitly supportive of collaborative management efforts.

In the paper by Armitage et. al. they conduct an observation of a complex social-ecological system, namely the narwhale organizations of Nunavut in Canada. They consist of local hunters' and trapper's organizations, regional wildlife organizations, and the Nunavut Wildlife Management Board (Armitage et al., 2009, p.96). In the article, they investigate how these different parties within this ecosystem are able to resolve conflicts and how the different fishers are able to perform democratic decisions.

The fact that this paper describes the narwhale organizations of Nunavut is visible through the ten conditions cited above. For instance, the detailed explanation of small-scale resources use contexts are "Small-scale systems (e.g. management of a specific rangeland or local fishery) will reduce the number of competing interests, institutional complexities, and layers of organization. Larger-scale resource contexts (transboundary stocks, large watersheds) will exacerbate challenges." (Armitage et al., 2009, p.101). Since it may be discussed whether these conditions are influenced by the case description, it may be argued whether these conditions are generic or not. A similarity that may be drawn between our thesis and the paper by Armitage et. al. is how the

different parties in the narwhale case may represent the different projects within Labdata. Each of the fishers, trappers and other primary industry parties may represent Infrastructure & Integration, Functionality & Standardization and other projects in the Labdata program. It may therefore exist similarities between the cases that may be drawn upon in order to make the ten conditions mentioned above fit this thesis. So instead of referring to a specific rangeland or local fishery in the second condition, a reference is done to one of the projects within Labdata.

Still, there are some conditions that work without any adjustments to fit this thesis, for instance the condition of clear and identifiable set of social entities with shared interests. This is a natural similarity due to the simple reason that the groups within the project need to have a common goal to work towards. Another important and familiar condition that we find in Labdata is the condition that requires key leaders or individuals prepared to champion the process. As the description by Armitage et. al says, there are a need for key individuals in order to maintain a focus on collaboration and the creation of opportunities for reflection and learning. Looking at the organization of Labdata, such a key person is represented by the project manager in Labdata.

5.5 Supplementing theory

In addition to the theories described above, a few additional theories will be supplemented in the discussion. These theories is not discussed in the same extent as the governance arrangement matrix and adaptive co-management, but is still useful in order to evaluate the organization of Labdata. The supplementing theory revolves around dependencies and critical path.

5.5.1 Critical path method

Dependencies and critical path are closely related, and describe what processes that are dependent of other processes in order to be completed. In our case, the processes are represented by projects in Labdata. The critical path method was first introduced at the end of the 1950's, more precisely in 1959 by Kelly and Walker (Kelley & Walker, 1959). This theoretical concept originates from project management theory and is defined as being: the series of activities in a network diagram that determines the earliest completion of the project; it is the longest path through the network diagram and has

the least amount of slack or float (Schwalbe, 2010). The critical path method (CPM) is an important tool often used to counteract project schedule exceedances.

An example is given below:

In this illustration there are four steps in a process. Each step has been assigned a name and time consumption. In order to get from *Step 1*to *Step 4*, there are two steps that need to be completed, namely *Step 2* and *Step 3*. The total time consumption of route Step 1, Step 2 and Step 4 is 9. However, the route Step 1, Step 3 and Step 4 has a time consumption of 11. Therefore the entire process has the time consumption of 11, regardless of the time consumption of Step 2. The route of Step 1, Step 3 and Step 4 is therefore the critical path of this process, because this is the most time consuming route, and regardless of what other steps that exist in the process, this route is the critical one in order to get finished in time.

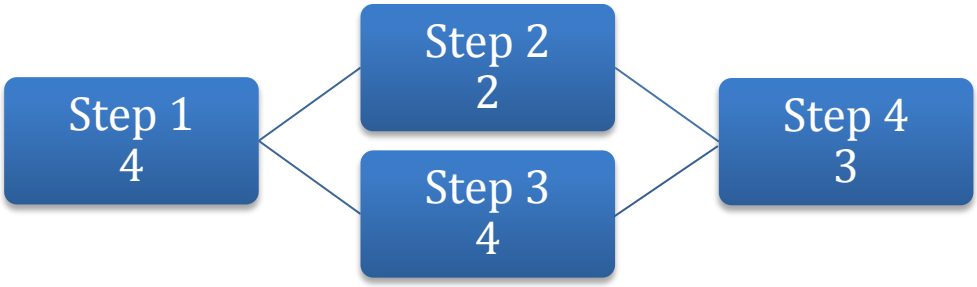

Figure 17: Critical Path

Schwalbe continues by presenting a short story on how a gorilla was used to deal with the managerial issues connected to CPM. Apple Inc. had some difficulties finishing a project on schedule. The team was working in an area with cubicles, and whoever was in charge of the current task on the critical path had a stuffed gorilla head on top of their cubicle. The other workers then knew that the gorilla head represented the person with the most time pressure, and was not to be disturbed. After the task was completed, the person in charge of the next task on the critical path received the gorilla head. (Schwalbe, 2010).

5.6 Summary of the theories

The theories described above are all great tools in order to evaluate the organizational structure of Labdata. Each of them provides different concepts which combined may synergize in the discussion of the new organization. As an apparent difference, the

governance design framework by Weill & Ross is a tool for mapping the decision areas in an organization, while the theory of adaptive co-management (particularly along with the ten conditions developed by Armitage et.al.) provides a tangible framework where key values of an organization may be discussed, such as their ability to collaborate, establish trust and learn. Even though the governance arrangement matrix by Weill & Ross does not provide such tangible concepts, a comparison may still be done. Through their thorough work, Weill & Ross have mapped the most common input/decision pattern for all enterprises. This is presented in their book *IT Governance* and may be used as an comparison where the decision making in Labdata may be compared to the most common input/decision pattern for all enterprises. The theory of adaptive co-management revolves around the importance of collaboration, trust and learning within an organization, which may be discussed by comparing the old organization of Labdata with the new. The last theory is program management. In addition to being a detailed framework for mapping the program type of Labdata, Thiry (2010) emphasizes several challenges related to program management and proposes some key features to ensure in order to achieve a successful program life cycle.

6
Findings

The findings are introduced by a description of the challenges that they have had in Labdata. Further on follows a description of the new organizational structure of Labdata, before the new organizational structure is compared to the old, in order to distinguish the new features from the old one in the new organization. Since the new organization was launched in March 2014, we have yet to observe whether the changes to the organization will solve the challenges that have occurred in the program.

6.1 Challenges in Labdata

Since the establishment of Labdata in 2013, there have been several challenges in the program organization. Through our interviews, challenges with communication, large complexity in the delivery projects, and many dependencies across the different projects came to light.

6.1.1 Communication challenges

The challenges regarding communication in Labdata involved initial issues with communication between the development projects, the delivery projects and the supplier Software Point. In the establishing phase of Labdata, the routines regarding structure of meetings were undefined. The frequency of their meetings and the form of their communication was also lacking, which was the source of the communication problems. The problems resulted in uncertainties regarding distribution of responsibilities, premise legislation and routines for escalation.

In order to solve these issues, they performed several adjustments to the organizational structure and routines. These adjustments involved:

- Establishing interaction models between the various actors
- Establishing more distinct delivery lists
- Establishing agreed responsibility matrixes associated with each delivery (extended HUKI-methodology)
- Establishing the format of their periodical meetings (who meets where and when)
- Establishing escalation procedures based on the responsibility matrix and forums
- Establishing fitting procedures for logging of incidents, risk monitoring and templates for reporting

The first three measures are closely related in practice. The interaction models regulate the distribution of responsibility between the delivery projects, the development projects and the supplier. These are established principles for interaction and clarification of responsibilities. As an example, the interaction model dictates that the delivery projects are responsible for anchoring in their respective organization. This means that the solutions developed by the development projects are transferred to the delivery projects for further anchoring. Another example concerns the responsibility for training. In this matter, the interaction model dictates that the program is responsible for training of super users, while the delivery projects are responsible for training of end users. The supplier is responsible for assisting with courses if required.

As for the format of their periodical meetings, there have been established weekly status meetings with each delivery project. Highlights from these meetings are escalated to the program management in subsequent meetings. The same goes for the escalation routines, which follows the structure outlined above. Regarding the escalation routines, each project has a project- related incident logger for risk monitoring. This is based on common templates for all projects. Incidents and risks are raised to program management through its own monthly risk meetings where significant risks per delivery project are discussed. Incidents and obstacles is reported through standard reporting templates. It is considered which incidents and obstacles that should be lifted from project to program management, from program management to the program board and

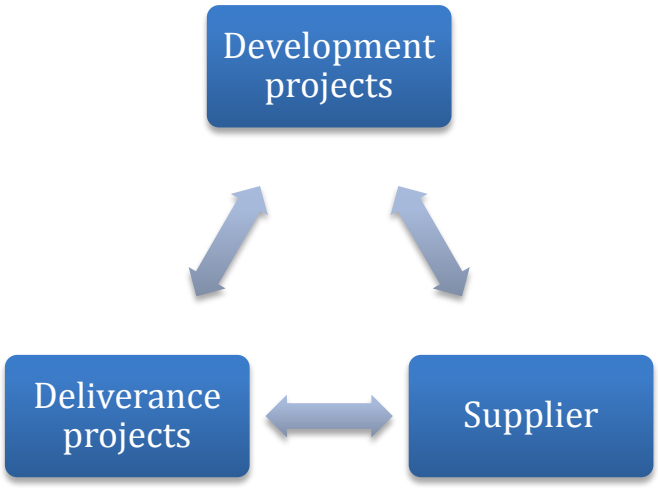

Figure 18: The communication between the projects and the supplier

from the program board to the renewal board (Fornyingsstyret). Incidents are logged continuously in the delivery projects. Obstacles are escalated on a weekly basis, while risks are logged and monitored on a monthly basis.

All of the improvements mentioned are related directly to the problems described above, and according to our interview subjects, these changes have improved the cooperation and ability to communicate between the development project, delivery projects and the supplier Software Point. However, there are still challenges related to the collaboration between Labdata and the supplier Software Point. As one of our interviewees explained, the main issue is the simple fact that Software Point is a Finnish software company, and that the geographical distance between the parties has become a challenge. In order to cope with this challenge, Software Point sends their people regularly to Oslo to meet with the staff of Labdata. However, according to our interview subjects these visits are not frequent enough, as the development of Labdata relies on key resources from Software Point that has limited time dedicated to the Labdata program. It is therefore still challenges related to the collaboration with the supplier. The supplier's lack of resources is visible through the description of Software Point in chapter regarding the case description.

Software Point consists of approximately 80 employees, which has been mentioned as a key factor to the scarce resources by our interview subjects. However, Software Point is in a phase of expansion to meet with the huge resource requirement from Labdata.

Hopefully this will solve some of the resource problems, which leads to Labdata getting the support from Software Point that they need.

6.1.2 Parallel projects

As stated in the case description, there were two delivery projects running in parallel in Labdata, namely a delivery project for the implementation of the new system at OUS, and a delivery project for the implementation of the new system at the new health firm in Østfold (PNØ). What was not expected in the initial phase of the project was the complexity of running multiple delivery projects simultaneously. The challenge was to clarify who was the premise dealer and whom that was supposed to deliver what to the different delivery axes. There were also challenges related to overlapping deliverances from the delivery projects. When we asked them if they knew any way of solving this differently from the start, the main areas of improvement would have been to realize the complexity at an earlier stage in the project. The communication lines between the development projects and the delivery projects could also have been developed at an earlier stage. In practice, this would have meant implementing the proposed solutions mentioned in the section above. The final proposed point of improvement was to have a closer cooperation and collocation between the development projects and the supplier at an earlier stage in the project.

During the work on this thesis, there has been a change in the organizational structure in Labdata. A detailed description of this organizational structure follows later in this chapter. However, there have been done some changes to the organizational structure that affect the difficulties experienced with the delivery projects. One of the changes involves lowering the ambition level for the delivery to PNØ. The initial plan was to deliver a fully working system for the establishment of the hospital. However, through this reevaluation, the ambition level has been dropped to implementing a working, but not fully functional lab system. This involves delaying the deliverance of the blood bank system. The blood bank system is considered to be the most resource intensive and complex functionality of the new system, and the delay of this functionality will free resources that can be used to make sure the vital parts of the lab system is ready for use when the lab system is implemented. The blood bank functionality will then be delayed so that it is ready for the implementation of Labdata at OUS. When Labdata is

successfully implemented at OUS, the additional functionality that was skipped initially will then be implemented at PNØ.

Another change made to the new organizational structure of Labdata is the change to sequential execution of the deliveries to OUS and PNØ. Earlier on, both of the delivery projects were running at the same time. As earlier explained, they did not expect the great complexity that came as a result of the parallel deliveries. Because of this they have decided to simplify this model, by putting the OUS implementation at a halt, only focusing on the deliverance of the lab system to PNØ. When the project of delivering and implementing the lab system at PNØ has been completed, the project of delivering and implementing the lab system at OUS will be initiated. In this manner, they simplify the model, making the delivery projects run in sequence instead of in parallel.

The last feature that led to the reorganization of Labdata was because of the reorganization that took place in the organizational structure of the supplier. This occurred simultaneously with the reorganization of Labdata. The reorganization of Labdata is therefore not only a local change in order to make things run more smoothly internally, but was coordinated with changes in Software Point. The new organizational structure of Software Point reflects upon the organizational structure of Labdata, making the interaction between the two parties run more smoothly.

6.1.3 Dependencies

In DF, the amount of dependencies between Labdata and the other programs are low. The infrastructure-modernizing program has responsibility for managing and organizing infrastructure within the programs. However, as long as the programs are under establishment, they are responsible for managing the infrastructure themselves.

The delivery-list for this program has a large amount of dependencies and is presented within the overview of deliveries. As seen in figure 18 there are a great number of both vertical and horizontal dependencies. The yellow heading in addition to the five different projects represents the deliveries from the supplier Software Point, which also constitutes as the regional basic package. Further down, “Leveranse 1” and “Leveranse 2” is illustrated which correspond to the delivery for PNØ and OUS.

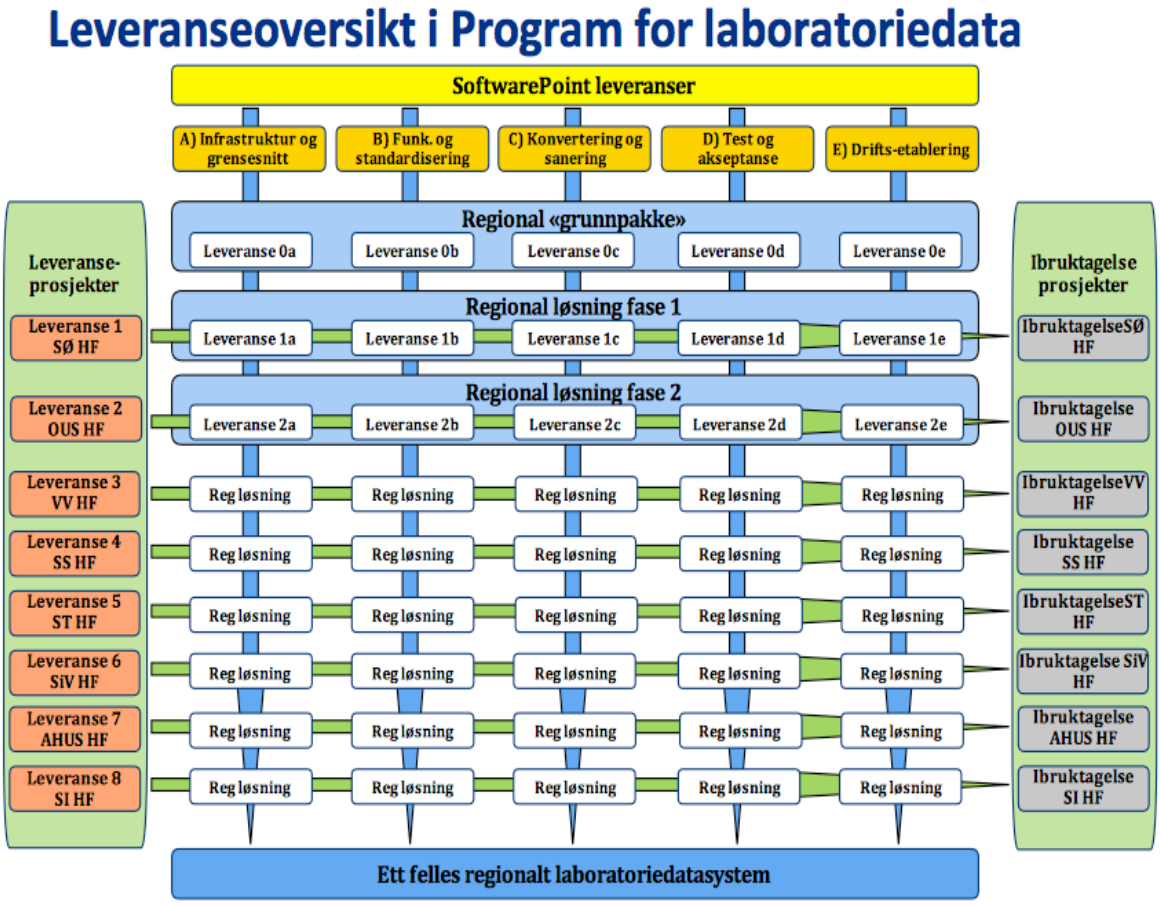

Figure 19: The delivery list in Labdata

As described in our theoretical perspective, the critical path is a series of activities in a network diagram that determines the earliest completion on a program; it is the longest path through the network diagram and has the least amount of slack or float. While slack or float is the amount of time a project activity may be delayed without delaying a succeeding activity or the project finish date (Schwable, 2010)

In addition to the definition of a critical path, one should also note that a project normally has several tasks done in parallel, and therefore most projects have several paths through a network diagram. According to Schwalbe, the path containing the critical path is what determines the completion date for the whole program. Even though the critical path is the longest path, it represents the shortest time it takes to complete a program.

To sum up, knowing the critical path is essential for the program manager at all times during a program's life cycle, since the critical path decides when the whole program is finished. Monitoring the other tasks must not be forgotten either, since a delay in

another task can lead to a change in the critical path. The program management must therefore know how to deal with the managerial issues regarding the critical path, and the people responsible for each task.

The people that are responsible for managing the responsibilities within Labdata are the program architect, in co-operation with the program chairman. There is a Project Management Office (PMO) that has been established to help manage this process. Their job is to regulate how the different parties are working together, namely the supplier, Sykehuspartner and how it should be taken into use. They work to ensure that the right people are communicating with each other, and also have the responsibility to make sure that information is flowing the right way.

6.2 The new organizational structure

A new organizational structure of Labdata was established in March 2014, and is illustrated in figure 20. Some of them have already been presented above, like the simplification of the delivery projects to make the deliverances run in sequence, rather than in parallel. In order to compare the new organization with the old one, a description of the new organizational structure follows.

The new illustration for the organizational structure has a different layout from the old illustration, but most of the features from the old organization are still present. In the new organizational structure, a grouping has been done which more clearly identifies three different levels of the lab program. The top layer consists of the management that is e.g. Fornyingsstyret, Programstyret and Programledelse in addition to the Program Management Office and the Program Architect. This top layer can be differentiated from the rest of the illustration by its light blue color. The middle layer consists of the delivery projects. This includes three projects, namely a project for the deliverance of Lab to PNØ (SØ), one project for the deliverance of Lab to Kalnes, and one last project for the deliverance of lab to OUS. There is a different color in use at these projects that play a vital role in differentiating from the previous organizational structure. A comparison between the two will be made in the next section in this chapter. The bottom layer of the organizational structure represents the development projects. These are the same as the development projects from the previous version of the organizational structure of Labdata, and were therefore explained in the case description.

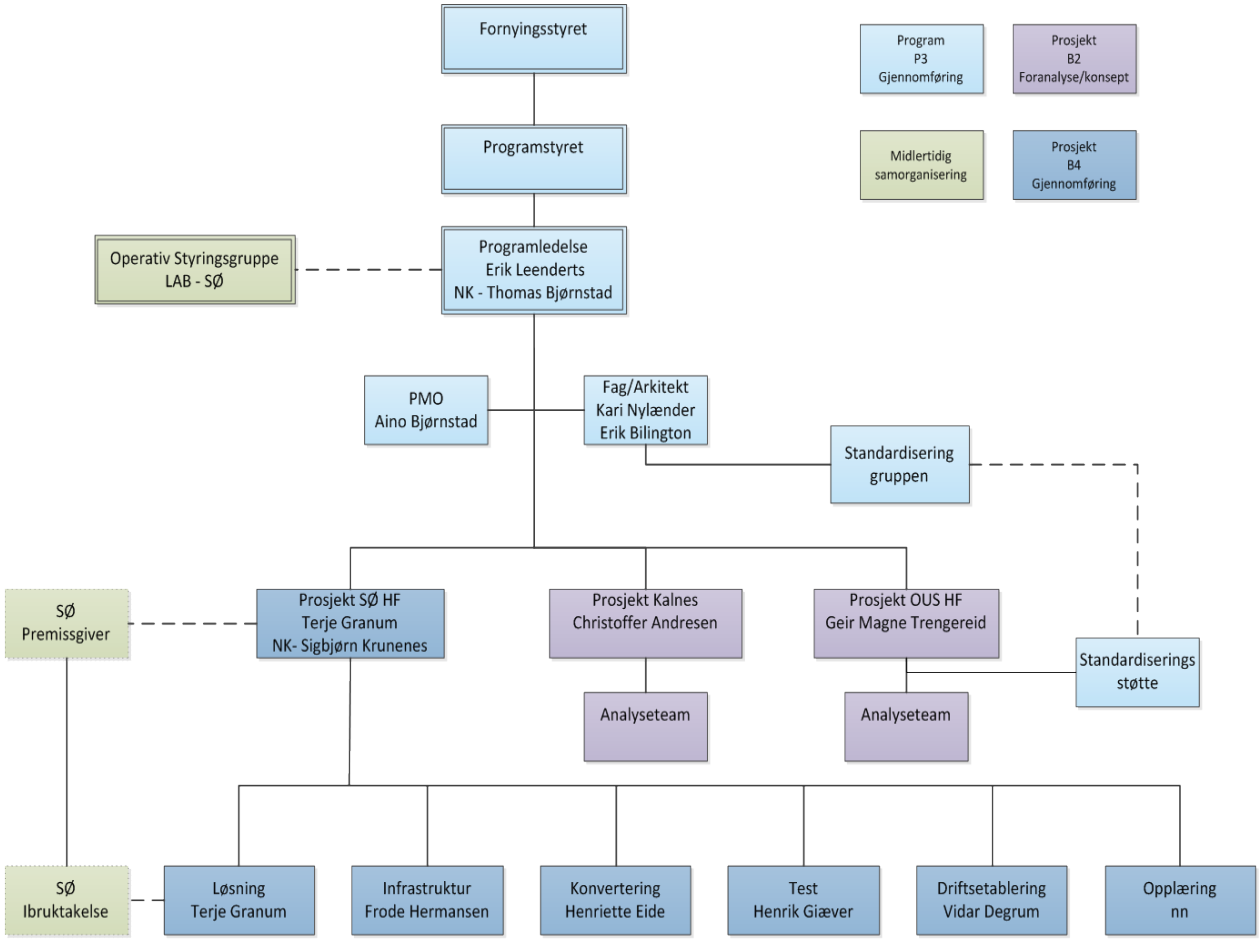

Figure 20: The new organization of Labdata from March 2014

In addition to the five development projects mentioned in the case description, there is an additional development project present in this new organization, namely *Opplæring*, found in the bottom right corner. As the title suggests, this project deals with the training of the staff working at the hospital so that they are able to use the new system when it is implemented.

Even though there are no development projects associated with the delivery projects at Kalnes (PNØ) and OUS, there will be established development projects at these hospitals when they are ready for implementing the new lab system. The close connection between the development projects and the delivery project at PNØ was also a tool for improving the collaboration with *SØ Ibruktagelse* located to the bottom left in the illustration.

Another factor that was decisive for the restructuring was that the supplier, Software Point, also had a change in their organizational structure. As previously mentioned, this was done exactly at the same time that Labdata introduced their new organization. This new organization is illustrated in figure 21 below.

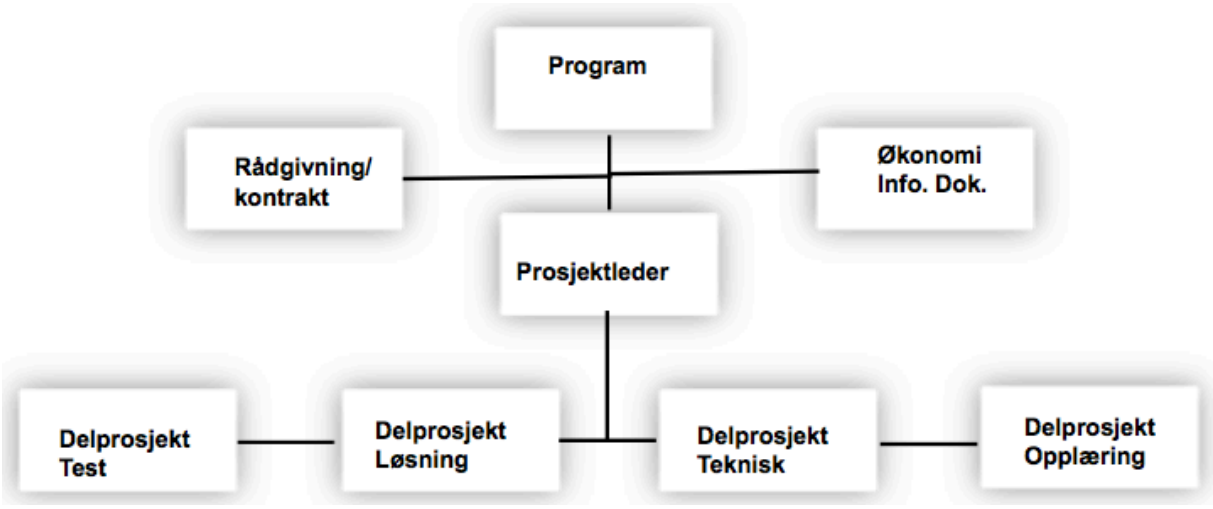

Figure 21: Software Point's organizational structure from March, 2014

Since there is old organizational structure from Software Point available, a comparison will not be performed, and is neither relevant for this thesis. However, a comparison between this organization and the new organizational structure of Labdata is appropriate. Even though the organizational structure of Software Point is far more simplified than the organizational structure of Labdata, it still looks similar, by the fact that it is designed in the same three "layers" that is described in the organization of Labdata above. The "top" layer of Software Point is organized similarly as Labdata, consisting of *Counseling*, *Economy* and the *Program Management*. The middle layer on the other hand, consists of only one delivery project, while Labdata's organizational structure consists of three. This is caused by the fact that Software Point is only working on one delivery at a time, therefore only focusing on the deliverance to PNØ. However, the biggest similarities between the two organizational structures is found in the bottom layer, where Software Point has four projects running, while Labdata has six. Many of the projects found in the organization of Software Point can be seen in the organization of Labdata, namely the Test-project, the Solution-project and the Training-project. The Technical project cannot be seen in the organization of Labdata, suggesting that its main purpose is the very development of the software solution. However, since we are

focusing on the Labdata program and not Software Point in this thesis, we will not go into further detail regarding the organizational structure of Software Point.

By performing this architectural change both at Labdata and Software Point, Labdata aims at improving their efficiency. More specifically they aim at increasing their implementation force at the new hospital in Østfold. The new organization will also simplify the control lines in Labdata, clarify who got the different responsibilities and clarify the interface between the projects in Labdata. The last achievable goal from this new organization is that it enables the program to phase the development of the regional solution towards OUS when the implementation at PNØ is complete.

6.3 Comparison of the organizational structures

As we now have an insight in the features of the new organizational structure in Labdata, a comparison of the old organizational structure and the new is possible. This enables us to see the new features they have added or unnecessary features from the old they have removed, which may indicate what they have tried to improve from the old organization to the new.

The first, and at first sight insignificant feature, is that there has been assigned names of most of the project managers. This may be argued to represent an attempt at handling an issue from the old organizational structure of Labdata. The previous organization of Labdata lacked clarified roles. In practice, this meant insufficient specification of who that was in charge of what, and to whom project managers was supposed to spread their information to. By clearly assigning names of the different project managers, these roles appear more clearly in the organizational structure. However, it does not explain how the projects communicate internally.

The second significant change is that the training-project has been moved. In the old organization, training was connected to a separate delivery project, and did therefore seem more remote from the development projects. By moving the training-project closer to the development project, the communication between the projects will increase, which might increase the efficiency of the training project because of increased collaboration.

The third difference in the organizational structure is that the development projects have been moved closer to the delivery projects. In the previous version of the organization in Labdata, the development projects and the delivery projects were separated, with the development projects all the way on the "left" side of the organizational map, while the delivery project were located on the "right" side. In this new organization, the delivery project(s) are directly connected with the development projects, making the communication between the projects a lot easier.

The fourth and final change done in the organization is that the deliverances to OUS and Kalnes are set on hold, while all of the resources are allocated to the implementation of the Lab system at PNØ. As earlier mentioned, this was to decrease the complexity of the deliverances, while in addition allocating more resources to the deliverance of Lab to the new health firm in Østfold. After the establishment of the Labdata program, they soon realized that the complexity was greater than anticipated. After a while, the progress of the program did therefore reach the "red" zone, meaning that some parts of the program were critically behind schedule. In order to cope with the complexity, and to make sure that deliverances go as planned; this sequenced deliverance will hopefully solve both issues. However, since this new organization was released in March 2014, the effects of the redesign of the organization not visible yet.

6.4 External consultants

The large number of external consultants used in Labdata and Sykehuspartner came to light during our interviews. All the project leaders within Labdata are hired from external consultant-firms. The reason for hiring external project leaders is simply because of their knowledge of and experience with project management. On the downside, you get project leaders with no anchoring to the health trust or perhaps without experience of managing health projects at all.

An option to consider is whether to go for external project managers, who work with project management on a daily basis, or go with internals without the proper background for project management. The latter was the case during the start of the Labdata program, namely that the managers had little or no background from project management. One should also note that there could be possible complications regarding the scientific terminology that (especially) is present within Labdata.

The cost of hiring someone from another company must also be taken into account. According to Sykehuspartner, the price of one external consultant equals the price of two internal employees. They are paying twice as much for their project leaders, in contrast of using their own employees. However, one must not forget that having a project leader without the required knowledge or experience on project management raises the risk of the project finishing on time and within budget, and could lead to greater costs and expenses.

At February 5th 2014, Fornyingsstyret reported that Sykehuspartner had planned to reduce their number of externals that work within DF. The main reason for this was to reduce their expenditures. Their budget suggested that the number of externals should be reduced by 30%, from 70% to 40%, hence reducing the expenditures by 84 million NOK (Helse Sør-Øst, 2014).

A minor additional remark regarding the use of external consultants was how the old management in Labdata consisted bio engineers. These bio engineers were experts in their field of research, which was the argument that made them into program mangers. On the downside, their knowledge around program management was limited. This resulted in delays until a decision was made to replace the management with personnel experienced within the field of program management. This is when the existing Labdata management was selected in order to get the program back on track. Since this challenge occurred long before we started on our master thesis, we will not discuss this challenge any further.

6.5 Legal challenges

An area which is considerable, but which we haven't prioritized in this thesis is the legal challenges related to the implementation of the new Lab system. Our interview subjects informed us of the importance of the legal aspect when dealing with health information systems. An example was how the merging of A-Hus, Ullevål University Hospital and Rikshospitalet into OUS was done in the 'wrong' order. The argument was that the hospitals were merged before the underlying infrastructure was merged. Therefore, the three health firms did not have access to the other health firm’s database.

However, there was a good reason the merging was done in this order. The Norwegian law prevented the health firms from sharing patient information before they were merged. It was therefore necessary to merge the hospitals into one before they could start thinking about harmonizing the underlying infrastructure for efficient sharing of patient information. It was in other words a legal challenge behind the decision of merging the health firms before the infrastructure, even if the desired order of actions was to do it the other way around.

Considering the example mentioned above, the project managers in Labdata have to consider the Norwegian law when developing their new system. For instance, the old database does still contain huge amounts of patient data. This patient information is to be converted into the new database format through the conversion project in the Lab program. When the lab data is converted, it is moved into the shared servers where all of the health firms running the new lab system can access the data required. One could therefore argue that this situation is similar to the situation they struggled with when they merged A-Hus, Ullevål University Hospital and Riskhospitalet into OUS.

In order to cope with the legal challenges, there have been established several laws amending the patient and user rights in the Norwegian health system (Lovdata, 2013). These laws does not only cope with the issue of storage of sensitive personal information, but copes with everything from the patients flow through the health system to safety in hospitals (Lovdata, 2013). Naturally, these laws count for all programs in DF, and do not affect Labdata alone.

In this regard, Labdata has a simpler task than the other programs. Through interviews, we have been informed that the results from a lab test are stored only for a limited period of time. This is naturally due to the Norwegian laws that regulate these premises. One can therefore argue that the Norwegian law works in favor for several projects in Labdata. In detail, this law simplifies the task assigned to the conversion project, as this law greatly reduces the amount of data in need of conversion.

Even though we will not perform a deep dive into the legal aspect of the implementation of the new lab systems, it is still worth highlighting that it is a crucial factor one have to consider regarding when developing and implementing a new health system that deals with sensitive patient information.

6.6 Summary

As our findings indicate, there were several challenges in the initial phase of the program. In detail, these challenges involved communication problems, large complexity in the delivery projects and many dependencies across the different projects. This led to uncertainties regarding distribution of responsibilities, premise legislation and routines for escalation. In March 2014 the management of Labdata established a new organizational structure. This reorganization involved repositioning of the projects in order to "close the gap" between the delivery- and development projects, and sequencing the deliveries to the health firms. In addition to the repositioning, the changes involved e.g. new interaction models between the various actors, more distinct delivery lists, agreed responsibility matrixes associated with each delivery, and established format of their periodical meetings. According to the program management, this new organizational structure solved many of the issues mentioned above. Since the Labdata program is such a newly established program, the effects of the reorganization are hard to measure. However, there are still possible to evaluate the new organization by comparing it with theory. This leads to the discussion that follows in the next chapter.

7
Discussion

As explained in the findings, Labdata have launched a new organizational structure, which according to the management solve many challenges, such as distribution of responsibility and routines for collaboration between the parties. The structure of this chapter follows the same structure of the theoretical chapter, meaning it starts with discussing the organization of Labdata in light of the theory of program management. It continues with Weill & Ross, namely the governance arrangement framework. It continues by discussing the organization by comparing it to both the theory of adaptive co-management. Towards the end of this chapter follows a comparison to the miscellaneous, such as the dependencies within the organization of Labdata.

7.1 Program management

Through his work on program management, Michel Thiry propose a classification of programs across two dimensions, as explained in the theoretical chapter. Through positioning Labdata within these dimensions, the research of Thiry proposes requirements in order to increase the programs efficiency. This section is introduced by positioning Labdata within the dimensions described in the theoretical chapter before Labdata is discussed according to the three program components, namely decision management, program management and profit management.

7.1.1 Positioning Labdata as a program

According to Thiry's definition of a program, the difference between a project and a program has to do with both the overall complexity and the number of services or products delivered. Where a project often has a single product or service that is to be provided, a program consists of delivering several products or services. One can say that

a program is more or less a set of several projects. According to the definition of a program, Labdata can then be regarded as one since it consist of five software development projects and two delivery projects, which are currently active.

To elaborate the categorization of Labdata according to what activities they manage and how the program was established, we argue that Labdata is a strategic and vision-led program. As described in the theoretical chapter, a strategic program has as its main priority to transform the organization or change the way the organization performs its business. A vision-led program is as its name implies driven by a clearly defined vision, or in other words, a distinct strategy. The reason for positioning Labdata as a strategic program, is that the Labdata program aims to transform some elements of HSØ, namely their laboratory system. The reason why Labdata is a vision-led program is the intention behind the initiation of the program. Labdata was initiated with the purpose of developing a standard laboratory system for all the health firms in the region, which matches Thiry's definition of an vision-led program where a strategy is defined along with a number of objectives, and a program is shaped based on these objectives.

7.1.2 The organic approach

According to Thiry, a vision-led program needs an organic approach where empowerment and creativity are privileged over a mechanistic control-based approach. However, this can be difficult to implement because the current paradigm in organizations still tends to focus on minimising risks rather than maximising opportunities (Thiry, 2010, p.39). In other words, there is a balance that needs to be considered, whether the program should be managed as a mechanical control-based approach with minimal risk, or an organic approach that maximise opportunities. Both approaches offers both positive and negative features, so there are no right or wrong approach, however Thiry recommends the organic approach because of the flexibility this provides to the program.

In comparison to Labdata, there are two values that needs to be discussed, namely Labdata's ability to support empowerment and creativity. This is necessary in order to evaluate whether Labdata follows the organic approach mentioned above. In regard to the empowerment, there are an important challenge that affect Labdata. This is the large amount of dependencies that exist both internally between the projects in the program,

and between Labdata and the other programs in DF. The renewal board in DF governs the progress of Labdata and are responsible for establishing the strategy and action plan for the programs. It is therefore arguable that Labdata lacks the empowerment that Thiry describes in his definition of an organic program approach.

According to Thiry, the last feature of an organic approach is creativity. The room for creativity in Labdata is uncertain, since it requires a detailed long-term study of the processes within the development- and delivery projects of Labdata. However, there are certain aspects of Labdata that may prevent the occurrence of creativity. As described in the case description, the software solution that is being implemented is based on the Labvantage Medical Suite. This is a complete, finished solution that only needs to be adjusted to fit the requirements of Labdata. It is therefore no room for development of new software, which may encourage creativity and new thinking. There are however other aspects that may argue that there is creativity in Labdata. As described in the findings, the new organizational structure of Labdata features a closer linkage between the development- and delivery projects. Since this may improve the collaboration between the research groups at the health firms and the development projects, it may give the development projects useful feedback from the users of the systems. Since the users often look at the system from a different point of view than the developers, the users might give the developers new ideas to features that could be implemented. This would therefore argue that there exists creativity in the Labdata program, which according to Thiry is a requirement for an organic program.

7.1.3 The deployment phase

As described in the theoretical chapter, Thiry divides a program's life cycle into five phases, namely the formulating phase, organization phase, deployment phase, appraisal phase and dissolution phase. Considering the descriptions of each phase from the theoretical chapter, the Labdata program may be considered to be positioned within the deployment phase of Thiry's program life cycle model. This is because Labdata is done with their planning phase, and are currently developing the software solution. As Thiry describes, there are a few challenges related to this stage of the program life cycle. The common way of practice is to make program managers impose a standardized project methodology for the program. However, mostly when working with senior project managers, it is best to let them "choose their own path". Experienced managers are

usually good at what they do and, over the years, have developed or chosen methods they are familiar with (Thiry, 2010, p.149). A consideration that has to be made is therefore whether the program manager is experienced enough to rely on his own experience, rather than imposing standardized project methodology for the program. As the findings indicate, there were challenges related to the program management in its initial phase. This was due to a lack of management experience, and it was therefore necessary to replace the management with a new one. The current program manager of Labdata has earlier experience from an IT program, and have also worked as a software developer. Whether this management experience is enough to put aside standardized project methodology may be argued, but there have been conducted measures which have solved many of the challenges that existed in the initial phase of the program.

7.1.4 Program components

Decision management: Within decision management there is the phase of implementation and decision. In Labdata this was first started as a parallel implementation phase, but they decided to move away from that decision, and chose to implement the respective projects in sequence instead. The second phase of decision management is the decision phase. This phase is quite comprehensive within Labdata, where all the projects reports to the program manager that sits at the top of the program, which then reports to the program board.

Profit management: Measuring profit within not-for-profit organizations must be dealt with in a different way than for-profit organizations. Labdata have, however, defined some goals they want to fulfill with the program. The goals are that standardization and a joint solution will facilitate that tests will be performed with the best professional quality and will provide easier work processes in everyday life. Increasing quality and safety for both patients and health personnel. (Helse Sør-Øst RHF, 2014)

7.2 Weill & Ross

The appliance of the governance arrangement matrix by Weill & Ross starts by mapping the current position of Labdata within the governance arrange matrix before comparing this matrix with the most common IT decision distribution presented by Weill & Ross. Additionally, a discussion on how value is created in not-for-profit organizations is presented, before comparing Labdata with top-performers.

7.2.1 Governance arrangements matrix – Current position

There will be presented a mapping of the current situation in Labdata. Afterwards, we will present our thoughts on how they could modify their IT Governance decisions in order for them to reach their desired objective. Towards the end, some guidelines is presented for them to follow in order to measure improvement.

This is how the Governance Arrangement Matrix looks like for Labdata. The 'X' marks where in the organization they get their input and where decisions are being made, and has been filled out in cooperation with a representative from the Labdata program. The green and orange fields represent the most common input/decision pattern for all enterprises (Weill & Ross, p.202).

	IT Principles		IT Architecture		IT Infrastructure		Business Application		IT Investments	
Business Monarchy	Inp	Dec	Inp	Dec	Inp	Dec	Inp	Dec	Inp	Dec
		X		X		X		X		X
IT Monarchy									X	
Feudal										
Federal					X		X			
Duopoly	X		X							
Anarchy										

Figure 22: Governance Arrangement Matrix for Labdata

- *IT Principles:* There are already architectural guidelines, which the programs have to follow. Architects and IT-specialists give the input, and the managers make the decisions.

- *IT Architecture:* A mixture of general strategies set by superiors, guidelines and choice of routes, as well as detailed design-solutions for each program (meant to support needs). The architects give the input, and the managers make the decisions.

- *IT Infrastructure:* A mixture of general strategies set by superiors, guidelines and choice of routes, as well as detailed design-solutions for each program (infrastructure as a service is a long-term goal, but is not present at this point). Architects and IT-specialists give the input, and the managers make the decisions.

- *Business Application:* Overarching long-term plans, strategies, guidelines and choices (meant to support needs). Architects and business/service owners give the input, and the managers make the decisions.

- *IT Investments:* This is often done at the level of Regional Health Authority (HSØ). The IT-group gives input, and the executive management makes the decisions.

As seen in the governance arrange matrix, Labdata is not so different from the most common input/decisions, except that decisions are often made at a higher level than what is most ordinary. The reason for this is closely linked to the type of organization that is responsible for the Labdata program, namely HSØ and Sykehuspartner. As explained in the case description, HSØ is a sub-department of the Department of Health and Sykehuspartner is a unit of HSØ that is being run as a separate business from HSØ, and are responsible for running and maintaining IT applications and infrastructure for the health firms of HSØ. In this matter, is has to be considered that both organizations responsible for the Labdata program are not-for-profit organizations. Before the discussion of the current situation and possible improvements, a closer look at some important characteristics of not-for-profit organizations will be presented.

7.2.2 Not-for-profit organizations

According to Weill & Ross, for-profit organizations generate their value through goods and services that are purchased by customers, and successful organizations also

generate value for their owners, where the value is represented in financial statements. Not-for-profit organizations however, generate public value in addition to private value represented by goods and services (Labdata to all the hospitals). The problem, as stated by Weill & Ross, is that many of the management frameworks and measures are designed for profit seeking organizations where the performance measures of profit, shareholder value, and good corporate citizenship are clear (Weill & Ross, 2004).

Weill & Ross then continues by presenting a framework that identifies three key factors (environment, capabilities and value) that is interconnected and must be aligned in order to generate value, which is shown below.

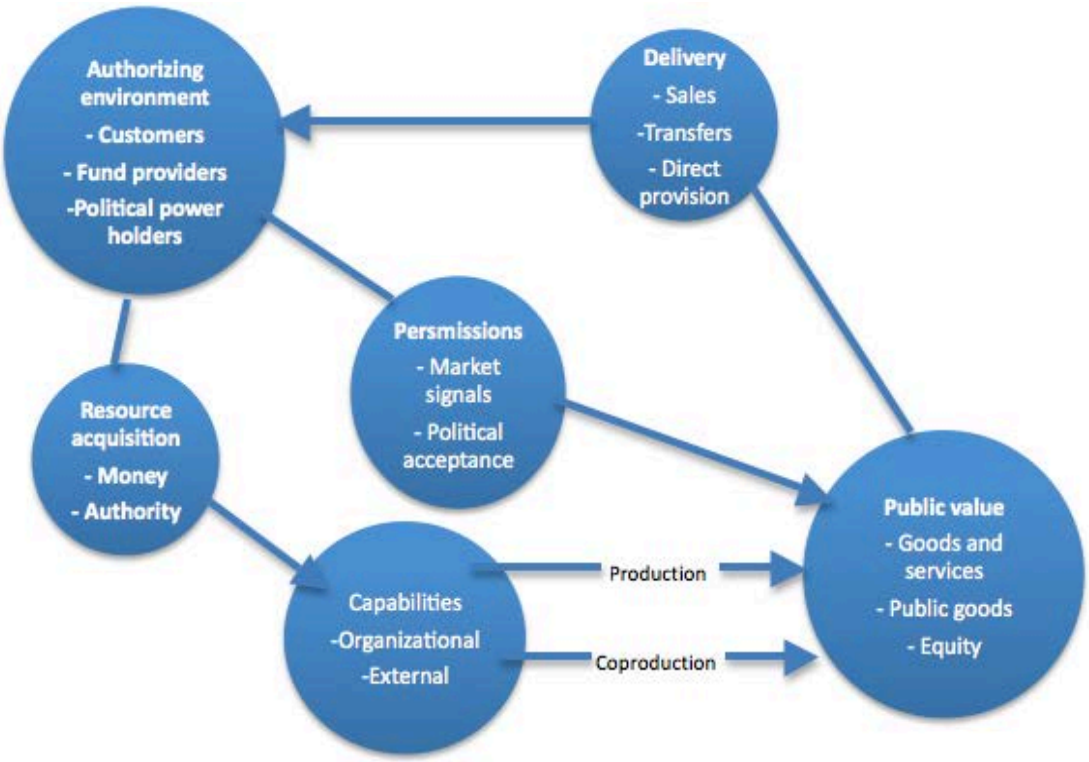

Figure 23: Value framework for managing not-for-profit organizations

- *Authorizing environment:* Where for-profit organization's environment is to find a market for its goods and generate capital, not-for-profit organizations have an authorizing environment consisting of potential customers, funding sources and political influences.

- *Capabilities:* In contrast to for-profit organizations, where the capabilities are profits and equity, not-for-profit organizations get their capabilities from the authorizing environment in the form of funding and authority to create capabilities.

- *Public value:* The public value that is created by a not-for-profit organization is given back to the authorizing environment in the form of transfers and provision of services. In our case, this would mean the Labdata system that is used by all the hospitals.

To sum up this value-generating framework, one can say that the public value results in a delivery back to the authorizing environment in the form of provision of services. The authorizing environment gives permission back to those who create the public value in form of political acceptance and market signals, such as increased demand. (Weill & Ross, 2004, pp.192-94)

7.2.3 Governance

Now that a basis for how not-for-profit organizations operate and create value has been described, it's possible to take a closer look at Labdata's position within the governance arrangements matrix compared to most not-for-profit organizations. The data presented in the governance arrangements matrix represent the most common input/decision for all enterprises, meaning both for-profit and not-for-profit organizations. Weill & Ross mentions that there are more similarities than differences when comparing the governance arrangements matrix for both types of organization. There are, however, five patterns where IT governance is different in not-for-profit organizations.

- There are more business monarchies in all decisions, with the exception of IT architecture.

- There are significantly fewer IT monarchies in all decisions.

- There are more federal arrangements in all decisions except for IT investments.

- There are more federal arrangements regarding where they get their input.

- IT architecture has more duopolies. (Weill & Ross, 2004, pp.201-02)

Next, there is the comparison of these five patterns with Labdata's position within the governance arrangements matrix. The first pattern is clear within Labdata, where all decisions are being made by business monarchy. Even though decisions regarding IT architecture is mentioned as an exception, Labdata already have architectural guidelines they follow, which explains why decisions are taken here. The second pattern is also arguable suitable, since no decisions in Labdata are taken as an IT monarchy. The third pattern may be argued to differentiate from Labdata. Where decisions often are done as a federal arrangement (except IT investments), Labdata has none. The fourth pattern, however, may be argued to fit the case. Federal arrangements are giving the input in IT infrastructure, business applications and IT investments. The two others (IT architecture and IT principles) are done as a duopoly. The last pattern, where IT architectures often have duopolies as input, is also the case within Labdata.

To sum this section up, one can see that most of the patterns regarding IT governance arrangements within not-for-profit organizations are also present at Labdata. As stated above, these patterns represent where the most common input/decision is being made in several organizations, and therefore not all of them will fit Labdata. Even though most patterns are present within Labdata, it does not necessarily mean that the governance is optimal. To find out how good Labdata's IT governance is, one has to take a closer look at the top performers in the category of not-for-profit organizations.

7.2.4 Labdata compared to top performers

This section presents a closer look on how top performers manage IT governance, in addition to a comparison and suggestions on how Labdata could be improved further. The guidelines presented by Weill & Ross are meant as a recommended starting point for further improvement.

- *IT Principles:* Use joint business and IT when making decisions.

  When both senior and IT management make joint decisions, one combines the IT management's technological abilities with the strategic organizational input from senior management. Collaboration between these two parties when making decisions

on IT principles will increase the chance of finding the right balance between what the business needs and what actually is possible from a technical perspective.

- *IT Infrastructure:* Consider the principles for IT infrastructure as strategic business decisions.

The essence here is that the strategic decisions needed in not-for-profit organizations should be made by senior management, or in other words as a business monarchy. The reason for this is that even though IT managers have a better technical perspective, they usually don't have the strategic mindset required in this type of organization. When considering the principles for IT infrastructure as business decisions, you initiate these strategies from the top of the organization.

- *Business application needs:* Don't use a feudal model.

Using a feudal model may seem like a good idea in the first place; for example specifying local needs for different regions. The problem, which decreases the governance performance, is the tension created between the focus on central strategies and the specific needs for each instance.

- *IT Investments:* Use joint business and IT when making decisions.

As for IT investments, the guideline presented here is the same as for IT principles. Combine the proficiency from both IT and senior management.

After establishing the recommended guidelines used by top performers, one can compare these to the current governance in Labdata.

IT principles within Labdata are following architectural guidelines established by senior management and input is given from both system architects and IT specialists. Senior management, however, makes decisions. Even though decisions are not jointly taken, Labdata is not too far away from the recommended guidelines because both senior and

IT managers are involved in the process. There is also basis for assuming that IT leaders were involved when the architectural guidelines for Labdata were created.

IT infrastructure in Labdata are following general strategies set by senior managers, and according to one of our contact persons at Sykehuspartner, a long term plan is initiated to enable infrastructure as a service (IAAS). Compared to the guideline for IT infrastructure, this is probably where Labdata is closest to what is recommended.
As for business application needs, Labdata is not using a feudal model, so there is not much to add here.

Finally, there is *IT investments* where the guideline is the same as for IT principles, namely to take decisions jointly. Since input is given by IT group and decisions are taken at regional level, there are signs of collaboration but senior management seems to have the last word here as well.

7.2.5 Summary of Weill & Ross

After having compared Labdata with top performing not-for-profit organizations, there is now room for discussing where and how Labdata could improve the current IT governance strategies. The governance arrangements matrix, showing where Labdata gets input and makes decisions, is a good tool for creating a perspective on the IT governance within the organization. However, just placing Labdata within the matrix is not enough to create a picture on how good the governance actually is.
First, explaining the different value perspective in not-for-profit organizations and then showing how top-performers govern IT, a basis created for comparing them with how Labdata governs IT. The main goal was to highlight which areas that had room for improvement, or at least pinpoint areas where Labdata differ from top performers that could be a possible challenge in the future. The biggest challenge that arose has to do with both evaluating and presenting improvements for Labdata, and it is closely linked to the fact that Labdata is not fully functioning yet. To utilize the governance framework to its full potential, one has to go an additional round with the governance arrangements matrix, after the delivery of Labdata is completed. This is sadly something we are not able to do, since the first delivery to the new hospital in Østfold, is supposed to be invoked at a later stage. Therefore, that has to be done at a later occasion when Labdata

is fully operational. Even though Labdata has some differences from the guidelines presented above, one cannot presume whether it will be a success or a failure based on this information alone.

What actually can be done at this point, is to give a heads up on which areas that usually distinguish top-performers from the rest. The two areas where Labdata differs from top-performers are IT infrastructure and IT investments, where Weill & Ross suggest that decisions are taken jointly.
Additionally, one has to consider what conditions that must be fulfilled in order to classify the Labdata program as a success or failure. As stated on page 32 and 33, to classify Labdata as successful is dependent on the satisfaction of the sponsor. Nor should the goals they had on scope, cost, and time be exceeded too much. To pave the way for Labdata to be a success, they need to keep up the level of executive support, listed on page 33 as the main success factor, and involve the IT leaders more in decision making.

7.3 Adaptive co-management

Through this section we will apply the theory from adaptive co-management to do some discussion regarding the findings we presented in the previous chapter. It will consist of both discussions whether Labdata follows the theory of adaptive co-management, and if adaptive co-management can be applied to improve certain aspects of the project.

7.3.1 Appliance of theoretical concepts

As presented in the theoretical perspective, the three core pillars of adaptive co-management are collaboration, learning and multilevel governance. The concept of adaptive co-management has been established through scenarios where different groups have to cooperate in order to strive for a common goal. In the paper presented in chapter 4by Armitage et al. (2009), the observed fishers, trappers and other groups all connected to the narwhale business in Canada. This can be compared to our case by seeing the fishers and trappers as representing the different projects in Labdata. This includes for instance the development projects, the delivery projects and the supplier. The theory from that case may therefore be applied to our thesis in order to perform a discussion.

7.3.2 Multilevel governance

Through the findings presented in the previous chapter, a description was made on how the organization of Labdata was changed in March 2014. One of the major changes done in this new version of the organizational structure was that the development projects were connected directly to the delivery project to PNØ. In the old version of the organization, these were separated. A natural effect from this change is that the cooperation between the development projects and the delivery project to PNØ increases. As described in the theoretical perspective, collaboration is a requirement in order to establish trust and learning. A natural assumption is therefore that there were small amounts of learning in the old organization, due to the separation of the development projects and the delivery projects. However, the very fact that there has been established a new organization in Labdata indicates that there has been some sense of learning from the very beginning. Learning will of course always be present, even if the collaboration between groups in an environment does not work perfectly. Some theory from adaptive co-management has always been present in the project, but has definitely been improved by the new organization.

As briefly mentioned in the theoretical perspective, Armitage et.al formulated ten conditions for successful adaptive co-management. This was done through the observation and analysis of a narwhale community in Canada. The first condition that may be argued as fulfilled in the organization of Labdata is the condition of "*A clear and identifiable set of social entities with shared interests"*. The entities within Labdata was created for the pure purpose of fulfilling the programs main goal, namely to create a new lab system. The shared interest in this matter is therefore apparent. The identification of the entities has however been improved by the new organization. As explained by one of the interview subjects, there have been improvements to clarify the roles of the different groups in the projects and their responsibilities. We may therefore argue that the set of entities in Labdata is distinct and identifiable.

These changes may also be argued to fulfil another condition from Armitage et.al., namely *"Reasonably clear property rights to resources of concern".* This has to do with the clarification of responsibilities and tasks in the new organization. This may also be generalized to the entire HSØ, since they have established the Y-model, as described in the case description. This model clarifies the roles, the different areas of responsibility, division of tasks, and establishes interfaces between Sykehuspartner, HSØ and the

health firms. It may therefore be argued that this model has moved the cooperation between these parties towards a fulfilment of this condition.

Another interesting condition is the condition of *"Key leaders or individuals prepared to champion the process"*. As stated in our findings, there were challenges early in the establishment of Labdata. This was due to that the former management consisted of bio engineers, and that their experience around management was limited. In order to get the program back on track a new management was selected, consisting of consultants with experience in management. In comparison to the condition above, Labdata can be argued to have failed this condition in its early phase. However, the consequences of lack of good management were impossible to overlook, and a new management had to be established. The condition was therefore fulfilled when the new management was selected, and today the program is en route according to its timeframe on most projects.

The next condition by Armitage et.al.is not as clearly fulfilled as the previous. This condition concerns *"Openness of participants to share and draw upon a plurality of knowledge systems and sources"*. In other words, the condition is about the ability to share knowledge between groups. In Labdata, there are three main groups, namely the delivery projects, the developing projects and the supplier of the software. Naturally, these three groups have their own unique responsibilities, which are not shared with the other groups. A shared knowledge base between these groups is therefore not desired, as the other groups have no use of the other group's knowledge. This does only count for their internal responsibilities, and communication between the groups is naturally desired. However, sharing of knowledge is present within each group. For instance, delivery projects of software services often cooperates with research groups at the hospitals, in order to get feedback on how the system works and how it may be improved. This feedback is then transmitted to the development project in order to implement the changes that were desired by the research groups.

The last similarity that we will discuss is the condition of *"Provision of training, capacity building, and resources for local-, regional-, and national level stakeholders"*. Since the management in Labdata experienced the complexity of running parallel execution of delivery to both PNØ and OUS, a started doing their deliveries in sequence, which meant delaying the OUS delivery and only focusing on PNØ. In this regard, the new organization also featured a transfer of the training project so that it was connected to the PNØ

delivery along with the development projects. By moving the training project closer to the development projects, collaboration, trust and learning become easier according to the theory of adaptive co-management. The fact that the supplier also has its own dedicated project to training emphasizes the focus they have put on training of staff for the new system. However, this comes as no surprise, as this system is to be launched across all the health firms in HSØ which employs over 75 000 employees(Helse Sør-Øst RHF, 2010).

7.3.3 Competition

In the theoretical perspective, there is a description of the disruptive force competition may have on an organization. Looking back at the Narwhale case, competition could in this case occur e.g. between the fishers and trappers, meaning that the fishers would promote decisions that was in favour of the fishers, but which would be undesirable by the majority. However, our case regarding Labdata is somewhat different from the Narwhale case, primarily because it is a program and not an ongoing business.

Before the fishers and trappers started using adaptive co-management in order to increase their collaboration and learning, they still did do their business. The only difference was that they did them separately, indifferent of what the other groups was doing. Therefore they had their own agenda and their own personal goals. The danger that existed when they applied adaptive co-management was that one of the groups would continue to favour their own interests, which as mentioned would be devastating for the trust between the parties.

The difference between Labdata and the Narwhale case is that the development projects, delivery projects and supplier were established for the only purpose of developing a new lab system for HSØ. In other words, there were no development projects before the establishment of Labdata, and therefore, the development projects never had the time to create their own agenda, which could interfere with the agenda of the Labdata program. The fact that the development projects was created for the only purpose of being a tool for reaching the goal of creating a common lab system, makes it impossible for the development projects to strive for their own personal goals.

It is therefore arguable that the argument of competition being a disruptive force is hard to apply to this case. However, this is not an conclusive fact, since the Labdata program

is dependent on a supplier, namely Software Point. Software Point is a separate supplier to the program, and existed long before the establishment of Labdata. It is therefore possible that Software Point could start making decisions that would gain Software Point, but be unwanted by the Labdata program. However, as the theory of adaptive co-management says, the multilevel governance in Labdata should prevent such events of occurring.

In addition to the challenge of competition from the supplier, there is also a challenge of competition in the projects. Even if it is unlikely that there will occur competition between the delivery projects and the development projects, like explained above, there may still occur competition within one of the projects, either development or delivery. Each project consists of separate individuals, there is a possibility that these individuals could prioritize their own personal interests and make these interests into the groups interests. However, as one of the features of the new organization is better linkage between the development projects and delivery projects, these horizontal linkages may prevent such events from happening.

A parallel can be drawn to the connection between the health firms and the delivery projects of any DF program. However, as some interview subjects explained, the delivery projects to health firms has been experiencing conflicts between research groups and the delivery projects. The research group of a hospital is the most important linkage between the delivery project of a program and the hospital, since the research groups works as the connecting link between the doctors, nurses and other employees of the hospital, and the delivery project, which supplies the new system. It is the research group of the health firm that works as a communication channel between the delivery project and the users of the system located at the health firm. However, the representatives in the research groups are usually doctors or other medical personnel from the health firm. Since they are closely related to their patients, they put the patient treatment as first priority. This is naturally the logical choice, but the overwhelming focus on patient treatment has in many cases resulted in little focus on interaction with others. As an interview subjects explained it, "A doctor with specialization on knee treatment puts his knee treatment as his top priority. Everything revolves around that. He does not care whether the system he uses is integrated with other parts of the hospital, as long as he is provided with the necessary information through the system to

do his job properly." If one puts it somewhat extremely, the doctors' prioritization revolves around patient treatment in the presence, while the developers and delivery projects prioritize to have an integrated system, which will work for a long time in the future.

7.4 Organization of Labdata

The discussion of the organization of Labdata is introduced by a evaluation through the theory of dependencies and critical path. This involves discussing the characteristics of Labdata's organization, before presenting what challenges they may face or how they could improve their organization.

7.4.1 Dependencies and Critical Path

The dependencies within Labdata are provided from the delivery list, illustrated in figure 18. This figure contains the information on the solution from Software Point, where the different deliveries have been named from A to E, where:

A: Infrastructure and interface
B: Function and standardization
C: Conversion and redevelopment
D: Test and acceptance
E: Operation establishment

There exist several dependencies between these projects. For instance, test and acceptance is not possible before building the infrastructure and interface. Additionally, conversion and redeveloping of the data is not possible before the function and standardization is in place.

As mentioned in the findings, Labdata changed from a parallel delivery to delivering in sequence, which also leads to a change in the critical path in the program. When for instance the infrastructure and interface (A1) project is finished at one health firm, they may continue with functioning and standardizing (B1), in addition to start the first project (A2) at a different health firm. This process could then be continued further on. After finishing functioning and standardizing (B1), both conversion and redevelopment

(C1) and B3 can start, and so on. When Labdata had a parallel approach to executing the program, meaning that there is a lot of work done on several fronts at a time, the critical path would change accordingly and become more and more complex.

Since Labdata decided to change their approach from a parallel delivery to delivering in sequence, the complexity was reduced for the critical path, and for the delivery list as well. The deliveries will then be completed one by one from A to E, meaning that the critical path would look like this:

Figure 24: Critical Path of Labdata deliveries

Since there are no time estimates available to us, and the fact that they chose to simplify their deliveries, there is just one critical path available, like stated above.

The fact that Labdata decided to change their approach from a parallel delivery to sequential delivery affects the program both positively and negatively, and there are some pros and cons for both approaches.

By having an approach that focuses on doing projects in parallel, Labdata have the opportunity to work on different projects at the same time and thereby reducing the amount of time it would take to complete the whole delivery (at all of the health firms). However, working on several projects at the same time involves additional precautions Labdata would have to consider. First, one would have to make sure that communications between the actors involved are highly prioritized, and reporting, in addition to an increase in risk of delivering Labdata on time.

8
Conclusion

In this thesis we have explored the organization and development of the organization in Labdata, a program in Digital Fornying. The research question we formulated was:

> *What are the challenges involved in the management of large scale & complex ICT systems and how can existing theories help us cope with the challenges?*

As the thesis question states, we have applied theory in order to discuss the choices they have done regarding the design of their organization. The theories we applied was the Governance Arrangement Matrix developed by Weill & Ross, adaptive co-management and program management.

Through the development of the thesis, we have conducted eight exploratory interviews in order to map the situation in the South-Eastern Norwegian Regional Health Authority, and eleven in-depth interviews when we had decided where to put our focus. These interviews were conducted through an ethnographic research methodology.

Our findings indicate that the reorganization of Labdata was crucial in order to improve collaboration, trust and learning, which is consistent with the theory of adaptive co-management. In greater detail, the new organization featured a closer relationship between the supplier (which is the supplier of the software solution), the development projects (which are responsible for the conversion of old data into the new system, establishing infrastructure, standardizing terminology of e.g. medical terms, testing and operating establishment) and the delivery projects (which are the projects responsible for the deliverance and implementation of the solution at the health firm). This closer relationship involved sequencing the deliverance by focusing the resources on the

opening of the new health firm in Østfold (PNØ) instead of the previously parallel deliverance to both PNØ and OUS. Sequencing the deliverance led to a reduction in both the overall complexity of the delivery and also reducing the risk of not completing the delivery on time. This change also increased the multilevel governance, which is in line with the theory of adaptive co-management which emphasizes learning-by doing through multilevel governance, since this prevents the occurrence of competition, and establishes trust between the parties which in the long term increases the learning value.

If we follow the theory of adaptive co-management, the new organization features additional changes which cope with trust building, which leads to better collaboration. Within each project of Labdata, the roles of the management etc. have been clarified to a greater depth than in the previous organization. This is part of improving the flow of information, since it clarifies whom that should communicate with whom.

The governance arrangement matrix gives insight to where an organization get its input and where decisions are being made. By mapping inputs and decisions, a basis is created for comparison between Labdata and other top-performers operating as not-for-profit organizations. Either by comparison with others, or by creating an additional mapping with Labdata's desired situation at a later stage, one can identify areas where IT governance is not optimal, in order for them to be able to govern IT effectively. The encouragement for taking joint decisions is also worth noting. In addition to combining the knowledge and skill of both senior and IT management, one also triggers several


Stopper dataprosjekt - risikerer milliontap

Et nytt datasystem skulle gi leger på Aker, Ullevål, Rikshospitalet og Radiumhospitalet tilgang til alle pasientjournaler og røntgenbilder. Nå stopper Oslo universitetssykehus millionprosjektet.

Anbefal Bli den første av dine venner til å anbefale dette.

Dette er saken

1. januar 2009 ble Aker universitetssykehus, Ullevål universitetssykehus, Rikshospitalet Radiumhospitalet sammen til det nye Oslo universitetssykehus. Målet er å

Figure 25: Aftenposten.no headline (Karlsen, 2013)

features from adaptive co-management. Learning, collaboration and co-management are all closely related to the process of making joint decisions.

Through the use of program management theory by Michel Thiry, we argued that Labdata is a strategic, vision-led program. As Thiry describes, a vision-led program should have an organic approach, which means to emphasize empowerment and creativity. As our discussion indicate, it is arguable that there is room for improvement in order to make Labdata organic according to the theory of Thiry. However, the setting in which Labdata was established, makes a transformation of Labdata into a more organic program challenging. Both empowerment and creativity are difficult requirements to accommodate, considering the rigid framework in which Labdata exist.

There has undoubtedly been a critical view on the Norwegian Health System in media. Some of this attention has been drawn towards the Norwegian Health Authority after earlier projects that ended up in failure (Karlsen, 2013). This attention has brought additional criticism to the front pages of media, such as procedural errors (Stabell & Heggen, 2012), an increased amount of patient complaints (Hirsti & Helljesen, 2013) and system errors, which may have catastrophic consequences for the affected (Vedeler & Eggesvik, 2013). However, these headlines only underline the importance of a well-functioning health care and the importance of keeping the systems in use at the health firms up to date to meet with the contemporary standards. Through the establishment of Digital Fornying and the underlying programs, the Norwegian Health Authority has taken a great step towards a well functional integrated information infrastructure where the patient journals no longer is transferred by Taxi (Gjestad, et al., 2011), but digitally through the shared health management information systems.

In this regard, it is important to consider the aspect of personal interests. As described in the discussion, the interests are often split between the stakeholders in a project. The surgeon with a specialty in knee operations will put his knee surgeries and patient care at the top of his priorities, and he is often indifferent to the integration and extra functionality of the system he is using, as long as the system provides him with the necessary information to enable him to do his job properly. The system developers have through our interviews been described as the opposite; prioritizing the development of the system above the welfare of the patients that may lead to unstable systems in their developing phase.

This reflects on the different perspectives the health firm workers and the system developers. This phenomenon can be drawn to the media as well. Naturally, the media does not see the full picture and what going on within the development of new health systems and the complexity of switching out an old system with a new one. And it is this information that is being perceived by the community. However, as we discovered through our findings, the developers of the new Lab system did not understand the complexity they were dealing with in the beginning. The initial idea was to run parallel deliverances to both OUS and PNØ, but as they soon realized, this resulted in greater complexity than they were prepared for. This resulted in the delays regarding the deliverances to PNØ, and was one of the bigger motivations for developing a modified version of the organization of Labdata in order to cope with the complexity. However, this is in line with the theory of adaptive co-management, as it encourages learning-by-doing, and that the theory therefore assumes that one never can e.g. initialize a project and immediately understand the full complexity of it.

Through the use of adaptive co-management, the governance arrangement matrix by Weill & Ross and program management, we have argued for some of the important aspects to consider when designing a cooperative environment for different parties with different areas of expertise. There exists an enormous amount of dependencies between the programs in Digital Fornying. While writing this thesis, the implementation of DIPS at OUS is currently taking place. However, there have been challenges related to this implementation that have led to some delays in the deliverance. DIPS is a central part of the new platform of system that are to be implemented throughout all of the health firms in HSØ, and it is therefore critical that DIPS is in place like it is supposed to. It is therefore intriguing to observe this implementation, since further delays in the deliverance may have severe repercussions for the deliverances of the other systems which is required for a well functioning health firm. It would also be interesting to observe the further progress of the development and deliverance of Labdata to both PNØ and OUS and see how they develop regarding the internal organization and how the final system will be in use. For a further development of this thesis, one could consider to analyze the progress in Labdata by using alternative theoretical perspectives in order to see the progress in Labdata from a different point of view.

References

Armitage, D., Berkes, F. & Doubleday, N., 2007. *Adaptive Co-Management: Collaboration, Learning and Multi-Level Governance.* s.l.:UBC Press.

Armitage, D. R. et al., 2009. Adaptive Co-Management for Social-Ecological Complexity. *Frontiers in Ecology and the Environment,* 7(2), pp. 95-102.

Baxter, P. & Jack, S., 2008. Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, pp. 544-559.

Cook, I. & Crang, M., 2007. *Doing Ethnographies.* s.l.:s.n.

DIPS, 2014. *DIPS - Historie.* [Internett]
Available at: http://dips.no/nor/om-oss/historie
[Funnet 2 January 2014].

Eide, T. H. & Sporsem, H. M., 2010. *MetaVision, elektronisk kurve: Et verktøy i forbedring av pasientsikkerhet?.* [Internett]
Available at: http://www.farmatid.no/id/3541.0
[Funnet 2 January 2014].

Gjestad, F. C., Ramsdal, R. & Dommerud, T., 2011. *Ahus måtte sende journaler i drosje etter datakollaps.* [Internett]
Available at: http://www.aftenposten.no/nyheter/iriks/Ahus-matte-sende-journaler-i-drosje-etter-datakollaps-5122725.html#.Uz7fpvl_t8E
[Funnet 04 March 2014].

Hanseth, O. & Lyytinen, K., 2010. Design theory for dynamic complexity in information infrastructurese: the case of building internet. *Journal of Information Technology,* Volum 25, pp. 1-19.

Helse Midt-Norge IT, u.d. *Klinisk Arbeidsflate.* [Internett]
Available at: http://www.hemit.no/no/Velkommen-til-Hemit/Fag/Tjenesteutvikling/Klinisk-arbeidsflate/106771/
[Funnet 2 January 2014].

Helse Sør-Øst RHF, 2010. *Helse Sør-Øst RHF - Det regionale helseforetaket.* [Internett]
Available at: http://www.helse-sorost.no/omoss/omhelseforetaket/Sider/helse-sor-ost-rhf---det-regionale-helseforetaket.aspx
[Funnet 10 March 2014].

Helse Sør-Øst RHF, 2010. *Revisjon av intern styring og kontroll i Sykehuspartner.* [Internett]
Available at: http://www.helse-sorost.no/omoss/styret/konsernrevisjonen/Documents/Revisjonsrapporter/2010/063-2010_Vedlegg_1_-_Revisjonsrapport_intern_styring_og_kontroll_SP.pdf
[Funnet 07 March 2014].

Helse Sør-Øst RHF, 2010. *Vår oppgave.* [Internett]
Available at: http://www.sykehuspartner.no/omoss/var-oppgave/Sider/side.aspx
[Funnet 20 February 2014].

Helse Sør-Øst RHF, 2012. *Frokostseminar.* [Internett]
Available at:
http://web.idg.no/app/web/online/Event/CIOforum/2012/Ithelse/SteinarMarthinsen.pdf
[Funnet 07 May 2014].

Helse Sør-Øst RHF, 2013. *Digital samhandling.* [Internett]
Available at: http://www.helse-sorost.no/aktuelt/digitalfornying/seks-programmer/Sider/digitalsamhandling.aspx
[Funnet 06 February 2014].

Helse Sør-Øst RHF, 2013. *Mandat - Fornyingsstyret for standardisering og teknologiske løsninger.* [Internett]
Available at: http://www.helse-sorost.no/aktuelt/digitalfornying/organisering-og-styring/Documents/Innkalling%20saker%20referater/20130306%20Fornyingsstyrem%C3%B8tet.pdf
[Funnet 05 February 2014].

Helse Sør-Øst RHF, 2013. *Programmandat - Program: Ett felles regionalt laboratoriedatasystem.* [Internett]
Available at: http://www.helse-sorost.no/aktuelt/digitalfornying/seks-programmer/Documents/Regional%20laboratoriedatasystem/Mandat%20Regionalt%20laboratoriedatasystem.pdf
[Funnet 09 February 2014].

Helse Sør-Øst RHF, 2013. *Programmandat - Program: Ett regionalt RIS/PACS Helse Sør-Øst.* [Internett]
Available at: http://www.helse-sorost.no/aktuelt/digitalfornying/seks-programmer/Documents/RIS%20PACS/Mandat%20Radiologi%20RIS-PACS.pdf
[Funnet 06 February 2014].

Helse Sør-Øst RHF, 2013. *Programmandat - Program: Infrastrukturmodernisering (IMP).* [Internett]
Available at: http://www.helse-sorost.no/aktuelt/digitalfornying/seks-programmer/Documents/Infrastrukturmodernisering/Mandat%20Infrastrukturmodernisering.pdf
[Funnet 09 February 2014].

Helse Sør-Øst RHF, 2013. *Programmandat - Program: Regional klinisk dokumentasjon.* [Internett]
Available at: http://www.helse-sorost.no/aktuelt/digitalfornying/seks-programmer/Documents/Regional%20klinisk%20dokumentasjon/Mandat%20klinisk%20dokumentasjon.pdf
[Funnet 06 February 2014].

Helse Sør-Øst RHF, 2014. *Laboratoriedata.* [Internett]
Available at: http://www.helse-sorost.no/aktuelt/digitalfornying/seks-programmer/Sider/regionalt-laboratoriedatasystem.aspx
[Funnet 20 April 2014].

Helse Sør-Øst RHF, 2014. *Målbilde og status Labdata.* [Internett]
Available at: http://www.helse-sorost.no/aktuelt/digitalfornying/seks-programmer/Documents/Regional%20laboratoriedatasystem/M%C3%A5lbilde%20og%20status%20Regionalt%20laboratoriedatasystem%20per%20juni%202013.pdf
[Funnet 20 April 2014].

Helse Sør-Øst RHF, 2014. *Organisasjonmodeller.* [Internett]
Available at: http://www.helse-sorost.no/omoss/organisering/Documents/Organisasjonsmodell%20Helse%20S%C3%B8r-%C3%98st%20RHF.pdf
[Funnet 19 April 2014].

Helse Sør-Øst, 2014. *Saksunderlag til Fornyingsstyret.* [Internett]
Available at: http://www.helse-sorost.no/aktuelt/digitalfornying/organisering-og-styring/Documents/Innkalling%20saker%20referater/2014/20140205_Saksunderlag%20til%

20fornyingsstyret_PRINT.pdf
[Funnet 25 March 2014].

HelsIT, 2011. *Hva karakteriserer god arkitekturpraksis og hvorfor ble valgt arkitekturmetode benyttet?.* [Internett]
Available at: http://www.kith.no/upload/6410/HelsIT-2011_T3-6_Roar_Engen.pdf
[Funnet 21 February 2014].

Hirsti, K. & Helljesen, V., 2013. *Klagestorm mot Ahus: Fra 209 til 529 klager på to år.* [Internett]
Available at: http://www.nrk.no/norge/klagestorm-mot-ahus-1.10939996
[Funnet 2 January 2014].

Holm, P. A., 2011. *Ahus lammet av tele- og databrudd.* [Internett]
Available at: http://www.aftenposten.no/nyheter/iriks/article4151192.ece#.U0QQufl_t8E
[Funnet 08 March 2014].

iMDsoft, 2014. *iMDsoft - About us.* [Internett]
Available at: http://imd-soft.com/about
[Funnet 2 January 2014].

Karlsen, A., 2013. *Stopper dataprosjekt - risikerer milliontap.* [Internett]
Available at: http://www.aftenposten.no/nyheter/iriks/article4121836.ece#UZiyK7VM98E
[Funnet 2 January 2014].

Lovdata, 2013. *Lov om endringer i helseregisterloven mv. (opprettelse av nasjonal kjernejournal m.m.).* [Internett]
Available at: http://lovdata.no/dokument/NL/lov/2012-06-22-46
[Funnet 25 March 2014].

Lovdata, 2013. *Lov om endringer i pasient- og brukerrettighetsloven mv. (rett til nødvendig helsehjelp og pasientrettighetsdirektivet m.m.).* [Internett]
Available at: http://lovdata.no/dokument/NL/lov/2013-06-21-79
[Funnet 25 March 2014].

Myers, M. D., 2014. *Qualitative Research in Information Systems.* [Internett]
Available at: http://www.qual.auckland.ac.nz/
[Funnet 26 January 2014].

Nordheim, F., 2013. *Styring av kompleksitet,* Oslo: s.n.

Orlikowski, W. J. & Baroudi, J. J., 1991. Studying Information Technology in Organizations: Research Approaches and Assumptions. pp. 1-28.

Oslo Universitetssykehus HF, 2014. *Om sykehuset på engelsk.* [Internett]
Available at: http://www.oslo-universitetssykehus.no/omoss_/omhelseforetaket_/Documents/Engelsk%20presentasjon%20av%20OUS-nov.2013.ppt
[Funnet 19 April 2014].

Rapoport, R. N., 1970. *Three Dilemmas in Action Research.* s.l.:s.n.

Ross, J. W., Weill, P. & Robertson, D. C., 2006. *Enterprise Architecture as Strategy; Creating a Foundation for Business Execution.* Boston, Massachusetts: Harvard Business Press.

Sannes, R., 2011. *Styrebehandlingen av Klinisk arbeidsflate ved OUS.* [Internett]
Available at: http://sannes.info/web/offentlig-sektor/helseit/styrebehandlingen-av-klinisk-arbeidsflate-ved-ous/#more-44
[Funnet 2 January 2014].

Skorve, E., 2014. *Shaping Information Infrastructures; Complexity and Management in The Context of a Clinical IS Implementation,* Oslo: s.n.

Software Point, 2008. *LABVANTAGE Medical Suite.* [Internett]
Available at: http://www.softwarepoint.com/products_Medical_Suite.html
[Funnet 22 March 2014].

Software Point, 2008. *Software Point.* [Internett]
Available at: http://www.softwarepoint.com/company.html
[Funnet 22 March 2014].

Stabell, E. & Heggen, H., 2012. *Fylkeslegen frykter systemsvikt ved Oslo-sykehus.* [Internett]
Available at: http://www.nrk.no/norge/politiet-etterforsker-oslo-sykehus-1.9230543
[Funnet 2 January 2014].

Sykehuspartner, 2012. *Sykehuspartner IKT - Presentasjon,* Oslo: s.n.

Sørensen, C., 2002. This is Not an Article, Just Some Thoughts on How to Write One. *Working Paper .*

The Open Group, 2014. *TOGAF, An Open Group standard.* [Internett]
Available at: http://www.opengroup.org/subjectareas/enterprise/togaf/
[Funnet 08 March 2014].

Thiry, M., 2010. *Program Management.* 1st Edition red. Valense Ltd, UK: Gower Publishing.

Truong Le, D., Dyregrov, G., Ådnanes, J. & Dahl, A., 2013. *Project Case Description of HSØ,* Oslo: s.n.

Vedeler, M. & Eggesvik, O., 2013. *«David» (60) ble offer for en datafeil - nå dør han av kreft.* [Internett]
Available at: http://www.aftenposten.no/nyheter/iriks/David-60-ble-offer-for-en-datafeil---na-dor-han-av-kreft-7143608.html#.UsWFP_TuJ6B
[Funnet 2 January 2014].

Walsham, G., 1993. *Interpreting Information Systems in Organizations.* s.l.:s.n.

Weill, P. & Ross, J. W., 2004. *IT Governance: How Top Performers Manage IT Decision Rights for Superior Results.* 1st red. Boston, Massachusetts: Harvard Business School Press.