Aalto University
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DEVELOPING MONTHLY MANAGEMENT REPORTING

Root Cause Analysis of Reporting Problems at Nuclear Services

Master's Thesis
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Abstract

Nuclear Services, a business area focusing on the sales of nuclear power related products and services at the Finnish energy company Fortum, has been struggling with errors in its monthly reports. The errors have rendered the reports unreliable, decreasing their value for management use. This thesis analyzes the underlying reasons for the reporting problems, providing suggestions for eliminating them and developing the reporting towards a direction that better supports the business goals of the unit.

Reporting is an important management tool for decision support and control. In this study, Management Information System and Management Control System concepts are utilized to analyze the decision support and control aspects of reporting, respectively. Management Control Systems are discussed using the Management Control System package typology of Malmi and Brown (2008). Additionally, suggestions for the implementation will be drawn from the management accounting change literature.

This thesis follows the root cause methodology for problem understanding and suggestions for eliminating the root causes. Flow chart analysis and interviews of Nuclear Services project managers and management are conducted for understanding the situation in the unit. Further perspective to the problem is sought with external benchmarking interviews at three reference organizations, conducting project-based business similarly to Nuclear Services. Once the problem has been charted, fault tree analysis is used to find the root causes. Management Control Systems are utilized to conceptualize the suggested controls for root cause elimination.

The fault tree analysis indicates three dominant efficiently solvable employee behavior related root causes: unclear reporting process and responsibilities, lack of clear instructions, and that systematic reporting is not expected. The root causes are suggested to be solved using three Management Control Systems, two administrative controls and one cybernetic control. A concrete description of, how the three suggested Management Control Systems could be implemented in Nuclear Services, is also provided along with suggestions for further reporting development in the unit.

Related to the management accounting change, a possible gatekeeper role is identified in the reporting practice implementation process. Additionally, the findings of this thesis suggest that simultaneous dual-purpose utilization of reporting as a Management Information System and a Management Control System could be possible, although no proof for the claim is received.

Current management accounting literature is limited regarding reporting practice and reporting problem solving. This thesis illustrates, how the root cause methodology can be applied to reporting problem solving.

Keywords reporting problems, Management Control System, Management Information System

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Tiivistelmä

Fortumin ydinvoimaan liittyviä tuotteita ja palveluita myyvällä Nuclear Services -yksiköllä on ollut ongelmia sen kuukausiraporteissa esiintyvien virheiden takia. Virheiden johdosta raportit ovat olleet epäluotettavia, mikä on vähentänyt niiden käyttökelpoisuutta johdon työkaluna. Tässä maisterintutkinnon tutkielmassa analysoidaan raportointiongelmien perimmäisiä syitä ja ehdotetaan keinoja niiden poistamiseksi sekä raportoinnin kehittämiseksi yksikön liiketoiminnan tavoitteita paremmin tukemaan.

Raportointi on tärkeä osa johdon päätöksenteko- ja ohjaustyökaluja. Tässä tutkielmassa käytetään johdon tietojärjestelmä- (Management Information System) ja johdon ohjausjärjestelmä -käsitteitä (Management Control System) raportoinnin päätöksenteko- ja ohjausominaisuuksien analysointiin. Johdon ohjausjärjestelmiä käsitellään käyttäen Malmin ja Brownin (2008) johdon ohjausjärjestelmäpaketti -typologiaa. Lisäksi työssä etsitään ehdotuksia suositeltujen muutosten toteuttamiseen johdon laskentatoimen muutos -kirjallisuudesta.

Tässä työssä käytetään juurisyyanalyysia metodina ongelman ymmärtämiseen ja juurisyiden poistamiseen. Ongelman ymmärtämiseksi käytetään vuokaavioanalyysia sekä yksikön johdon ja projektipäälliköiden haastatteluja. Laajempaa näkökulmaa ongelmaan haetaan kolmesta muusta projektiliiketoimintaa harjoittavasta verrokkiorganisaatiosta benchmarking-haastatteluilla. Ongelman kartoituksen jälkeen etsitään juurisyyt vikapuuanalyysilla. Johdon ohjausjärjestelmiä hyödynnetään juurisyiden poistamiseksi ehdotettavien ohjaustoimintojen käsitteellistämisessä.

Vikapuuanalyysi antaa tulokseksi kolme hallitsevaa tehokkaasti poistettavissa olevaa työntekijöiden käyttäytymiseen liittyvää juurisyytä: epäselvä raportointiprosessi ja -vastuut, epäselvät ohjeet sekä se, ettei systemaattista raportointia edellytetä. Juurisyyt ehdotetaan ratkaistavan kolmella johdon ohjausjärjestelmällä, joista kaksi kuuluu hallinnollisiin ohjaustapoihin ja yksi kyberneettisiin ohjaustapoihin. Työssä esitetään myös suunnitelma kolmen ehdotetun johdon ohjausjärjestelmän käytännön toteuttamiseen Nuclear Services -yksikössä sekä muita raportoinnin kehitysajatuksia.

Tutkimuksen tulosten perusteella uusien raportointikäytäntöjen käyttöönotossa saattaa esiintyä niin sanottu portinvartijan rooli. Tutkielman havainnot puoltavat myös ajatusta, että raportointia voisi käyttää samanaikaisesti sekä johdon tietojärjestelmänä että ohjausjärjestelmänä, vaikka varsinaista näyttöä väitteen tueksi ei saada.

Raportointikäytöntöihin ja raportointiongelmien ratkaisemiseen keskittyvä kirjallisuus on vielä tällä hetkellä vähäistä. Tässä tutkielmassa esitetään, miten juurisyyanalyysia voidaan käyttää raportointiongelmien ratkaisemiseen.

Avainsanat raportointiongelmat, johdon ohjausjärjestelmät, johdon tietojärjestelmät

Foreword

This master's thesis was written in the Nuclear Services business area of Fortum Power and Heat Oy, focusing on the development of monthly management reporting at Nuclear Services.

I would like to thank Petra Lundström, Vice President Nuclear Services, for the opportunity to write a thesis on such an interesting and relevant topic.

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Espoo, November 19th, 2018

Otso Manninen

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Abbreviations

APROS	Advanced PROcess Simulator
CRM	Customer Relationship Management
EEA	European Economic Area
ERP	Enterprise Resource Planning
EU	European Union
HVAC	Heating, Ventilation, and Air Conditioning
IFRS	International Financial Reporting Standards
IT	Information Technology
KPI	Key Performance Indicator
LOC	Levers Of Control
MAS	Management Accounting System
MCS	Management Control System
MIS	Management Information System
NS	Nuclear Services
NURES	NUclide REmoval System
PMS	Project Master Schedule
POC	Percentage Of Completion
RWS	Recycling and Waste Solutions
sub BA	sub Business Area
WBS	Work Breakdown Structure
WIP	Work In Progress

1 Introduction

The objective of this Master's Thesis is to develop the management reporting in the Nuclear Services unit at Fortum. This goal can be broken down into two sub-goals. The first sub-goal is to find the underlying reasons for errors that have been troubling the monthly reporting at Nuclear Services and to provide corrective suggestions for eliminating the problems. The other sub-goal is to provide suggestions for developing the reporting further into a direction that would support the business goals of Nuclear Services.

Nuclear Services is a relatively young unit at Fortum, a Finnish energy company. The unit focuses on sales of nuclear-power-related services and products, utilizing the resources and knowhow of Fortum's large nuclear talent pool. The unit has grown fast and the increasing complexity has led to issues with the unit's reporting. While the entire reporting could previously be managed by the unit business controller, using manual methods, the increasing number of projects has rendered this approach invalid. At the same time, Nuclear Services is facing high growth expectations. If realized, the growth will add to the complexity, making the reporting even more challenging in the future.

Accurate management reporting is a crucial process for successful management. Managers make decisions and focus their attention based on the reported information (Seal, et al., 2009, pp. 4-6). Additionally, reporting can be used as a tool to control employee behavior (Tuomela, 2005). On the other hand, as reporting is seldom executed solely by the managers themselves, control is also needed for successful reporting. In management accounting, the broader concepts for decision support and control tools are Management Information Systems and Management Control Systems, respectively. These concepts, bundled under Management Accounting Systems, will be applied in this thesis to understand, how to fulfil the purposes of reporting.

Solutions for the reporting problems of Nuclear Services are sought using root cause analysis. The methodology is applied to understand the problem, find the underlying root causes, and to suggest methods for their elimination. The implementation of the suggested changes is discussed in the light of the management accounting change literature. The remainder of this thesis is structured as follows.

In Chapter 2, we will look at the role of reporting in Management Accounting Systems and management accounting change. The various definitions found in the literature for Management Accounting Systems, Management Information Systems, and Management Control Systems will be discussed. Furthermore, the central Management Control System package concept will be elaborated on. Moreover, different types of reporting, including financial reporting, management reporting, and project reporting will be presented. The role of reporting in Management Information Systems and Management Control Systems will also be studied more closely. Lastly, two management accounting change frameworks will be introduced for conceptualizing the discussion related to the suggested changes.

In Chapter 3, we will present the methodology of the study. The placement of the study in managerialist management accounting literature will be discussed and the applied root cause analysis methodology presented in detail. We will also elaborate on the internal interviews as well as the external benchmarking interviews that were carried out to build a better understanding of the problem at hand and to put it into perspective.

Chapter 4 will zero in on the case. The unit and the business it conducts will be introduced in detail. We will also delineate the unit's reporting practices, including the report contents, and focus on the problems that have been identified in the reporting. Following, the findings from the benchmarking interviews will be summarized and a comparison between the other units and Nuclear Services will be made. After finding sufficient amount of information on the problems, a fault tree analysis will be conducted to find the root causes for the errors in the reports. Based on the analysis, we will identify three employee behavior related root causes that should be eliminated to reduce the errors in reporting. We will come up with controls for eliminating the root causes and discuss them from both a theoretical and a practical viewpoint. The theoretical discussion will be facilitated using Malmi and Brown (2008) typology of Management Control Systems package. We will also discuss the implementation of the suggested changes, including driving forces and potential barriers. Furthermore, some remedies for the potential barriers will be presented, such as the communication of benefits and costs of the suggested changes.

Finally, Chapter 5 summarizes the findings and concludes. We examine, how the goals of the thesis were achieved, what was learned along the way, and how this could be utilized elsewhere. Additionally, suggestions for further research will be set.

2 Management Accounting Systems, Reporting, and Change

2.1 Management Accounting Systems

2.1.1 Management Accounting System Definition

Different kinds of controls and information systems have been subjects of interest for accounting researchers for a longer time. Yet, different terminologies are used in different studies. Sometimes the terms are also used interchangeably. For instance, there exists a variety of definitions for Management Accounting System (MAS), Management Information System (MIS), and Management Control System (MCS). (Bouwens & Abernethy, 2000; Chenhall, 2003; Malmi & Brown, 2008)

In this thesis, we will use the term Management Accounting Systems to refer to a broader concept that contains both Management Information Systems as well as Management Control Systems. There are MISs and MCSs can only be used either for MIS or MCS purposes. Additionally, some authors, such as Malmi and Brown (2008), have shown that some systems can be used for either purpose, based on the situation. We argue that some systems can also serve both MIS and MCS purposes simultaneously. This is illustrated in Figure 1.

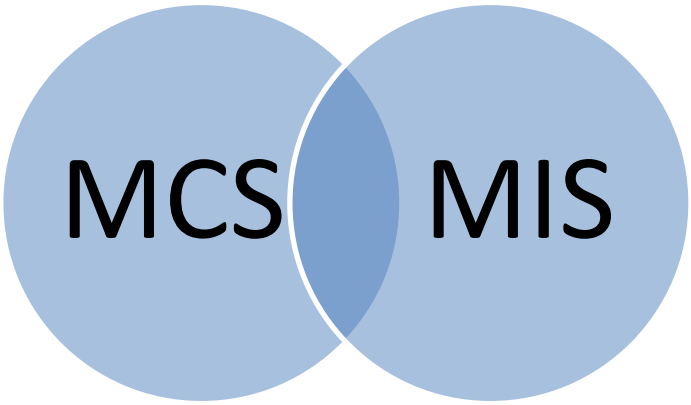

Figure 1 Management Accounting Systems (MASs) consist of Management Control Systems (MCSs) and Management Information Systems (MISs). The two categories are not mutually exclusive.

We will look at the more detailed definitions of MIS and MCS in Sections 2.1.2 and 2.1.3, respectively. These sections also describe the purpose and use of the systems. In Section

2.1.4, we will also take a more detailed look at MCS as a package that is a key concept in modern MCS research.

2.1.2 Management Information Systems

Management Information Systems (MIS) is a widely used concept, yet there seems to be no consensus on its definition. While the words management and information are clearly in key role here, authors have different views on the objective and the boundaries of MIS. Also, as already mentioned in Section 2.1.1, terms are sometimes used interchangeably and different authors may refer to the same concept by different names.

Let us first look at how different authors define the objective of Management Information Systems. Van der Heijden (2009, pp. 2-3) defines Management Information Systems as systems that provide decision support information for managers. According to him, the two most common and important decision types and use cases for MIS are Key Performance Indicator (KPI) monitoring and selecting between different alternatives (van der Heijden, 2009, pp. 12-15, 103-132). The definition of O'Brien and Marakas (2009, pp. 14-15) is slightly different. Their view of the objective of MIS is to provide managers and other personnel with formal reports, in paper or digital form, to support business decisions. At first glance, the definition of O'Brien and Marakas (2009, pp. 14-15) seems broader than that of van der Heijden (2009, pp. 2-3). However, O'Brien and Marakas (2009, pp. 14-15) group MIS under Management Support Systems, together with Decision Support Systems and Executive Information Systems. While they do not express it unambiguously, they convey the picture of MIS supporting more routine day-to-day decisions and the Decision Support Systems being something more comprehensive for larger decisions. The Executive Information Systems, in turn, are something that summarizes the information of MIS and Decision Support Systems for a general view. (O'Brien & Marakas, 2009, pp. 14-15)

The interpretation of O'Brien and Marakas (2009, pp. 14-15) is supported by the MIS definition of Laudon and Laudon (2011, pp. 71-75). Laudon and Laudon (2011, pp. 71-75) also group MIS together with Decision Support Systems and Executive Support Systems. However, for them, all these systems belong under Business Information Systems together with Transaction Processing Systems. According to them, the purpose of MIS is

to serve middle management with information and reports that help them make daily decisions, monitor the current situation and forecast the future. Laudon and Laudon (2011, pp. 71-75) express more clearly that the difference between MISs and Decision Support Systems is the frequency of the decisions. Decision Support Systems are used to help non-routine decision making. The Executive Support Systems, on the other hand, are meant to support senior management in non-routine, often strategy related, decisions, drawing information from MIS and Decision Support Systems in addition to summarizing external information such as regulatory or competition information. The Transaction Processing Systems, also distinguished from MIS by van der Heijden (2009, pp. 3-8), are, in turn, systems that operational personnel and operational managers use to handle basic business processes such as sales and orders. (Laudon & Laudon, 2011, pp. 71-75) Additionally, Laudon and Laudon (2011, pp. 37-39) use the term Management Information Systems to refer to the research area of information systems in business.

Some authors have also used other terms, when referring to similar concepts. For instance, Bouwens and Abernathy (2000) define Management Accounting Systems as systems that provide information for managers. They also mention that MIS is used for the same concept (Bouwens & Abernethy, 2000). In some cases, even the term Management Control Systems is used for passive systems that support managers by providing information (Chenhall, 2003).

The definitions of MIS also vary in terms of contents or boundaries of the system. Van der Heijden (2009, pp. 2-3) restricts the definition of MIS to include only the information technology (IT), while acknowledging that some use broader concepts. His definition of MIS also includes only formal information systems, which rely on predetermined categories of data and ways of collecting it. Laudon and Laudon (2011, pp. 71-75) also only refer to IT systems when talking about MIS.

O'Brien and Marakas (2009, p. 4), on the other hand, argue that the boundaries of an information system can be drawn to include any combination of IT, people, procedures, and processes. Some authors, such as Bouwens and Abernathy (2000), do not take any clear stand on the boundaries of the MIS concept. Yet, Bouwens and Abernathy (2000) do restrict MIS as systems for formal information.

In this thesis, we take a broad definition of MIS, including the people, processes, IT, and all kinds of structures such as organizations that affect the information and related data collecting, storing, processing, and presentation. We define the purpose of MIS to support managerial business decision making on all organizational levels, however, excluding those information processing systems on the lowest levels of organization that require no real consideration. An example of such a routine task would be weighing an item to determine its price. Even though this requires measuring the weight of the object and processing this information to calculate the price, once the process has been set up, no real consideration is required. The data and information in a MIS can be either quantitative or qualitative. However, similarly to the other authors, we require the information to be formal, that is, in order to be a Management Information System, the process needs to predefined and systematic. This requirement of systematic process is not fulfilled, if randomly obtained information is interpreted to support decision making.

Management Information Systems can be further categorized based on four dimensions: scope, integration, aggregation, and timeliness. The scope of a MIS deals with the type of information that is being processed. The scope can be either narrow or broad, or something in between. A narrow MIS is only concentrated on some areas of information, typically the traditional accounting information, while a broad MIS includes more types of information. A broad MIS can take for instance qualitative and external information into account. The integration of a MIS is concerns its links with other units, departments, or divisions in the company. Low integration means only taking intra-unit information into account, whereas a highly integrated MIS comprises information from other units, relevant for decision making. The aggregation dimension in turn tells of the level of summarization in the outcome. The more aggregated the MIS, the wider the data summarized in the final result. For instance, a MIS that summarizes data from different units from a longer period is more aggregated than another one focusing on a specific unit at a specific time. Lastly, the timeliness dimension concerns the frequency and the speed of analysis. Higher frequency and speed equal higher timeliness. (Bouwens & Abernethy, 2000)

So far, we have talked about the definition of MIS as well as some dimensions that can be used to characterize MIS. Now, we are going to examine, what is required from a MIS to be useful. Looking at the dimensions above, one might think that scoring higher on any

dimension would be beneficial. This may, in principle, be true for dimensions such as timeliness, assuming that there is no cost in increasing the timeliness of the MIS. However, not all dimensions behave this way. For instance, the optimal level of aggregation depends on the question at hand. All necessary factors should be weighed in, but on the other hand, looking at the problem from too high a perspective, one might lose some of the details.

If too much information is provided, it no longer supports the decision making. Instead, the important information gets lost or the decision maker may lose concentration and interest. This phenomenon is called information overload. In order to direct the concentration to the significant information, all irrelevant information should be left out of a MIS. (van der Heijden, 2009) Although, this sounds intuitive, it may be difficult at times. While it may be relatively easy to leave out information that does not concern the decision, it is far more difficult trying to figure out, what to include and leave out, when there is plenty of information, all of which is somewhat relevant. Yet, the decision making would be easier and lead to better results, if some of the less relevant facts were left out.

2.1.3 Management Control Systems

Similarly to Management Information Systems introduced in Section 2.1.2, Management Control Systems are a widely used concept, but there is no general agreement on its definition (Malmi, 2013; Speklé & Kruis, 2014). In this section, we will look at the definitions proposed by different authors and define MCSs as they are used in this thesis.

Otley (1999) defines MCSs as information providing systems serving managers and organizations in the development and upkeep of successful operational patterns. The definition of Malmi and Brown (2008) is slightly different. They see MCSs as tools that management can use to get employees perform desired actions (Malmi & Brown, 2008). While the two definitions clearly talk about the same subject, there are two definitive differences between them, the user of MCS and the content of MCS.

The first difference is the user of the tool. While Malmi and Brown (2008) see managers as the users of MCSs, Otley (1999) has a broader definition, where also the impersonal organization is the utilizer of MCSs. The same difference in the user of MCSs divides also other authors. For instance, Maccintosh and Quattrone (2010, p. 5) take the definition

to the other extreme, not including managers as the primary users of MCSs at all. According to their broader definition, MCS consist of all administrative actions that organizations use to control the managers and employees. Their narrow definition of MCS covers only a set of tools, used for tactical control. (Macintosh & Quattrone, 2010, p. 5) On the other hand, for instance the definition of Simons (1995, p. 5) is almost identical to that of Otley (1999), with the exception that the users are restricted to managers.

The other significant difference between the definitions of Otley (1999) and Malmi and Brown (2008) is the content of the MCS. Malmi and Brown (2008) restrict the term to exclude pure decision support tools and practices. The definition of Otley (1999) makes no such restriction. On the other hand, Otley (1999) restricts the tools and practices that fall under MCS by requiring them to be information providing. This restricts, for instance, organizational and cultural controls outside of MCSs. Malmi and Brown (2008), in turn, include these and other forms of control that produce no information to their definition of MCS.

There are similar differences regarding the contents of MCSs in other definitions. For instance, the definition of Simons (1995, p. 5) restricts the MCSs into information based controls similarly to Otley (1999). On the other hand, Merchant and van der Stede (2003, p. x), Anthony and Govindarajan (2007, p. 17), and Macintosh and Quattrone (2010, p. 5) make no such restriction. Merchant and van der Stede (2003, p. x) have a broad definition for MCS, containing everything that managers do to make sure plans and strategies are realized. In their book, however, their main concern is results control (Merchant & van der Stede, 2003, p. x). Anthony and Gonvindarajan (2007, p. 17) have a very similar definition of MCS. They define MCS as the system that managers use to control the activities of the organization and to implement its strategies (Anthony & Govindarajan, 2007, p. 17).

In terms of Management Control System definition, we follow in the footsteps of Malmi and Brown (2008). Similarly to them, we feel that their definition suits the name Management Control System. First, the user of MCS is naturally the management. However, we do not want to make any further restrictions on the level of management. While some tools are practically only used by the top management, and others more commonly in all management levels, they all fall under the category of MCSs. Second, the aim of MCSs

is to control employee behavior and to make them work towards the goals of the company. As the emphasis is on control, we do not include decision support systems that do not direct employee behavior. As we want to keep the definition clear, we also exclude indirect controls such as decision support systems that managers use to make controlling decisions. These would all fall under the category of MIS, discussed in Section 2.1.2. However, as argued in Section 2.1.1, the same system can be categorized under MCS or MIS depending on the use. However, we stress that a system can serve two purposes simultaneously. It may be used as a MIS and MCS at the same time. An example of such a system, although perhaps not a perfect one, would be a KPI system that acts simultaneously as a control system for employees, as they know their performance is evaluated based on the KPIs, and as a decision support system for the management. Third, the control mechanism must be a system. This does not mean an IT system, and in fact contrary to MIS, none of the MCS definitions examined for this thesis suggested that the term should be restricted to IT systems. The system can mean an IT system, but it could also be a process or an organization structure. However, a single rule for instance would not count as a system, but a set of rules would. (Malmi & Brown, 2008)

2.1.4 Management Control Systems as Packages

Management Control Systems, discussed in Section 2.1.3, have been a research topic for a long time. Since the beginning of 1980s, researchers have also increasingly paid attention to the fact that they do not exist in a vacuum (Fisher, 1998). Instead, they are affected by the surrounding environment and each other (Otley, 2016). In this section, we will go briefly through some of the reasons that have led to the development of Management Control Systems as a package concept. We will also briefly present a frameworks around the MCS as package concept that will be later utilized in this thesis.

The contingency theory of management accounting has played a large part in the popularization of the MCS as a package concept. In essence, the contingency theory aims at explaining how different environmental circumstances, that is contingencies, affect management accounting and related systems (Reid & Smith, 2000). There are also other definitions for the contingency theory, but they all revolve around the idea that the success of a set of management accounting systems and practices is determined by its match with

the contingency factors of the environment. (Otley, 2016) Extensive reviews of the accounting literature related to the contingency theory have been conducted for instance by Chenhall (2003) and Otley (2016).

Depending on the definition of the contingency theory, it is sometimes interpreted to focus on the technical factors of the environment. Yet, also the institutional environment of the company is important in explaining what kind of controls are effective. The institutional environment consists of the social and cultural factors, such as laws, rules, norms, beliefs, values, and ideas. (Abernethy & Chua, 1996)

While the contingency theory and the institutional theory suggest that MCSs should not be studied in isolation, as environmental factors affect them and their success, they do not rule out the possibility to study MCSs one by one. However, the MCSs are also interdependent, meaning, one MCS may have an effect on another one and vice versa. Thus, the performance of a MCS is not only determined by the situation of the company, but the other MCSs that the company has in place impact as well. This is why the MCSs should rather be studied as a package than as individual systems. (Malmi & Brown, 2008)

Unsurprisingly, there is no universal consensus on Management Control Systems as a package. Also, the terminology varies, with names such as Accounting Control Systems as a package (Abernethy & Chua, 1996), Performance Management System (Ferreira & Otley, 2009), and Management Controls as a package (Bedford, et al., 2016) used. There has also recently been debate on, whether the combination of different MCSs should be called a package or, instead, a system. The ones who prefer the term system emphasize the importance of careful consideration of interplay when designing MCSs, while those in favor of the package stress that the combination of different MCSs is usually not an intelligently designed system, but rather a combination of separate interdependent MCSs built with trial and error. (Otley, 2016)

Delving deeper into the concept of MCS as a package, a popular framework for studying MCS packages was created by Malmi and Brown (2008). Their conceptual typology consists of five types of controls: cultural controls, planning, cybernetic controls, reward and compensation, and administrative controls (Malmi & Brown, 2008). The typology is illustrated in Figure 2.

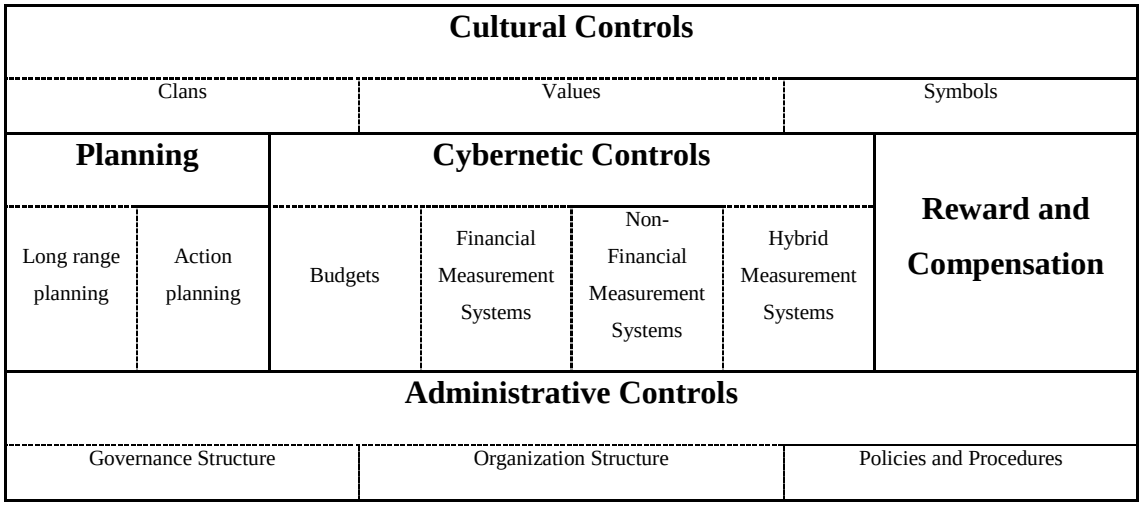

Figure 2 Management Control Systems Package typology (Malmi & Brown, 2008)

Cultural controls are placed at the top of the typology of Malmi and Brown (2008).They are present in everything that takes place in the organization. Even though, the culture is slow and often difficult to change, if successfully utilized, it will direct the behavior of the employees towards the goals of the organization. The cultural controls can be broken down into three categories: clans, values, and symbols. The clan controls work by associating the employees with the identity of a certain group, for instance a certain profession. Value controls aim at giving the employees values to follow. In practice, this can be achieved by hiring people with suitable values, making the employees internalize the values, or simply demanding that they are followed until they become an automation. Symbol controls are visible expressions that aim at fortifying certain culture. For instance, a uniform may strengthen a culture of professionalism. (Malmi & Brown, 2008)

Similarly to the cultural controls, the administrative controls expand over the entire organization. They are pictured at the bottom of the typology in Figure 2, as they form the basis of the MCS package. Administrative controls consist of governance structure, organization structure, as well as policies and procedures. The governance structure deals with the composition and structure of management teams and board, division of authority and accountability in the organization, and the constructs that coordinate the interplay of different parts of the organization. The organization structure defines the roles, responsibilities, and authorities in the organization, providing clarity and stability into operations. The policies and procedures, in turn, specify the processes and other models of operation in the organization. (Malmi & Brown, 2008)

Planning, cybernetic controls, as well as rewards and compensation are the traditionally acknowledged forms of management control. They are placed at the center of the typology and lined up from left to right in the order that they usually take place. Planning can be divided into long range planning and action planning. A common distinction between the two is that action planning focuses on intra-year planning, while long range planning looks further into the future. Planning serves two purposes. It clarifies the goals of the organization and also provides standards for comparison to be utilized in other controls such as the cybernetic controls. The cybernetic controls compare a measured value against some standard and initiate corrective actions, if necessary. The peculiar name of the cybernetic controls comes from the feedback loop's close analogy to electronics (Lock, 2013). Cybernetic controls are divided into budgets, financial measurement systems, non-financial measurement systems, and hybrid systems that combine financial and non-financial measurements. Finally, reward and compensation motivate the employees in goal achievement. While the focus on research has been on extrinsic monetary rewards, also other types of extrinsic or intrinsic rewards are possible. Reward and compensation is often tied to cybernetic controls, but also other kinds of compensation schemes are possible. (Malmi & Brown, 2008)

Naturally, in addition to the framework presented here, there are many more in the literature, such as Simons' (1995) Levers of Control (LOC), Otley's (1999) five questions, Ferreira and Otley's (2009) 12 questions, and the MCS package division into social networking, organic innovative culture, and formal controls by Chenhall et al. (2011). However, we will not go into details regarding those. MCS packages will be further analyzed in Section 2.3, discussing the role of reporting in a MCS package. In the discussion, we will use the framework of Malmi and Brown (2008), as it, in our opinion, best captures the interdependent nature of MCS packages. The framework will be further utilized in Section 4.4.1, where we suggest additional MCSs to the MCS package of the case organization.

2.2 Reporting

2.2.1 Reporting in Accounting

For many non-accounting professionals, accounting seems somewhat synonymous with reporting. Also, when reading accounting text books, the first chapters that approach the subject broadly and try to explain the essence of accounting on a general level often cover themes that could be grouped under reporting. Clearly, reporting is at the heart of accounting activities, even if the reporting activity itself has not been researched much.

Here, we will take a closer look at the reporting activity. In Section 2.2.2, we will elaborate on financial reporting. Respectively, we will zoom in on management reporting in Section 2.2.3. In Section 2.2.4, we will also take a brief look at project reporting, a specific sub-category of management accounting, relevant for this thesis.

2.2.2 Financial Reporting

According to Atkinson et al. (2001, p. 5), financial accounting is the process that produces financial statements for external stakeholders. Looking at this definition, the term financial accounting seems interchangeable with financial reporting, the latter being slightly more concrete on the aim to produce documents. In this thesis, we will use the term financial reporting to refer to the process that produces the financial statements for external shareholders. Financial reporting aims at closing the information gap between the management and external stakeholders in a way that does not compromise the business secrets of the company. (Elliot & Elliot, 2012, pp. 3-4)

As the investors have no access to the company data, their rightful concerns are the objectivity, verifiability, and the precision of the information. These issues have been addressed in financial reporting with a couple of protocols. First of all, the financial reporting is regulated. As such, it is also mandatory. Companies are required by the law to publish certain financial reports. For instance, all listed companies in the European Union (EU) as well as in the three European Economic Area (EEA) countries must follow the International Financial Reporting Standards (IFRS) (Deloitte Touche Tohmatsu Limited, 2014, p. 21). Additionally, the local legislation may add to the requirements. The externally set rules make financial reports of different companies more objective, and thus

more comparable, helping the investors in decision making. They also limit the possibilities that managers have to present the results in a misguiding light. (Seal, et al., 2009)

Financial reporting takes place on a regular basis. Depending on the accounting rules followed by the company and the report type, the usual cycles are reporting on a monthly, quarterly or annual basis. The idea with the reporting cycles is to give the investors and other stakeholders recent enough information for decision making without overloading the companies with the reporting tasks. (Pollard, et al., 2007, p. 804)

2.2.3 Management Reporting

Management reporting or internal reporting, as it is sometimes called, deals largely with the same financial data as financial reporting, described in the previous section. Yet, the two are very different in many parts. As the name suggest, the customer for management reporting is the management. Naturally, the information needs of the management are also different from those of investors and other external stakeholders. Investors and other external stakeholders are only interested in the entire company, its financial status, and future success prospects, whereas the management is interested in how all different parts of the company are doing and more importantly, what should be done differently to increase the chances of future success. In essence, management accounting serves two purposes for the management: it provides decision support for planning and it is used as a control tool, providing feedback and directing people. The decision support part of management accounting is similar in nature to that of financial accounting, although the scope varies from individual projects and teams to the entire company, and the decisions can be anything related to the business, as opposed to an investment decision. (Seal, et al., 2009, pp. 4-6) More about the double role of management reporting as a decision support system, that is, a MIS, and as a MCS, is delineated in Section 2.3.

Contrary to backwards looking fact-based financial reports, forecasts are usually an integral part of management reporting. Forecasts are devised in order to take rational actions at the time of forecasting. This requires understanding the related uncertainties and the limitations of the model. (Saffo, 2007) The forecasts can be divided into three categories based on the forecasting method: mathematical, judgement based, and statistical fore-

casts. Another way to divide forecasts is according to their purpose. Short-term operational forecasting calls for different methods and different accuracy compared to long-term forecasts for strategic planning. (Morlidge & Player, 2010, pp. 70, 120-121)

While in principle, having as much information as possible in the management reports would be preferred, in practice, there are some limitations to this. First of all, the human capacity to process information is limited. If the reports are congested with information, the relevant matters may not receive the amount of attention, they would require. This is the information overload, already discussed in Section 2.1.2 regarding MISs. Second, there is always cost related to reporting. The time, effort, and other resources spent on reporting are away from other activities. Thus, the managers must weigh the costs of reporting against the benefits acquired with the report and decide on an optimal level of reporting. (Pollard, et al., 2007, pp. 802-805)

Albeit, the contents of management reports can be freely chosen, the contents are often fairly similar in nature to financial reports (Seal, et al., 2009, p. 8). There are a couple of main reasons for this. As already mentioned, the reporting inflicts cost. Financial reports are mandatory for legal reasons, so the cost of utilizing the same information for management reports is low. If there is even some benefit from the information produced for financial reports, it is worthwhile, to include it in management reports. Another reason has to do with the control aspect of management reporting. The things that are being measured are the ones that people concentrate their focus on (Pollard, et al., 2007, pp. 804-805). This creates a natural tendency to create congruence between the financial reports and management reports, as the financial reports are in the end the measure of the company's success and thus the management aims at improving the results of financial reporting. This control dimension of management reporting is discussed in more detail in Section 2.3. One particularly interesting management reporting sub-category, considering this thesis, is project reporting. It will be discussed in more detail in the following section.

2.2.4 Project Reporting

Project reporting is a subject, mainly discussed in project management literature. However, given the broad definition of management reporting, it can be categorized as a specific sub-category under management reporting, where the information is segmented based on projects. There are many ways in the project management literature to further

categorize different kinds of project reports. Perhaps the most common way is to divide them based on the end user. There are internal reports meant for the project team and external reports meant for others. The external reports can be further divided to those communicated to the company management and to those sent to the customer. Here, we will mainly focus on external reports to the company management, as they are the most relevant for this thesis. The reports can also be divided based on the contents. There are progress reports that give an overview of the project situation in terms of completion. The other approach is exception reporting, or variance reporting, as it is also called, which aims at highlighting the deviations from the plans or forecasts. (Lock, 2014)

While some project reports may serve as pure management information systems, usually the purpose of project reporting is controlling. Project control is a part of project management. It involves measuring deviations, evaluating, and correcting them (Kerzner, 1995). The purpose of project control is to ensure that the project fulfills its expectations. Project follow-up is an important part of project control that helps finding the deviations. Project reporting, on the other hand, is the systematic way of conducting the follow-up. This way, deviations can be found and eliminated in time. (Artto, et al., 2011, pp. 192-193) In addition to the deviation management, there are also other benefits from project reporting. Most of them are related to the improved communication. For instance, the project goals are better understood by all stakeholders, when they are clearly expressed in the reports. There is also less need for other communication of project status between the project team members as well as between the project team and other project stakeholders. (Meredith & Mantel, 1995, pp. 452-457)

Similar to other management reports, project reports usually contain forecasts. Most often this forecast is based on the Work-Breakdown-Structure (WBS) and the Project-Master-Schedule (PMS). While the WBS and PMS are often considered a forecast, not only a plan, they do not take into account trends in deviations from the plan, such as constant budget overruns. However, the trends can be taken into account using earned value method of forecasting, in which the actual performance of the project is compared to the originally planned performance and the deviation is extrapolated to determine the projected outcome. (Fleming & Koppelman, 2005, pp. 14-15, 161-163) If the project report is a part of a larger management report, such as a project portfolio report or a unit report,

the forecasts of different projects are usually summed up for one total value. The forecast can even be extended longer into future by including known projects, the unit is going to bid for, using weighing factors according to the respective closing probabilities. (Artto, et al., 2011, pp. 300-301)

There exists no clear consensus on who should be involved in the project reporting process. According to Meredith & Mantel (1995, pp. 452-457), all project stakeholders should preferably be involved in the process. Naturally, this does not mean that everyone should be involved in the report generation, and for most stakeholders, the role is only at utilizing the contents of the report. Andersen (2008, pp. 209-210) argues that at minimum the project manager and project owner should be involved in the project control, and thus the reporting process. However, the focus of the two roles should be different. The project owner should focus on the achievement of milestones and other project outcomes, while the project manager should center his attention to the more detailed level, realizing the outcomes. Again, this does not necessitate that they are involved in the actual report preparation. Lastly, Artto et al. (2011, pp. 194-197) say that it does not really matter, who is compiling the report as long as the role division and responsibilities are clear. While the three books give different views on who should be involved in the project reporting, they do not contradict each other. Certainly, it is most important that roles are clear. It seems also natural for the project manager and project owner to be involved in the process. It is also easy to agree that the participation of all stakeholders should be beneficial for the project.

The length of the reporting cycle is another subject that seems to divide the views of different authors. However, everyone seems to agree that the suitable reporting cycle is very much project dependent. According to Turner (2014, pp. 293-294), the reporting should systematically take place at set intervals. However, the interval may change during the project, based on the stage of the project. Also, the length of the project and the risk levels should be taken into account, when defining the reporting interval. Conversely, Meredith & Mantel (1995, pp. 452-454) argue against periodic reporting. While they do recognize the possible need for periodic project reporting as a part of overall management reporting, they are against reporting at set intervals. They do not think that it makes sense to report only due to it being a tradition and demand more reporting at project milestones

instead. Neither book clearly expresses, which audience the reporting cycle suggestion is for. However, it would seem likely that both are correct, the optimal cycle length just depends on the audience and the purpose of the report. While periodic reports may be useless for the project team, they certainly have their place in the company management reporting as control tools.

To reach the benefits of project reporting described above, there are also some considerations to be made about the reporting tools and the contents of the report. The prerequisites are that the process, as well as the roles and responsibilities are clear. The reporting tools should also be easy and practical to use. If reporting takes too much time, there is a risk that it will be neglected. The report contents should be relevant to the project and the scope of reporting should be balanced. There should be enough information to mediate the big picture of the project. Yet, the amount of information should be kept to minimum, to aim focus on the right things. The report contents should also facilitate decision making, when it is required, and serve as a conversation basis regarding the project. (Artto, et al., 2011, pp. 194-197)

2.3 Role of Reporting in Management Accounting Systems

Reporting activities have been studied surprisingly little in accounting literature. Especially the role of reporting in MASs is an overlooked subject. A rare exception to this is a book chapter by Di Vaio and D'Amore (2013), where they look at the different controls and information systems that the public port authority has in place for the private water concessionary contractor, focusing on reporting. However, the work of Di Vaio and D'Amore (2013) is about intercompany reporting and controls, not internal controls for directing employee behavior. Another study that touches the subject of reporting as a control mechanism is the research of Tuomela (2005). In the study of Tuomela (2005), the company introduced a performance measurement system with increased reporting responsibility for managers to make them more aware of the measurements and interested in improving them. In this section, we will discuss the role of reporting in MISs and MCSs. We will first look at the function that reporting has in both types of MASs and its importance for successful implementation of MISs and MCSs. We will also look at different types of reports and the functions they usually play in MASs.

As described in Section 2.2.2, financial reporting is aimed at external stakeholders of the company. As such, it is usually not used as decision support material inside the company and it is not directly involved with the MISs of the company. The same applies to using financial reporting for MCSs. However, this division is rather theoretical. Like already mentioned in Section 2.2.3, the contents of financial reports are often utilized for management reports, and goal congruence between the two is strong, as the performance of the company is usually measured through its financial reports.

Management reporting, on the other hand, plays a crucial role in both MISs and MCSs. MISs, as explained in Section 2.1.2, are about collecting and processing information to the management that takes decisions according to it. Although some authors set the focus on IT systems, when talking about MISs, the essence of MIS is in fact reporting, according to our broader definition of the subject. The reporting can take place in the form of physical or electronic documents, or it can take place entirely through IT systems. Large parts of it may be automated, but conceptually it is reporting.

The role of reporting is enabling for MISs, as it is required as an input for a functioning MIS. At the same time, the role is also limiting. The quality of the reported information is the limiting factor in a MIS. The MIS can only support good decision making, if the information provided by it is of high quality.

While the relationship of MISs and reporting is quite straightforward, reporting is much more interesting from a MCS point of view. First of all, reporting is built on the administrative controls of the Malmi and Brown (2008) MCS package typology, presented in Section 2.1.4. Policies and procedures, governance structure, and organization structure all play a part in defining the reporting process and the reporting responsibilities. In this way, administrative controls are a prerequisite for functional reporting that enables the use of reporting and reports in other MCSs and MISs.

Reporting can also be linked to any category of MCSs in the middle of the Malmi and Brown (2008) typology. For instance, the management may decide to give reward to employees to motivate them, when a specifically good result has been reported. Similarly, reports can be utilized as a basis, when using planning controls and involving the employees into the planning process to better commit them to achieving the goals. However, the most typical MCS use of reporting is in cybernetic controls.

As already explained in Section 2.1.4, cybernetic controls measure a value, compare it against a standard, and take corrective action in case of deviations. A key component in the cybernetic control is the feedback loop that provides the measurement information for comparison (Green & Welsh, 1988). In practice, this is usually some kind of report. For instance, reported KPIs are compared against the targets. In fact, reporting could even be regarded as a cybernetic MCS of its own. Budgeting is a typical example of a cybernetic control system, where actuals are compared with budgeted numbers. In this case, reporting is the feedback loop that rarely receives much attention in literature. However, we could define the contents of the MCSs differently. We could see reporting as the main cybernetic MCS and budgeting as a mere source of information for it. This kind of theoretical difference in division of MCSs in the company's MCS package may not affect the practical end result. However, it can make analyzing and explaining certain situations easier, much in the same way as the different frameworks for MCS packages.

Similarly to all MISs, reporting is a prerequisite for many MCSs, especially cybernetic controls. In this way, the role of reporting is enabling or limiting also for MCSs. On the other hand, MCSs are also needed for effective reporting. In larger companies, no reporting actions take place without administrative controls. Reporting is a good example of the interdependence of the MCS package. It should also be noted that reporting is a link between MCSs and MISs, and the composition of the MCS package also affects the MISs.

Now that we have discussed the function of reporting in MISs and MCSs on a general level, we will briefly look at the different management report types and their role in MISs and MCSs. Naturally, there is an unlimited number of possible types of management reports and they all serve some slightly different purpose. For the sake of simplicity however, we will restrict the discussion here to five common types of management reports that have been at least briefly mentioned in this thesis before. These types are: one-off management reports for decision making, periodical management reporting such as monthly reporting, periodical project reporting, project reporting at decision gates, and project exception reporting.

One-off decision support reports clearly are most often intended for MIS purposes. It is even implied by their name. The role of monthly reporting, on the other hand, is not as clear. While many see it first as a MIS support, the MCS role should not be overlooked.

While the management may use the reports for decision support, such as focusing their own attention, they also use the reporting to communicate the focus areas to the employees and to steer their attention towards those goals. As already mentioned in Section 2.2.3, the measured goals are usually the ones attained. Thus, we would argue that monthly or other periodical management reporting often serves two purposes: MISs and MCSs. Naturally, the same control principle could be utilized for one-off reporting as well. The managers could give the task to prepare a report of a specific issue, in order to direct the employees to work on correcting the issue.

Similar logic applies to project reporting. Periodical project reporting may contain information that is utilized for decision making. This is especially the case, when the project is not going well. However, most of the time, the management is only interested in hearing that everything is taken care of and in order, and the detailed contents of the reports are of less interest. This is further strengthened, if the periodic reporting is in the form of exception reporting. Either way, we argue that periodical project reporting serves first MCS purposes and only second MIS purposes. Decision gate or milestone project reports are different, however. These clearly serve a MIS purpose, as important decisions regarding the continuation and direction of a project are taken based on these reports. Naturally, also these reports have a controlling effect on the project manager, even if it is not specifically intended.

2.4 Management Accounting Change

Reporting practice change has not been studied a lot. However, there is plenty of research on management accounting change, which can be applied to reporting practices. As already mentioned in Section 2.2.3, management accounting is largely centered around reporting and many management accounting change studies such as Innes and Mitchell (1990), Cobb et al. (1995), Vaivio (1999), and Lukka (2007) have researched reporting related accounting changes.

According to Kasurinen (2003), management accounting change literature can be divided into long-term change and short-term change studies. The short-term change studies can be further divided into studies of the role of management accounting in other changes and those studying the changes in management accounting. These, in turn, comprise of studies

researching the forces advancing the change, the barriers to change, and both. (Kasurinen, 2003) In this thesis, we handle a case of reporting practice change and thus, we are interested in the forces advancing the change in management accounting systems and the barriers to the change. We use the accounting change model by Cobb et al. (1995) to discuss them. Additionally, we use the framework of Burns and Scapens (2000) for studying the process of change.

Cobb et al. created the model for accounting change, while studying management accounting change in a bank. They base their work on the forces advancing the accounting change, discovered by Innes and Mitchell (1990). These forces are the catalysts, motivators, and facilitators that together grow potential for change. The motivators, for example the market situation, support change in a general manner. The facilitators, such as resources, are necessary for the change, but do not bring it about. The catalysts, on the other hand, are directly involved in the change and, especially, the beginning of it. (Cobb, et al., 1995)

The components added to the model by Cobb et al. (1995) are leaders, momentum for change, and barriers to change. The leaders are a part of the model, as the change process takes place through people and the leaders are the ones carrying it out. The momentum for change was something Cobb et al. (1995) noticed to help the change. As the bank they were studying had carried out changes related to accounting recently, people were more in terms with change, which eased further changes. Lastly, there are also barriers to change, which hinder the changes. In the bank case, these were for instance accounting staff turnover and staff attitudes towards change. (Cobb, et al., 1995) The accounting change model is depicted in Figure 3.

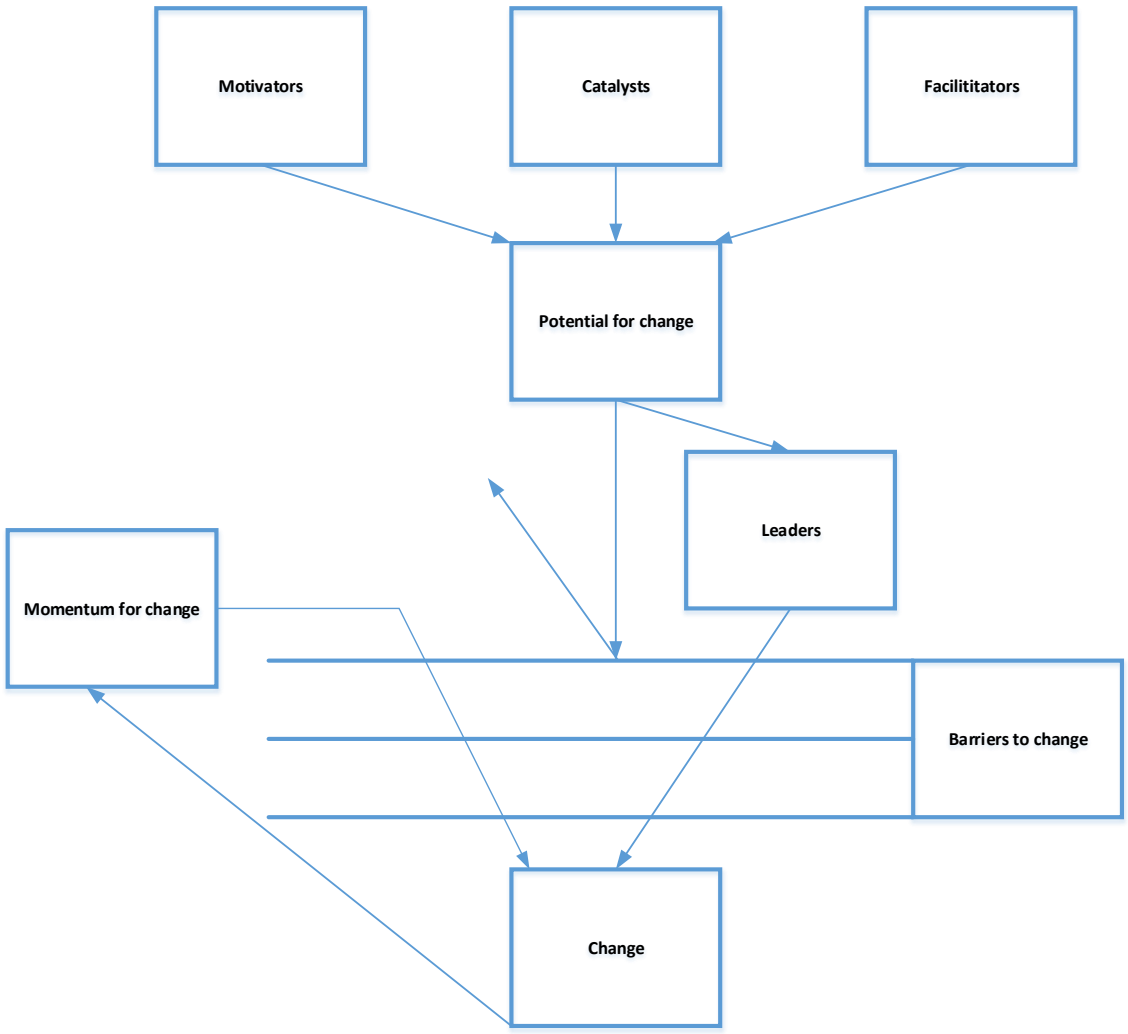

Figure 3 Accounting change model (Cobb, et al., 1995)

Burns and Scapens (2000) take a different kind of approach at management accounting change, focusing on the change process. They base their framework on the old institutional economics theory. The framework is divided into two sides: the realm of action and the institutional realm, two parallel axes of time. The realm of action represents the observable actions that take place in the organization and the institutional realm the institutions, that is, the organizational understanding of how things are. Between the two realms are the rules and routines. The rules and routines are always encoded, that is, interpreted, in the light of the institutional information. They are then enacted according to the interpretation and other factors, such as resistance, that affect them. The enactment reproduces the rules and routines. However, the rules and routines are often not reproduced exactly

the same, which changes the following interpretations of them. This change can be conscious or unintentional. Lastly, the routines and rules are institutionalized. (Burns & Scapens, 2000)

The enactment and reproduction of rules and routines is intermittent, taking place, when actions are taken in the realm of action. The encoding and institutionalization, on the other hand, are continuous processes. Naturally, the rules and routines can also change. However, the new rules and routines are always encoded in the light of the institutions and the reproduction of previous rules and routines affects the enactment of the new ones. The change process is illustrated in Figure 4.

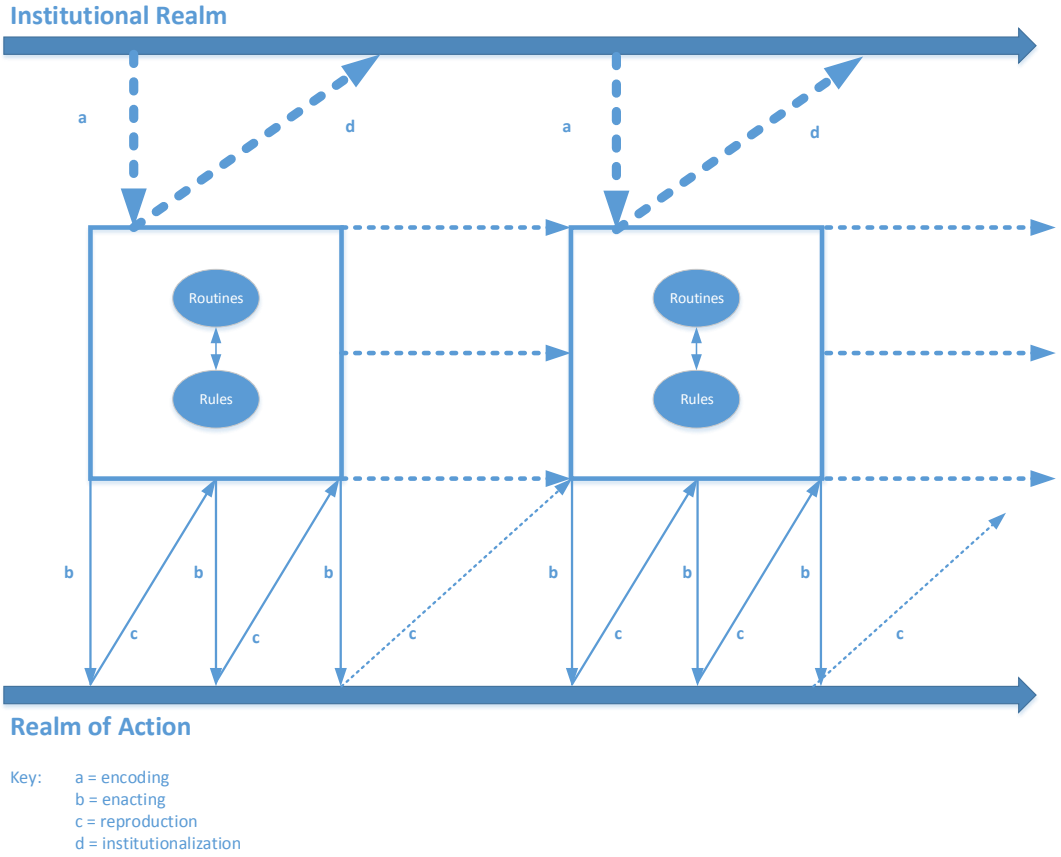

Figure 4 The management accounting change process (Burns & Scapens, 2000)

3 Methods of the Study

3.1 Managerialist Study with an Interventionalist Approach

In this Chapter, the research methods of this thesis will be presented. The thesis is written as commissioned work for the case organization. As such, it has a managerialist approach, meaning that the aim of the work is to help decision making and control in the organization. According to Malmi (2016), managerialist studies in management accounting can be divided into two categories: interventionalist studies and non-interventionalist studies. Albeit, most of the analyses were carried out, conclusions drawn, and suggestions constructed by the author, the study falls in the category of interventionalist studies, as intermediate results and ideas were discussed with the key people in the organization, getting new input and catalyzing the process. (Malmi, 2016)

Using the categories of Malmi (2016), the interventionalist studies can be further broken down into constructive approach and action research. In the constructive approach, theoretically new concepts are developed and their usefulness is proven by actual users. Clearly, this thesis does not fall under the constructive approach. There is no proof that the changes suggested by the thesis actually improve the situation, as the thesis will already be published before the time the changes will be fully implemented. Action research, in turn, can be divided into several sub-categories. These are: learning during intervention, demonstrating value of existing concepts, construct development without proof, and field experiments. The role of reporting has not been widely discussed as a part of management control system packages, but the use and the benefits are not shown in this thesis, so it falls under the category of construct development without proof. (Malmi, 2016)

As mentioned in Chapter 1, there have been errors in the monthly reports of Nuclear Services. Since the causes of errors are not clear, root cause analysis was chosen as the primary method for the problem solving. Root cause analysis is a systematic approach to solving complex problems with interacting variables. It is based on the deductive approach and can be applied to different kinds of problems ranging from technical problems such as breakdowns of equipment to business process problems such as low customer satisfaction scores. (Oakes, 2009, pp. 16-17) The root cause analysis process followed in

this thesis is described in more detail in Section 3.2. A large part of the root cause analysis consisted of interviews. The interview methodology is presented in detail in Section 3.3.

3.2 Root Cause Analysis

In this section, the main problem-solving methodology used in the making of this thesis, root cause analysis, will be explained. Root cause analysis is a systematic approach to breaking down and solving a problem. While the history of the methodology lies in technical applications, it has also been utilized in solving business process related problems. For instance, it has been used to manage project cost of poor quality (Malmi, et al., 2004).

Root cause analysis is an umbrella term for tools and practices that follow the same deductive logic that aims at finding the underlying causes of a problem and fixing them (Andersen & Fagerhaug, 2006, p. 22). Thus, there are many correct ways of conducting a root cause analysis. As root cause analysis is applied to all kinds of problems, there is no single set of tools that would be optimal for all situations. The process of problem solving can also be broken down in various ways (Oakes, 2009, pp. 11-15). For this thesis, the six steps used by Andersen and Fagerhaug (2006, p. 19) will be adopted. The steps are:

1. Recognition of the existence of a problem
2. Agreeing on the problem
3. Understanding the problem
4. Finding the root cause(s) of the problem
5. Eliminating the root cause(s) of the problem
6. Monitoring that the problem has been solved

As natural for a commissioned thesis work, the first two steps had already taken place before the start of the thesis. The problem of inaccuracies and errors in Nuclear Services reporting had been noticed by the unit management team as well as the division management team. There was an agreement that the errors in reporting were an issue and this Master's Thesis was commissioned to better understand the problem and find solutions for it.

The scope of the thesis contains Steps 3 and 4. Also, Step 5 is partially covered. The problem is studied and analyzed to find the underlying reasons for it. Suggestions for

fixing the situation are also given, but the implementation of those solutions takes place outside the thesis. As expected, this limits the post-solution monitoring outside the scope of this thesis, and no proof that the presented solution works can be given.

The starting point for the thesis was the problem that had been recognized and identified as a real issue. There were opinions about the causes of the problem, but the problem had not been studied systematically. Hence, the first step for the thesis work was understanding the problem, Step 3 of the process suggested by Andersen and Fagerhaug (2006). The main sources of information in the beginning were the handbook of the unit and discussions with key people responsible for the processes of the unit. The handbook describes the operations, quality management procedures, and the organization of the unit, linking them to the general guidelines, instructions and processes of the company. The key people that were most involved were the business controller of the unit, the Head of Sales and Processes, the Manager of Projects and Processes, and the Vice President of the unit.

Based on the information, a flow chart was prepared, containing the most important processes of the unit related to reporting and the information flows to the report. The creation of the flow chart was an iterative process. First, the author created an initial version of the flow chart and it was presented to the key people and discussed with them. The discussions with the key people were mostly conducted one-on-one to get a balanced view of different perspectives and to avoid some opinions dominating over others. Based on the feedback, the flow chart was specified and expanded, and mistakes were corrected. The flow chart was then presented to the key people again for additional feedback. This cycle was repeated until everyone could agree that the flow chart depicted the processes accurately. A simplified version of the flow chart is presented in Section 4.1.2.

Simultaneously to the studying of the situation through documents and discussions, the author also participated in the monthly reporting activities in order to learn more about the reporting practices in the unit. This included helping the business controller in compiling the report and going through the data, but also participation to meetings that the business controller had started to organize individually with each sub business area head to go through and check the data before the end of the month. While the original idea for the author was to participate in these meetings in a role of a silent observer, taking notes

and only asking questions to clarify the interpretation of the situation, in practice the author was often drawn into the conversations, being involved in the projects and sales of almost all sub business areas. The author only participated in a large extent in the data processing and report compiling during the reporting of a couple of months, but participation to the monthly check-up meetings with the sub business area heads lasted through the entire thesis process.

In addition to trying to understand the course of the activities, the possible problems were listed right from the get go. There were many sources of information regarding the problems. The author, having been involved in the sales and project delivery processes of the unit himself, identified some problems when compiling the flow chart. Similarly, some discrepancies between what was said in the handbook and what actually took place were noticed. These were also noted as possible sources of problems. Additionally, the key people brought up some findings of their own related to problematic parts in the processes, when the flow chart was discussed with them. While the scope and level of abstraction of the problems varied largely at this point, they were all written down for the analyses.

To further deepen the understanding of the problem, external and internal interviews were carried out. The external interviews were used to benchmark the unit against other organizations doing project based business. Benchmarking is a tool that can be used to bring external perspective to the problem. Comparing the challenges an organization is facing to those of reference organizations helps in putting the problems into perspective and identifying the issues that can be solved from the ones that seem to trouble all organizations in a similar situation. (Andersen & Fagerhaug, 2006, p. 34) The internal interviews, on the other hand, were used to widen the internal perspective of the problem. So far, the people involved in the making of the study, had been those, deeply involved in developing the processes. Due to their heavy involvement in the development of the processes, they could be biased regarding some matters or blind to others, so the views of those familiar with, but less linked to, the practices were sought with the internal interviews. In addition to asking opinions about the reporting, and reporting related practices and systems, the author included some questions to test interviewees' knowledge on reporting related subjects, as the question had been raised, whether the general understanding of the reporting

practices was on as high a level, as it was believed to be. A more detailed description of how the benchmarking and internal interviews were carried out is given in Section 3.3. The interview questions are presented in Appendix 2.

After the benchmarking and internal interviews, the findings were shared and discussed with the key people involved in the thesis. The discussions revolved around three themes: the list of problems identified internally in Nuclear Services reporting, the report contents in comparison to the other organizations, and the differences in reporting practices between Nuclear Services and the other organizations. Also, a short presentation of the list of identified problems was held at the Nuclear Services management team meeting. At this point, it was decided that enough information about the situation had been gathered and a sufficient level of understanding regarding the problem had been reached, and it was time to move on to systematic search of the root causes. The description of the situation of reporting at Nuclear Services has been summarized in Section 4.1.2. The results of the comparison between reporting in Nuclear Services and in the other organizations is discussed in Section 4.2.

For the Step 4 of the root cause analysis, finding the root cause or root causes behind the problem, fault tree analysis was chosen as the method. The fault tree analysis is a method with origins in the US missile and space programs in the 1960s (Stamatelatos, et al., 2002). It has been widely adopted by safety critical industries such as the nuclear industry (Haasl, et al., 1981). However, in addition to technical applications it can also be utilized in finding the underlying reasons for all kinds of other problems such as business process problems. Other tools exist, but the fault tree analysis is especially useful in complex situations. Contrary to many other methods, it can simultaneously take into account several sources of problems and several root causes. It is also good at visualizing the interlinkages between the different events. (Andersen & Fagerhaug, 2006, pp. 106-108)

In the fault tree analysis, all issues that had been identified to having caused problems or having the potential of causing problems were included in the tree. Events that were identified having the potential to cause problems, but regarded highly unlikely to occur in comparison to the other identified events, were left out of the tree to maintain the focus on the relevant issues. In cases, where two or more causes were identified for the same event, they were combined using round "and" and triangular "or" gates, which signal,

whether all of the causes or only one needs to occur for the event to take place, respectively. This work was done by the author.

Again, the results were presented to and discussed with the key people. Based on the feedback, some of the causes were delved into further and others were rephrased or otherwise corrected to better match the situation. As the work progressed it was also noted that similar causes turned up in different branches and they were joined together.

When the fault tree was complete and the underlying root causes had been identified, it was noted that they were not all of equal importance. In addition to their different placement in the fault tree, resulting in a more or less critical role, depending on the "and" and "or" connections of different branches, some of the events were a lot more frequent or probable than others. Some events were also considered less important to eliminate than others, as they were easier to cope with. To illustrate the significance of individual root causes in the problem elimination, the identified root causes were then planted on, what is called an efficiency diagram in this thesis. The idea with the efficiency diagram is similar to that of the payoff matrix suggested by Oakes (2009, p. 93). The efficiency diagram was used to depict the positive impact that could be achieved by eliminating a root cause in comparison to the effort the elimination would require from the unit. The efficiency diagram was again first prepared by the author, based on subjective judgement of the aforementioned criteria, and then shown to the key people for comments. The results of the fault tree analysis as well as the efficiency diagram are presented in Section 4.3.

When the root causes had been found, it was time to move on to the elimination of problems, that is, Step 5 of the problem-solving process. Coming up with solutions is less straight forward than identifying the issues, and there are less ready-to-implement tools for this stage. The author took the results of the fault tree analysis, the efficiency diagram, the internal interviews, as well as the benchmarking interviews, and analyzed them. As the root causes that were most efficient to eliminate were related to employee behavior, the solutions were conceptualized using the typology from Section 2.1.4. These theoretical considerations are presented in Section 4.4.1.

Based on the theory and the benchmarking references, a practical suggestion for corrective actions to solve the root causes were devised by the author. Corporate wide systems and processes were taken into account as restrictions, and the benefits and costs for all

those affected by the suggested changes were taken into account. The solution suggestion was divided into two parts, a rough way of doing it that could be implemented on a short notice and a more refined approach that would require more development in the current systems. Once again, the results were presented to the key people and constructive discussions provided ideas for improving the solution. These ideas were incorporated in the solution. The solution is presented in Section 4.4.2.

It was estimated that the suggested solution will solve the immediate reporting problems in the unit, if implemented correctly. The implementation plan was dissected utilizing the management accounting change literature from Section 2.4. However, the author and the other key people involved in the thesis work also agreed that solution alone is not enough in the future, if the unit grows as expected. The implementation plan and the idea of future reporting development needs of the unit are discussed in Section 4.4.3.

3.3 Internal and Benchmarking Interviews

In addition to what was found out in the other activities of root cause analysis, described in Section 3.2, the status of Nuclear Services reporting was fathomed out through interviews at Fortum. Additionally, three benchmarking interviews were carried out in reference organizations. The benchmarking interviews served two purposes. First, they helped in understanding the problem by comparing the issues faced in the organization to those faced by other similar organizations. Second, they provided a point of comparison when creating the solution to the problems. While the comparison does not unambiguously prove that something done by another organization will work, it certainly makes a case for it.

It was seen important that the majority of the reference organizations' business would be project based. Project business is a broadly defined term that encompasses all business related to projects and the achievement of goals (Artto & Wikström, 2005). This includes the companies delivering projects as well as those conducting large investment projects (Artto, et al., 2011, pp. 10-15). However, in this thesis, the term project-based business is used to refer to organizations for which delivering projects is the main source of business.

The reference organizations were chosen as follows. First, a rough list of possible reference companies that conduct project-based business, was gathered by searching project

related positions in a couple of Finnish employment service portals on the internet. The list was supplemented by going through the companies listed on the Helsinki Nasdaq stock exchange and picking the ones that do at least part of their business in project form. This resulted in a list of 23 companies. The list served as the basis for a discussion with the Nuclear Services management about the preferences on benchmarking organizations. In the discussion, eight of the companies were dropped from the list, and the remaining 15 were assigned priorities. Additionally, another, recently acquired, unit within Fortum was identified as a potential benchmarking organization. It was also decided that a suitable number of reference companies would be three to five. This amount of interviews was expected to give a representative picture of good practices in project business, while still being manageable in terms of data and workload. Contacts to the 15 reference companies were searched within Nuclear Services and at the university in the priority order. Finally, interview requests were sent to four companies on the list and the potential reference organization within Fortum. Two of the four companies accepted the interview requests along with the reference organization within Fortum. One potential reference company declined the interview request and one did not reply.

All interviews were semi-structured interviews, where a question list was followed, but the interviewee was let to answer freely to the questions and the interviewer asked specifying questions, where more information seemed necessary. The interviewer had also written down some specifying questions that were asked, unless the person interviewed brought the topic up him or herself. The lists of questions can be found in Appendix 2. The interviews took place in meeting rooms with only the interviewer and the interviewee present. All interviews were carried out in Finnish, as it was the mother tongue of the interviewer as well as all the interviewees. All of them were also recorded and notes were later taken based on the recordings with one exception. There was a technical problem with the recording in one of the Fortum internal interviews related to Nuclear Services reporting. Due to the technical problem, part of the interview was not recorded. Notes of the missing part were written down based on the interviewer memories. An option of pausing the recording was also given to the interviewees to encourage free speech even considering troublesome subjects. This option was utilized once in the external benchmarking interviews and a couple of times in the Nuclear Services internal interviews. The

interviewer had prepared to make notes of these sections on a general level, but considered that the content of the non-recorded parts was mainly not significant for the study. The non-recorded parts were mostly criticism towards certain individuals and not related to the processes, practices, skills, or systems.

The three benchmarking interviews were held at the reference organization offices. A brief description of the study and the purpose of the interview was given either by email or phone, when contacting the company. The questions were also sent in advance to interviewee, to lower the anxiety and make the interview situation as comfortable as possible, and to give the person time to prepare for the questions in order to get as thought out answers to the questions as possible. The question list in the benchmarking interviews contained background questions specific to finding out more about the benchmark organizations. The question list of the benchmark interviews can be found in Appendix 2. The benchmarking interviews lasted between one hour and two hours, depending on the amount of conversation that the questions brought up. The positions of the interviewees in the benchmarked organizations were Vice President Finance, Head of Department, and Senior Site Manager.

In total, 11 interviews were carried out regarding the reporting in Nuclear Services. Four of the interviewed were Nuclear Services sub Business Area (sub BA) heads and seven project managers in Nuclear Services' projects. All sub BA heads were interviewed, apart from the ones that were already otherwise involved in the making of this thesis. Five of the project managers belonged to the Nuclear Services organization and two were from the business area Engineering and Projects. The project managers were picked by the interviewer with the idea of having as representative sample as possible of Nuclear Services project managers in terms of project sub BA, home organization, personal background, and experience in project management. Separate lists of questions were used for project managers and sub BA heads, with the question list of the sub BA heads being more extensive. The question list of the project managers and the questions for the sub business area heads are presented in Appendix 2. The interviews considering Nuclear Services reporting took between half an hour and an hour. The average length of a sub business area manager interview was a little longer than the average interview of a project manager. All of the interviews were conducted in meeting rooms at Fortum headquarters

with only the interviewer and the interviewee present. In the interviews about the Nuclear Services reporting, the questions were not sent or shown to the interviewees in advance, although the general topic and purpose of the interview was naturally told, when asking permission for an interview and booking it. This approach was chosen, as some of the questions were to test the interviewees' knowledge on the Nuclear Services reporting practices.

The results of the interviews were utilized to write Chapter 4. The interviews were especially used in the preparation of Section 4.2, but also Sections 4.1.2 and 4.3 are largely based on the interviews.

4 Findings

4.1 Case Organization: Fortum Nuclear Services

4.1.1 Background

Fortum is a Finnish energy company with main markets in the Nordics, Baltics, Russia, Poland, and India. The majority shareholder with 50.8 per cent is the state of Finland. The market capitalization of the company is approximately 19 billion euros. Fortum is a medium sized player in the European power market and among the largest heat producers globally. Fortum is also the largest electricity retailer in the Nordics. Its power generation capacity consists mostly of hydro and nuclear power, especially in the European Union area. (Fortum Oyj, 2018)

After the divestment of its electricity distribution business 2014-2015, Fortum has been looking for investment opportunities. In addition to investments into traditional energy business, such as the investment in Uniper shares in 2018, the company has been looking at alternative revenue streams independent of the electricity market price. This is largely due to lower electricity market prices and thus shrinking margins for the traditional power producers, brought by feed-in-tariff subsidized renewable energy production (Manninen, 2016). The goal has also been included into Fortum's strategy, expanding the company's line of business beyond the traditional power and heat production, and sales. A good example of the new strategy is the acquisition Ekokem, a Finnish circular economy company in 2016. (Fortum Oyj, 2018)

Fortum is also looking at creating new kind of business internally. Partly, new revenue streams can be created utilizing the existing resources and knowhow. For instance, Fortum has a support organization of several hundred nuclear experts for its fully owned and operated Loviisa nuclear power plant. The reason for the out-of-the-ordinary extensive support organization lies in the history of the power plant. Normally, much of the support of a nuclear power plant comes from the plant vendor. However, for Loviisa nuclear power plant, being a unique combination of soviet power plant technology and western safety systems, relying on vendor support has not been an option. (Michelsen & Särkikoski, 2005) This has created the need for a large internal support organization.

Now, in the spirit of the new strategy, this capability is being utilized for external sales in addition to internal support.

A new business area called Nuclear Services, focusing on external sales of nuclear related services and products, was formed in 2016. Its purpose is to, in part, fulfil the strategic goal of creating electricity market price independent revenue streams. The unit is building on the expertise gathered with Loviisa nuclear power plant and has an offering designed to support nuclear power plants throughout the life-cycle, starting from licensing support for new-builds and ending in decommissioning services and final waste disposal consultation.

The business area is located in Fortum's Generation division, which has the main task of power generation and electricity trading in the Nordic region. In the Generation division, Nuclear services works in close collaboration with two other business areas: Engineering and Projects, as well as the Loviisa nuclear power plant. Engineering and Projects is an engineering organization with the main task to provide support for the Loviisa nuclear power plant, but nowadays it also supplies resources for Nuclear Services' external projects. Nuclear services comprises of only a few dozen people and operates mainly as a sales organization. Additionally, it provides project managers and project management support, but most of the resources come from Engineering and Projects or, in some cases, the Loviisa nuclear power plant.

Nuclear Services is divided into five sub BAs. These are: Sales, Decommissioning and Waste, APROS and Virtual Reality, Newbuild and Upgrade Services, and Large Projects. Additionally, Nuclear services houses a team, responsible for the strategic planning, research and development, as well as division level mergers and acquisitions. The sub BA division follows the lifecycle of a nuclear power plant, starting from Newbuild and Upgrade Services and ending with Decommissioning and Waste. The Nuclear Services management team consist of the Nuclear Services vice president and the sub BA heads. The Nuclear Services organization is visible in Figure 5.

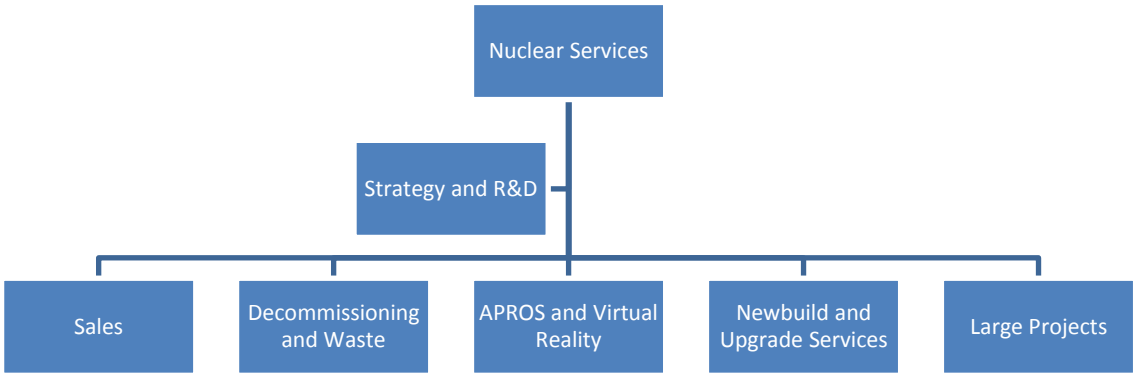

Figure 5 Nuclear Services organization

The Sales sub BA is the owner of the key processes of Nuclear Services, such as the sales, project delivery, customer feedback, resourcing, and procurement processes. The sales team also supports other sub BAs in marketing and sales activities, and manages new leads and initiatives. In addition, the Sales sub BA is tasked with delivering scalable growth for Nuclear Services through business development activities. New products and services that do not belong under any other sub BA yet are nurtured through the early stages of their life in the Sales sub BA. For instance, Fortum's virtual reality related products and services started under the Sales sub BA, but have then been moved to the same sub BA as APROS™.

The Newbuild and Upgrade Services is a sub BA, focused on offering services that, as the name suggests, support commissioning of a new nuclear power plant as well as the needs of an operational plant. This includes licensing expertise, engineering and design, as well as operations and maintenance support. The work is carried out in the form of projects and commissions. Most assignments are billed with an hourly rate, but fixed priced contracts are also used especially in the larger projects. The project sizes vary from simple commissions at tens of thousands of euros to large projects with several million euros of revenue. Most of the customers of the Newbuild and Upgrade Services are domestic nuclear power plants and projects. (Fortum Power and Heat Oy, 2018a)

The APROS and Virtual Reality sub BA focuses on selling APROS™ (acronym for Advanced PROcess Simulator), a software for the simulation of processes at nuclear and other thermal power plants. Nuclear Services is responsible at Fortum for APROS™ sales to nuclear customers, whereas conventional power plants are served by another unit at Fortum. The tool has been developed for decades in collaboration with the Technical Research Center of Finland VTT and the revenues from license sales are split among the partners. In addition to one-off license sales, Nuclear Services offers service contracts that include updates, as well as trainings and support services, such as modelling, related to APROS™. Nuclear Services also offers APROS™ based conventional and virtual reality training simulators. In addition to APROS™ based virtual control room simulators, the APROS and Virtual Reality sub BA is responsible for the sales of other new virtual reality and 360° video products and services. The prices of the services range from a few thousand euros for a 360° Starter Pack to hundreds of thousands of euros for the building of an engineering simulator model. APROS and virtual reality sub BA has a truly global customer base. (Fortum Power and Heat Oy, 2018b)

The end of a nuclear power plant's life cycle is covered by the Decommissioning and Waste sub BA. The sub BA offers decommissioning planning as well as the actual decommissioning work. It can also consult clients in spent nuclear fuel disposal and other nuclear waste related issues. Decommissioning and Waste sub BA also sells NURES™ (acronym for NUclide REmoval System), a media for treating radioactive liquids. NURES™ sales used to make up the majority of Nuclear Services revenue when the unit was formed, as the demand for water purification technologies was especially high in Japan after the Fukushima accident. However, the relative significance of the product in Nuclear Services revenue has decreased since. NURES™ can be sold with different business models, namely media sales per kilogram, as a service or with a purification system as a turn-key solution. The sales of Decommissioning and Waste range from deliveries of NURES™ to test laboratories at a couple of thousand euros to possible large shares in a nuclear power plant decommissioning project at tens of millions of euros. (Fortum Power and Heat Oy, 2018b)

Large Projects is a sub BA that originated from the Newbuild and Upgrade Services. As a couple of the projects grew significantly larger than the others, it was decided that they

should receive special attention in a sub BA of their own. The length of these projects is years and the revenue is measured in millions. At the moment, Large projects is only serving two customers.

During the course of its roughly two-and-a-half-year history, Nuclear Services has already gone through a lot of changes. It has achieved significant growth in terms of revenue, apart from the drop of post-Fukushima NURES™ sales. In 2018, the unit is expected to almost double its sales to approximately 20 million euros. Simultaneously, the organization has grown from just a few people to its current size of 35 professionals (Fortum Power and Heat Oy, 2018a). Nuclear Services is also facing huge growth expectations. The revenue is expected to reach hundred million level in a couple of years. Although, the growth does not necessarily have to be all organic and some merger or acquisition may be included, attainment of these figures will be challenging.

The growth has also brought, and continuing, will bring, many challenges regarding the management of the unit. Even though, the organization is still fairly small and nonhierarchical, and everyone knows each other, a critical limit seems to have already passed that information sharing has become more difficult. As more and more people are joining in, including project managers that come from other units within Fortum or from subcontractors, it has become increasingly important to have rigorous and well-articulated processes.

One area, where the growth has brought problems is management accounting. While everything used to be manageable by one business controller manually, using Excel spreadsheets, it has become increasingly difficult. Therefore more robust systems and practices are required for additional growth. This is especially visible in reporting. There have been cases, where the numbers in monthly reports have been significantly off. Also, the units forecasting capabilities have been questioned. These problems in reporting serve as a starting point for this study that aims at finding the causes for the problems and corresponding corrective actions. The reporting in Nuclear Services will be under closer inspection in Section 4.1.2.

4.1.2 Reporting at Nuclear Services

When reporting is mentioned at Nuclear Services, it usually refers to the monthly reporting of the unit. The report is prepared for the Generation division management team, but also the Nuclear Services management team utilizes the report. The management team goes through the report in its monthly meetings reviewing the status of the unit. The report is in the format of Microsoft PowerPoint presentation and comprises of approximately 15 slides depending on the amount of highlights and other comments. (Fortum Power and Heat Oy, 2018a)

The report consists of many parts. In some of them, the data remains fairly unchanged from month to month and mostly serves as a reminder of the situation, while others vary each time. The unit is focused on sales and this can also be seen on the monthly report that starts with the sales pipeline. In the sales pipeline, the sales prospects are divided into five categories: leads, opportunities, draft proposals, proposals out, and orders. Leads are the least concrete sales prospects. A possibility for sales has been identified, but it may not be certain yet, what would be the scope, schedule, client, or even the product or service to sell. The next stage of a sales prospect is called an opportunity at Nuclear Services. In the opportunity stage, the sales possibility is getting clearer. At this stage, it is clear who the client is and there is at least an idea of the scope, schedule, and product or service. A sales prospect turns from an opportunity to draft proposal, when the proposal preparation begins. After a proposal is ready and sent to the customer, it enters the proposal out category. Finally, the prospect turns into an order, when an order is received from the customer. (Fortum Power and Heat Oy, 2018b)

The five stages of sales pipeline are presented in the monthly report in terms of revenue and number of prospects. For draft proposals and proposals out, there is a further division into normal and hot proposals based on the expected hit rate. There is also a bar chart that shows the division of expected revenue of different prospect categories to the coming years. The numbers are also compared to the previous year and the previous reporting period. Additionally, there are Nuclear Services management team comments pointing out the highlights and low points in the development of the sales pipeline. There are also separate lists for the sales and invoicing of the largest projects, proposals under preparation, proposals out, and recent orders. Only the most important prospects are presented

on the lists. Again, all these lists are accompanied by comments clarifying the lists. (Fortum Power and Heat Oy, 2018a)

After the sales and the sales pipeline, most attention is given to the actuals and forecasts. There is a slide with a Nuclear Services income statement, some key figures such as economic value added and forecasts of these numbers. The same table is used in different business areas within Fortum and contains some unnecessary information such as the electricity price, which has no direct impact on Nuclear Services business. The table contains numbers for the reporting month, comparison to the previous month, for the reporting year up till the reporting point, as well as forecasts for the reporting year and three following years to come. There is also a separate table with the operating profit calculation for all Nuclear Services' sub BAs. The table contains numbers for the reporting month, the reporting year up to that point, and a forecast for the entire year. The report also includes one slide with a graph of the comparable operating profit distribution month by month throughout the year and a slide where project margins and EBIT margins for different businesses are calculated. (Fortum Power and Heat Oy, 2018a)

The sales, actuals, and forecasts are arguably the main contents of the report. There is also a separate slide for highlights and concerns considering the entire unit. There are also a number of tables related to the costs of the unit. These include a couple of tables on the fixed costs of the unit. One is with a division for different businesses, similar to that of the comparable operating profit, and another one with forecasts for the following three years. The tables are accompanied by graphs that show the development of costs as a function of time, including the forecast. Also, the costs of the research and development programs are shown in a table. The rest of the report consists of a couple of tables that cover other subjects. For instance, there is a look at the current situation of the key performance indicators that are used to assess the performance of the unit. There is also a table of the headcount of the unit, including a three-year forecast. (Fortum Power and Heat Oy, 2018a)

The form of the Nuclear Services monthly report is not that strictly specified and the document has constantly gone through changes, during the life-time of the unit. Apart for some parts that are mandatory in Fortum internal reporting, the business area reports may vary according to needs. The history can be seen in the PowerPoint presentation, which

may seem like a fairly miscellaneous collection of tables at first glance. The reason for the less structured form is that Nuclear Services' business differs from the main business of Fortum, and thus the same reporting practices that may be good for other units, would not suit Nuclear Services. The form of the report is constantly evolving and there are additions and changes almost every month. The development is driven by requests by Generation division management team, as well as ideas and suggestions by Nuclear Services management team and those involved in the reporting.

There is currently no written description of the reporting process at Nuclear Services. In fact, it might be more suitable to talk about a reporting practice instead of a reporting process. Although the same steps are usually followed from month to month, they are not set out by rules. Most of the reporting related activities are done by the unit business controller, who downloads the data from different systems, reviews, processes and analyses it, and compiles the PowerPoint report. The business controller is helped by a few individuals, who also compile certain tables to ease the workload. The vice president and the sub BA heads write comments on the report to make sense of the numbers and highlight the important developments.

The data required for the reporting comes from three Nuclear Services processes: the planning process, the sales process, and the project delivery process. The data coming from different processes is maintained in different systems. As the unit is still fairly minor, the planning process is done on an Excel spreadsheet. All the sales-related data, on the other hand, is in Nuclear Services Pelican Customer Relationship Management (CRM) system, which is based on Microsoft Dynamics. The data containing the actuals and other project information is contained in various systems. However, all the systems containing actuals are synced to the master system Visma L7, where the data is extracted from as part of the reporting. This system is called Liinos at Fortum. It should be noted that all orders are regarded as projects in the accounting systems and common language at Nuclear Services, regardless of their nature. Here, this terminology is adopted and all work numbers are regarded as projects, be they actual projects that fulfill the definitions of a project or simple deliveries of NURES™ media or an APROS™ license. The data flow from different processes is presented in a simplified form in Figure 6.

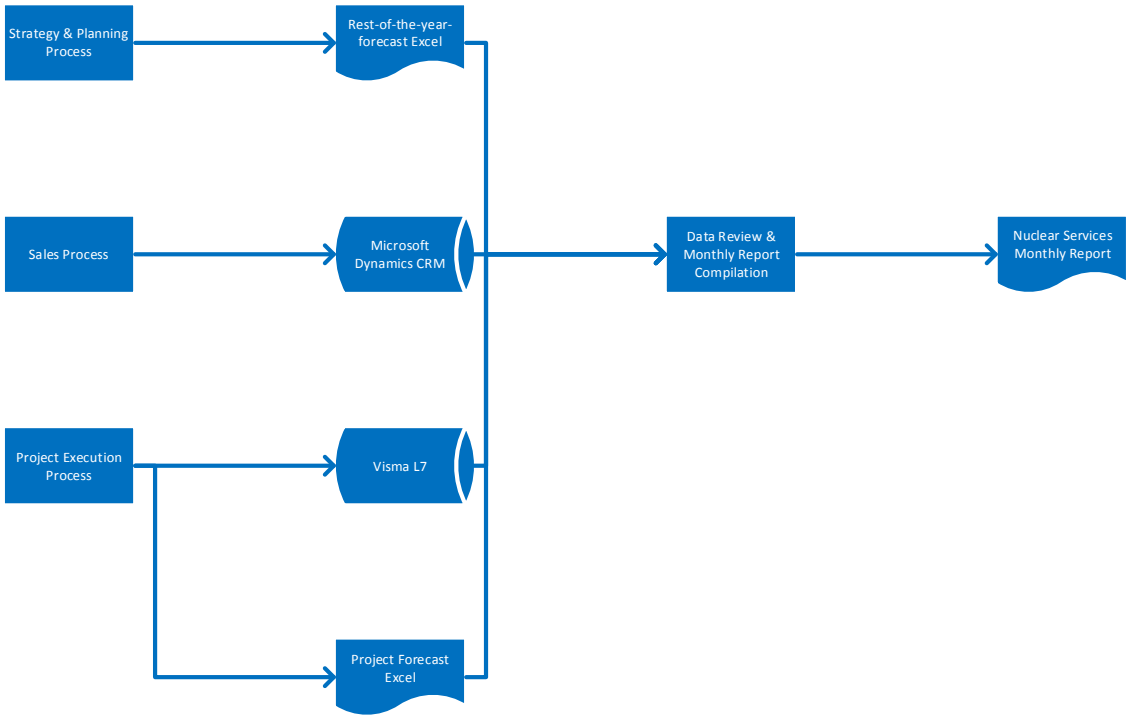

Figure 6 Simplified flowchart of Nuclear Services reporting process

The rest-of-the-year forecast Excel contains monthly sales estimates for the sub BAs as well as rough estimates for the following three years. The forecast is based on sub BA head judgement and consists of different sales cases combined with a management view component of the yet to be identified sales prospects. The sales process, on the other hand, produces a mathematical forecast based on the prospects in the sales funnel, their distribution over the years, and the probabilities of closing the deals. The data is filled into the system by the prospect owners and it is based on their judgement. This sales forecast is not at the moment included in the monthly report, but is monitored alongside it. There have been discrepancies between the sales forecasts of the rest-of-the-year Excel and the sales funnel. The sales funnel has constantly been missing some of the prospects included in the rest-of-the-year forecast.

The project forecasts for the ongoing projects come from the Project Forecast Excel, where project managers update the forecasted sales and costs of their projects with a monthly division. There are currently no instructions on how project forecasts are devised at Nuclear Services. In practice, project managers base their forecasts on their judgement of WBS and PMS, and their realization. According to the internal interviews, methods like Earned Value are currently not used. Lastly, the actuals come from Visma L7 and are

results of transactions such as the input of hours in the working time system, sub-contractor invoicing, travel claims, and customer invoicing.

A lot of the time spent on reporting goes to verifying the data. Prior to reporting, a list containing the accruals of all projects is extracted from the accounting system and sent to all project managers with a message to check their projects. At around the time of the start of this thesis, the business controller has also started to arrange a monthly pre-reporting meeting with each sub BA head, where the controller together with the sub BA head goes through the project actuals, the sales pipeline, and the forecasts. The meetings usually last for about one hour and the sub BA heads often invite some of their subordinates to participate as well. Together with the business controller, they look at the forecast data directly in Excel and the sales pipeline data directly in the CRM system, filtering it based on the sub BA. The actuals, on the other hand, are not viewed directly from Visma L7, as the systems is lacking in user friendliness. Instead, the results are shown with QlikView, a data viewing software. A special Nuclear Services Project Dashboard has been built into QlikView for the use of project managers. All relevant project data has been collected onto the project dashboard for the project managers. The data can be filtered based on any criteria such as the project, year, month, or sub BA.

When the actual reporting starts, the business controller exports data from all of the systems. The export format is Microsoft Excel. The data is pasted on prepared Excel templates that contain formulas for calculating numbers that are then copied on to the report. Some sets of data, such as the orders in the CRM system, the order book in Visma L7 are cross checked. In the cross check the order values between the two systems are compared. The main reason for this check is that there is no identification or other data connecting the CRM system data and the project number at the moment. When an order comes in, a project is opened manually in Visma L7. An integration for direct opening of project numbers from the CRM system has been under construction for a while now, but the work is not yet finished. The cross checks are often cumbersome and difficult, as the project may carry a different name from the prospect. However, usually some inconsistencies are found in these checks. If the data of a project does not match, the corresponding project manager is asked about the situation. It is also not unusual that some projects may miss

from one list or the other. This can be noticed by comparing the number of new projects to the number of new orders.

The Visma L7 order book is also cross checked against the project forecast Excel, the tool that project managers use for updating the forecasts of their projects. Naturally, the forecasted remaining sales of the project should match with the remaining order value in the order book. However, when the author participated in the reporting process, a significant share of projects had mismatch between the two.

Finally, when all the numerical data has been processed on to the slides, it is supplemented with qualitative information, gathered in the form of comments. Bid managers and sub BA heads comment the orders as well as proposals under preparation. The sub BA heads may also comment the most significant ongoing projects together with the project managers. The vice president of the unit finalizes the report, adding the management thoughts on the status.

In addition to the accumulation of project numbers as a part of the monthly management reporting, there are diverse separate project reporting practices in the Nuclear Services. Currently no unit-wide rules, guidelines, or requirements for project managers on how to report their project exist, although the subject has been discussed. At the moment, the sub BAs handle projects in the way that suits them best. Some utilize separate project reporting, while others do not. However, there is a self-updating QlikView dashboard for all Nuclear Services projects, where transaction information from different systems is collected and can be viewed by anyone in the unit. The QlikView tool is a MIS that can also provide project reports, summarizing the data in the systems.

The focus of this thesis is the improvement of Nuclear Services monthly reporting. Naturally, the project data must be included in the monthly reports and successful monthly reporting must also include project reporting. However, as separate project reporting is currently not carried out systematically in Nuclear services, the practices vary between different sub BAs, and not all projects are separately reported at all. The different practices of separate project reporting in different sub BAs will not be handled here in more detail.

Looking back at what was told about the rope of reporting in MASs in Section 2.3, we can analyze, how reporting is utilized at Nuclear Services. As we recall, reporting can serve two purposes, MIS and MCS. The Nuclear Services monthly report arguably acts as a division MCS directing the actions of the Nuclear Services unit.

The Nuclear Services management team would like to utilize the reports as a MIS, supporting their decision making in steering the unit and dividing their attention to the most relevant matters. However, the reports do not serve this purpose at the moment. As the vice president of the unit said, when commissioning this thesis, the reports are too unreliable to base decisions on. The reports have contained errors that could have led to wrong conclusions. The inability to utilize the reports as MIS, combined with the feedback from the division management, was the starting point for this thesis.

Interestingly, not everyone in the unit, or in the Nuclear Services management team, shared the same concern for reporting. The most concerned people were the ones more involved in the reporting. The vice president of the unit could also be considered heavily involved in the reporting, although she was not the one compiling the reports, as she was one conducting the final review, and eventually, the one responsible for the contents. This finding is partly similar the research of Lukka (2007), who studied loose coupling of management reporting rules and routines. In the Finland based international company studied by Lukka (2007), it was also only the ones involved in the reporting process, who were worried about the reporting. The reporting practices were described informal and ad hoc (Lukka, 2007). Both of these findings apply for Nuclear Services. However, two distinctive factors set the two cases apart. There was a well-defined reporting process in the organization studied by Lukka (2007), it just was not followed. In the case of Nuclear Services, there is no reporting process to begin with. The other difference is that the reports at the company studied by Lukka (2007) were free from errors, whereas Nuclear Services reports have not been. It is natural, not to be concerned with something that works. However, the lack of concern towards reporting problems, indicated by the internal interviews, raises a question, whether the importance of reporting is understood. This question is proven valid in the fault tree analysis, in Section 4.3.

When MCSs were brought up in the intermediate discussions with the vice president regarding the findings and the status of the thesis, interest towards management reporting

utilization increasingly also as a MCS arose. The idea gathered interest also among the sub BA heads, first with the ones who participated in the thesis work and later with a larger group, when the findings were presented to the management team.

The Nuclear Services monthly reporting practice is compared to that of benchmarking companies in Section 4.2. After the comparison, the aforementioned main problem of Nuclear Services reporting, errors in the reports, is delved deeper into in Section 4.3, using fault tree analysis. A solution for the problem using MCSs is presented in Sections 4.4.1 and 4.4.2.

4.2 Comparison of Reporting in Studied Organizations

As mentioned in Section 3.3, interviews were carried out at Nuclear Services and at reference organizations in order to better understand the reporting problems at Nuclear Services, to put them into perspective, and to find possible solutions for the problems. The three reference organizations were: the Port Solutions business area at Konecranes, one of Ramboll's six Heating, Ventilation, and Air Conditioning (HVAC) departments in Finland, and the Soil Remediation unit of Fortum Recycling and Waste Solutions (RWS).

All three reference units and Nuclear Services operate in different lines of business. They are also of different size. The Soil Remediation unit and HVAC department are smaller than Nuclear Services in terms of revenue, totaling at approximately three and four million euros of annual revenue, respectively. The Port Solutions Business Area on the other hand is significantly larger with approximately one billion euros of annual revenue, compared to Nuclear Services' corresponding approximately 20 million euros. However, all organizations have in common the fact that a considerable majority share of their business is conducted in the form of projects.

All interviewed organizations follow a monthly management reporting schedule. The contents of their reports are also fairly similar. Common elements for all of them are: profit and loss, order book, and profit and loss forecast. Also common for all organizations is that none of them has included cash flow statement into their monthly report. This all makes sense, as profit and loss are at the center of all businesses and order book is an essential part of short term forecasting. The absence of cash flow statement is also no surprise, as significant financing activities at this level of organization are usually more

of an exception. However, all organizations follow invoicing as a part of their reporting activities.

There are also differences in the report contents. Port Solutions is the only one of the organizations to report balance sheet. It makes sense, as its projects are mostly about delivering products, and thus, it has more assets and more variation on its balance sheet than the other units. Port Solutions is also an official reporting segment of Konecranes, including all the global businesses and operations, supply units, as well as service operations in dozens of countries globally. Nuclear Services has also some product deliveries, but they are only a small share of revenue, while the HVAC department and Soil Remediation operate almost solely in service business.

Another difference in the contents is, how sales are reported. Nuclear Services and Port Solutions have sales forecasts and sales funnels as parts of their reports. Ramboll also has a sales funnel system, but it is not considered that useful at the HVAC department apart from large proposal preparation, and hence it is not included in the report. Both the HVAC department and Soil Remediation say that construction business is fairly stable, following a yearly cycle. The managers have an experience-based view of the upcoming sales, and thus there is little need for forecasting the sales. Both units also stress that there is little active selling in their business. Most orders come from competitive bidding and the requests for proposals are often known in advance through personal relationships. Building on these arguments, the fact that Port Solutions and Nuclear Services operate globally, while the HVAC department and Soil Remediation operate only in Finland, probably makes a difference in sales forecasting needs. Also, Nuclear Services and especially Port Solutions are larger in terms of sales volume and organization size, which may increase the need to share the sales expectations in a more organized way. This is well illustrated by the global CRM process that Port Solutions run for sales funnel forecasting. On the other hand, Soil Remediation named sales funnel as one of the future development areas, as it could help them plan and distribute the workload more evenly throughout the year.

The third significant difference in terms of the report contents is that the Nuclear Services' report has less focus on projects than the other units do. The other units have both project status as well as project forecast included in their reports. In Nuclear Services, status observations of some of the larger projects may be included in the report, but this is not

systematic. Also, no individual project forecasts are included. According to one Nuclear Services sub BA head, the focus in reporting development has been on sales due to the short history and fast growth of the unit. Despite not being on the report, the project managers in Nuclear Services are supposed to check the status and update the forecast of their projects alongside the monthly reporting, similarly to other units. However, based on the interviews, it is questionable, whether all of them actually do this every month or are even aware of such responsibility. A summary of monthly report contents is presented in Table 1.

Table 1 Summary of the report contents

	Fortum Nuclear Services	**Konecranes Port Solutions**	**Ramboll HVAC Department**	**Fortum Soil Remediation**
Profit and Loss	X	X	X	X
Balance Sheet		X		
Cash Flow Statement				
Order Book	X	X	X	X
P&L FCT	X	X	X	X
Sales FCT	X	X		
Sales Funnel	X	X	(X)	
Project FCT		X	X	X
Project Status	(X)	X	X	X

In addition to differences in the report contents, there are also differences in the reporting practices in the units. For instance, the reporting tools are different. The reporting at Port Solutions relies on an Enterprise Resource Planning (ERP) system, whereas Soil Remediation works with Excel spreadsheets located on a cloud server. The different approaches can both be viable due to the different sizes of the organizations (van der Heijden, 2009, pp. 3-8). An ERP would be too expensive for the Soil Remediation unit's use compared to its benefits, while Port Solutions, on the other hand, could not manage only with Excel.

Nuclear Services operates in between the two, both in terms of size and solution. Nuclear Services has currently a hybrid solution for its reporting, where part of the data is handled in different tailored IT systems and part on Excel spreadsheets. Excel is also utilized in report compilation. The use of Excel has been proven problematic in Nuclear Services, which can also be seen in the fault tree analysis in Section 4.3.

The reporting tools at the HVAC department have gone through quite a change since it was acquired by Ramboll a couple of years ago. Reports now mostly come from a database, whereas people used to look at the data in different IT systems a couple of years ago. The focus is on relevant figures and information overload is avoided. On the other hand, while department level and project level reporting work well, information on team level is difficult to get out of the current IT systems, and team level reporting is a development goal for the HVAC department in the future.

Besides the contents and tools, also reporting responsibilities differ from organization to organization. Regarding Nuclear Services' reporting problems, an interesting difference is in the role of project managers in monthly reporting. In all of the studied organizations, project managers, line managers, and business controllers or other financial people are involved in the reporting. However, other organizations appear to have a more clearly defined reporting process and role division. The other organizations seem to also hold their project managers more accountable for their numbers. The accountability was well summarized by one interviewee.

"We like to think of the project manager as the CEO of the project. Naturally, he or she cannot authorize all decisions regarding the project, but that's the philosophy we like to cherish." -Vice President Finance, Port Solutions, Konecranes

Personalizing the accounting information by making the managers responsible for their numbers is an effective control technique (Garrison, et al., 2008, pp. 372-373). It could also be a key to improving the quality of reporting at Nuclear Services. This is supported by the fault tree analysis in Section 4.3.

An interesting detail related to the roles and responsibilities in reporting are the accruals, which have been a topic of debate for some time at Nuclear Services. One side of the debate argues that project managers should manage the accruals, as they are essential for

the profit impact of the project, while the other side thinks that it is unrealistic that all project managers would understand accruals, and therefore they should be left for the business controllers. At the moment, for most projects, financial personnel at the back office calculate the accruals using the Work In Progress (WIP) method, and project managers are supposed to check the results. However, there have been problems with this. Project managers have either not known what to do or how to do it.

The responsibilities regarding accruals vary from organization to organization. At Soil Remediation, the business controller takes care of the accruals. Port Solutions accrues using Percentage Of Completion (POC) method. Their project forecast is based on WBS, which in turn defines the POC. In essence, the accruals are based on the project forecast. Naturally, there are, at times, deviations and the forecast needs updating. In these cases, the project manager must get approval from the management and business controller for updating the forecast. Keeping the forecasts updated requires work and is something that has been stressed at Port Solutions lately. At the HVAC department hourly priced projects are accrued using the WIP method and fixed price projects using the POC method. The project managers decide accruals together with financial project assistants, and the head of the department or, in case of large projects, the project steering committee approves them. Involving the project managers in the process has been seen beneficial at the HVAC department.

"This [accruals] was considered very tricky at first, when it came. It's a little difficult to understand, but there's a point to it. In my opinion, the better the understanding of these things there is on the lower levels of the organization, the better the project managers look after the money." -Head of Department, HVAC department, Ramboll

Increased reporting responsibilities are a part of a larger change in the role of project manager at the HVAC department. During the last couple of years, the focus of project managers has shifted from a fairly narrow technical perspective towards a wider view with increased responsibility of the financial side of the projects. Similarly, at Port Solutions, the role of project manager has been going through change, away from the technical focus towards a more overall view. The shift has been from hands-on involvement in

problem solving more to business network management. This change has not been without problems and especially some of the more senior project managers have struggled with their new role.

While this thesis focuses on reporting, the changing role of project managers at the other units, reflected on the reporting responsibilities, is interesting for Nuclear Services also in a broader sense. To achieve its exquisite growth targets, Nuclear Services probably has to use more subcontracting. This would mean a shift from doing more towards business network managing also for Nuclear Services' project managers. Additionally, the increased subcontracting can bring new challenges to reporting.

4.3 Root Causes of Errors in Nuclear Services Reporting

Based on the information that had been gathered about Nuclear Services reporting practices with the flow chart analysis and the interviews, a fault tree analysis of the reporting problems was carried out. In fault tree analysis, the undesired event, called top event, is placed at the top of the tree on the left side of the diagram. Based on the findings in Section 4.1.2, the top event in this case is "unreliable monthly reporting". Next, the possible direct causes are added as lower level events to the right side of the top event and connected to the top event with a line. If there are multiple causes they are connected with round "and" gates or triangular "or" gates. An "and" means that all the causes are required for the event to take place, while only one cause is enough to inflict the event in the case of an "or" gate. In order to keep the analysis manageable, very improbable events, for instance sabotage in this case, are left out. The same methodology is then applied to the lower level events, expanding the tree further. The analysis is stopped, when all branches have reached a root cause. The identification of root causes required iteration. On one hand, there may be further causes for the events that were first considered root causes, and on the other hand going too deep into the causes may lead to nitpicking. The resulting fault tree is illustrated in Figure 7.

Figure 7 Fault tree analysis of Nuclear Services reporting problems

On the top level, the fault tree is divided into two branches that may cause errors in reporting: the actuals and the forecasts. Looking at the errors coming from actuals, the reason why the errors get through to the final report is that there is limited time to review the data and spot all the errors, compiling the report. The two reasons why it is difficult to do are the arduousness of the review work due to low levels of integration and automation in the IT systems, and the high amount of errors in the data. The IT systems are non-ideal for Nuclear Services' use, since integration works are partly still ongoing, and not all Nuclear Services IT needs are noticed in the company, as Nuclear Services is a relatively small unit conducting business that differs from the majority. The high amount of errors in the actuals, on the other hand, exists, because project managers have either not reviewed the data or have made systematic mistakes doing so. There are two options why the project manager has not reviewed the data. Either the responsibility has not been communicated clearly enough, or the project manager has prioritized other tasks, as reporting has not seemed to be expected and the significance of reporting has not been understood. The systematic mistakes in reviewing the data occur, when the information content of the data is not understood or the presentation of the data is misinterpreted. The root causes for these systematic mistakes are insufficient training and poor instructions.

The errors on the forecast side can come from three sources: the project forecasts, the sales funnel and order book, and the rest-of-the-year forecast. The errors in project forecasts result from similar reasons as the errors in project actuals, the project manager has not updated the forecast or there are errors in the forecast. The reasons for not updating the project forecast are also similar to not reviewing the actuals: the responsibility has been unclear, the updating has not been expected, and the importance of forecasting is not comprehended. The errors in the project forecasts may also result from mistakes caused by lack of training and unsatisfactory instructions, similarly to errors in actuals, but, additionally, technical problems with the Excel, used for inputting the project forecast data, can be the cause. The sales funnel and order book data can also suffer from not being updated. Here too, the root causes are unclear responsibilities, no demands for updating the CRM system, and ignorance of sales data importance. The other reason for wrong sales funnel data is that the CRM system has been used wrong, as no appropriate instructions for its use have been given. Lastly, the forecasting errors can also come from the rest-of-the-year forecast, which includes a management view component in addition

to what is in the sales funnel at the moment. The rest-of-the-year forecast is done by the sub BA heads.

The identified root causes have been aligned to the right side of the picture in Figure 7 to highlight them clearly. Once the root causes have been found, they should be eliminated to solve the problem. However, in cases of large fault trees it may not be wise to try to tackle every root cause. Instead, battles should be picked and the root causes prioritized. For this, we will take a closer look at the root causes.

Some of the root causes are the same, or at least very similar, for different branches of the fault tree. For instance, lack of instructions, lack of training, and unclear responsibilities appear as root causes for many events. The probabilities or frequencies are different for different root causes. For example, the clear instructions are missing every time, while there have been technical issues with the forecast Excel only a few times. The severity of problems varies also from root cause to another. A similar scale mistake in sales forecast is not considered as harmful as in actuals. On the other hand, Nuclear Services has different ability to affect the different root causes. For instance, the choice of creating better instructions for its own processes is entirely in the hands of the unit, while for choices of corporate wide IT systems, it may have little say. Additionally, the amount of effort should be considered. For example, there may be two ways of achieving the same target, changing the attitude of employees so that they start working towards it, or simply demanding that they do it. Both are within the realms of possibilities for the unit, but arguably, one might be more efficient solution than the other, depending on the situation.

To help prioritization between the elimination of different root causes, similar root causes were combined, and the remaining list of root causes was plotted on a diagram that we call the efficiency diagram in this thesis. The horizontal axis of the efficiency diagram represents the effort required from the unit to eliminate the root cause, taking also into account the ability of the unit to affect it in the first place. The vertical axis, on the other hand, represents the positive effect on reporting that the root cause elimination would have. This includes the frequency of the root cause and the severity of problems inflicted by it, also considering its placement in the fault tree regarding the "and" and "or" gates. The efficiency diagram is depicted in Figure 8.

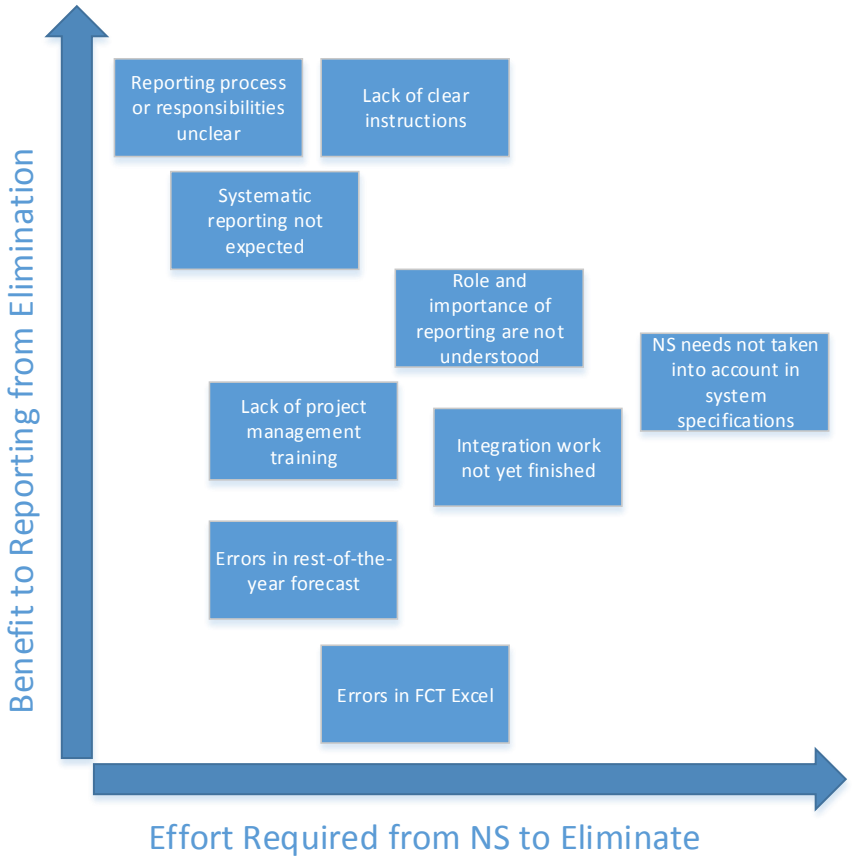

Figure 8 The efficiency diagram depicting the root cause elimination benefit to reporting against the effort required for elimination

The top left corner of the efficiency diagram is, where the benefits of root cause elimination are greatest compared to the associated cost, that is, the effort. The unclear responsibilities seem to be a common problem at Nuclear Services and the interviews showed that many project managers are unaware of or confused with, what is expected from them in terms of reporting. As defining the roles and responsibilities, as well as describing the reporting process are relatively low effort tasks, this root cause is farthest to the top left corner. Creating instructions is equally important, but a little more burdensome, hence it is placed to the right of responsibilities and process. Expecting that the process is followed is also important in the hectic world, where different tasks compete of the time and attention of project managers. It is also close to the corner.

Training project management skills and increasing the understanding of reporting significance through training or other methods improves reporting results. These kinds of trainings are also important, but they take more effort from the unit and time for the project

managers to digest. Therefore, they are not as efficient methods for eliminating the errors from the reports. Lastly, there are root causes that are either difficult to eliminate, such as the fact that not all Nuclear Services' needs are taken into account in IT specifications, or rarely cause true harm to the reporting like the technical errors that have bothered the forecast Excel, but have been overcome by restoring previous versions and asking people to fill in their information again. The methods to eliminate the root causes, prioritized with the efficiency diagram, will be discussed first on a more theoretical level in Section 4.4.1 and then on a practical level in Section 4.4.2.

4.4 Development Suggestions for Nuclear Services Reporting

4.4.1 Supporting Reporting with the Management Control Systems Package

Problems are solved using the root cause analysis methodology, by eliminating the root causes after they have been identified (Andersen & Fagerhaug, 2006, p. 15). As already mentioned in the previous section, depending on the case, not necessarily all root causes need to be eliminated for the desired outcome. Here, we will suggest the elimination of the three root causes based on the efficiency diagram in Figure 8 and the fault tree in Figure 7. Their eliminations were identified as the most efficient actions to decrease the errors in the monthly reports, in Section 4.3. The root causes are: the unclear reporting process and responsibilities, the lack of clear instructions, and that systematic reporting is not expected.

As we recall from Section 2.1.3, MCSs can be used to impact employee behavior. All three of the root causes are employee related instead of being technical problems. Hence, we can utilize MCSs to eliminate the root causes. We will utilize the Malmi and Brown (2008) typology, presented in Section 2.1.4, to structure the controls that, we argue, should be included into the MCS package of Nuclear Services to solve the problems. These are two administrative controls and one cybernetic control.

The first root cause is the unclear reporting process and responsibilities. As already mentioned in Section 4.1.2, there is no process definition for reporting in Nuclear Services. Interlinked to this, there are no definitions for roles and responsibilities in reporting either. While this may sound odd at first, it is explained by the origins of Nuclear Services and

its business processes. When the unit was first established and the business processes defined, it consisted only of a few people and a couple of projects. This amount of complexity was well manageable for one individual, conducting the monthly reporting of the unit, that is, the business controller. A similar method has also been successfully used in other units at Fortum, where the level of complexity is manageable and the IT systems better support the business. Even though the number of people and projects, and the general complexity has grown, the unit still relies, in large part, to the same reporting arrangement, where the business controller is the active party in reporting and the other parties provide reactively information, when asked to do so. Naturally, some individuals are more proactive than others, but this seems to be the tendency. The current reporting hierarchy is illustrated in Figure 9 and was also well manifested in some interviews, when the interviewees were asked about their role in the monthly reporting:

"Could it be that the project manager answers, if being asked about something?" -A Nuclear Services project manager

"Well, you can see there [on the report], how much money has been made per business area. If any has been made and what it is… and it's sure interesting, but… [the name of the unit business controller] always says that it should be commented, but… it's not something that really gets done." -A Nuclear Services sub BA head

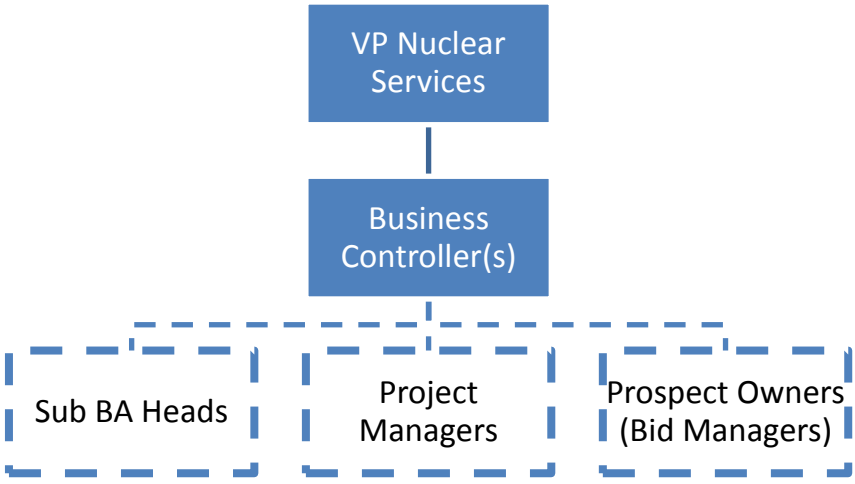

Figure 9 Current Nuclear Services reporting hierarchy

For eliminating the first root cause, the solution seems axiomatic. There should be clear roles and responsibilities related to the reporting. As illustrated by the fault tree analysis, the problems arise with the errors in the data, coming from sales and projects. The natural

responsibility of this data lies with those producing it, that is, the prospect owners and project managers. We suggest a reporting hierarchy, where the prospect owners and project managers answer to the respective sub BA manager, who in turn is responsible for the reporting of his or her sub BA. The vice president of the unit is responsible for the entire report, as currently, while the business controller is in a review and supporting role. Looking at this through the Malmi and Brown (2008) typology, all administrative controls deal with the division of authority and responsibilities in the organization. However, as the organizational hierarchy is already in place and the control we are suggesting is distributing the reporting authority accordingly, it can be categorized under policies and procedures. The suggested new reporting hierarchy is presented in Figure 10.

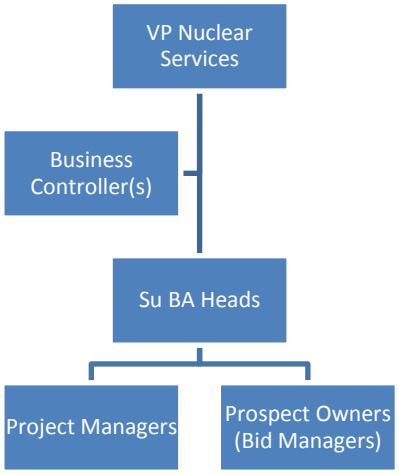

Figure 10 The suggested new reporting hierarchy for Nuclear Services

The second root cause to be eliminated is lack of clear instructions. The interviews showed and the author's own experience confirms that the required reporting actions are not self-evident and it is also possible to misinterpret the IT systems and documents, which leads to false inputs into the systems. The solution to this is even clearer than to the first one. Appropriate instructions must be created for all parties participating into the reporting. The instructions must be written using terminology and level of detail necessary for the personnel carrying out the tasks. According to the Malmi and Brown typology (2008), this second control is also in administrative control sub-category policies and procedures.

The third and final root cause, suggested here to be eliminated, is that systematic reporting is not expected. In an ideal situation, the definition of the reporting process and the related

responsibilities, coupled with the necessary skills acquired from the instructions, should lead to error free and timely reporting. Yet, the practice, proven by the fault tree analysis, shows us that the employees sometimes prioritize other things, even if they know, what they are supposed to do and how to do it. This takes place, when they do not understand the significance of the data they are supposed to provide and the reporting is not, in practice, expected from them. In order to communicate the expectations to the prospect owners and project managers and to make them accountable for the data, we suggest implementing a feedback loop for the reporting. A feedback loop indicating the status of the reporting, would fall under the non-financial measurement systems, which is located within the cybernetic controls in the Malmi and Brown (2008) typology.

The implementation of a cybernetic control is further supported by the research of Green and Welsh (1988), who have set four questions for determining, whether it is sensible to implement cybernetic control. Their first question is about the dependence on the resource. In this case, it is clear that the reporting relies on correct and timely data. The second question considers the expected resource flows without a control. The reporting errors at Nuclear Services have shown us that even in cases where all prerequisites are met, proactive cooperation in reporting cannot be counted on. The last two questions ask, whether the control is cybernetically feasible and the cost of control manageable. We believe that both of these criteria are also met with the suggested solution, which will be described in practical detail in Section 4.4.2. (Green & Welsh, 1988)

The three root causes, identified as the most efficient to eliminate using the efficiency diagram, could be eliminated with the suggested controls. The root causes and their elimination methods are summarized in Figure 11.

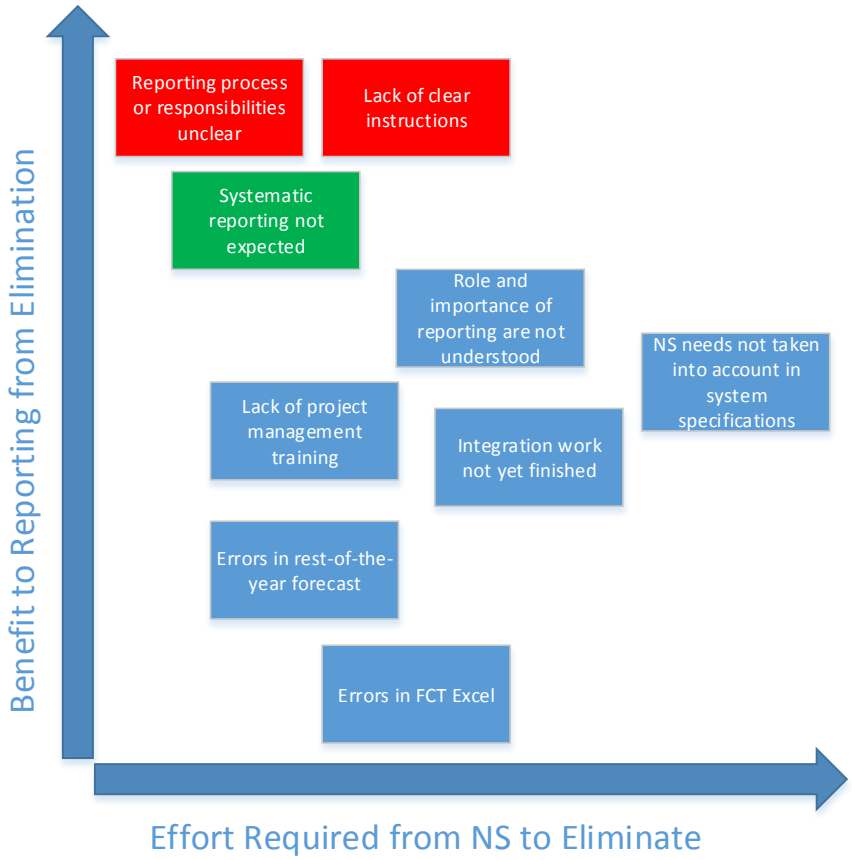

Figure 11 The eliminated root causes highlighted by different colors according to the elimination method: policies and procedues (red) and non-financial measurement systems (green).

We can also look at the effect the implementation of the suggested controls would have on the fault tree. First, we mark the eliminated root causes, using the same colors as in Figure 11. Then, we deduce which ones of the events on the next level of the fault tree get eliminated using the cause-and-effect logic indicated by the lines and the logical operations of the "and" and "or" gates. We mark the subsequent eliminated events all black. This way, we move through the tree working from right to left until we get to the top event. The result can be seen in Figure 12.

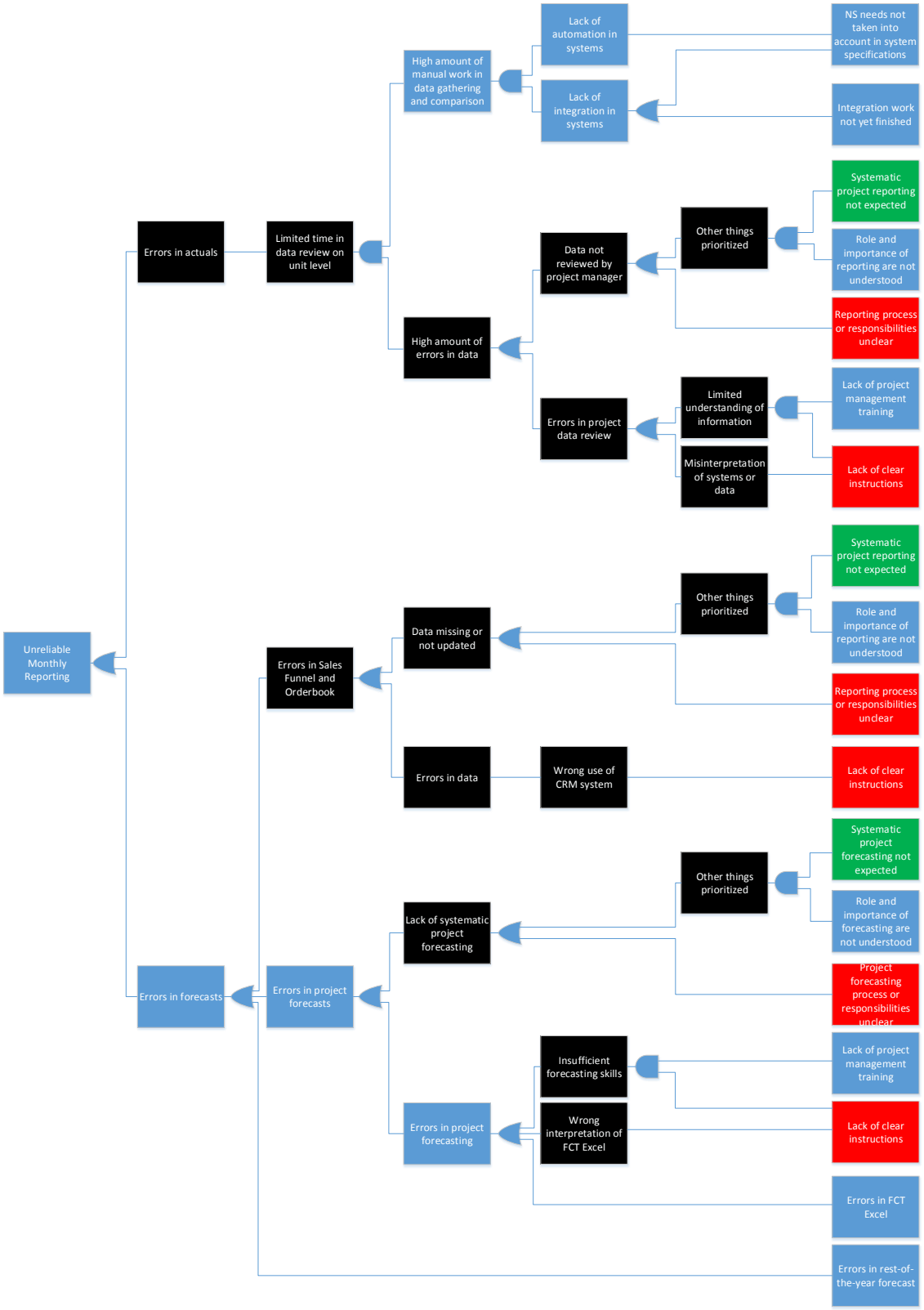

Figure 12 Eliminated root causes are colored according to the control, similarly to Figure 11. Subsequent eliminated events in the fault tree are shown black.

As can be seen in Figure 12, most, but not all, events leading to the top event can be eliminated using the suggested MCSs. More specifically, two root causes that ought to be eliminated, in order to take out the top event, remain. These are errors in the forecast Excel and errors in the rest-of-the-year forecast. There have been some technical problems a few times with the forecast Excel that is used to input project forecasts. As it is an Excel spreadsheet that can be accessed and edited by anyone with access rights to Nuclear Services' IT systems, there is a risk that people edit or delete each other's data by mistake. Also larger problems, where large amounts of projects have been somehow accidentally deleted from the list, have occurred a couple of times. While majority of the data has been restored from back-ups in these cases, some of the newer updates have been lost. Even though, this is an issue, we do not give any suggestions here for solving it, as the replacement of the forecast Excel with a more robust IT system is already being planned. It should also be noted that since the problem is of technical nature, MCSs are not the correct tools for solving it.

The other root cause, not eliminated and still affecting the reliability of reporting, is errors in the rest-of-the-year forecast. The rest-of-the-year forecast is prepared on the sub BA level by the sub BA heads. It combines the information of the known prospects with a management view component of the years' sales. Problems with the rest-of-the-year forecast have been rare compared to those resulting from other causes. The amount of these errors has also been declining. Thus, it was not perceived sensible to implement new MCSs to control them. This is also indicated in the efficiency diagram, in Figure 8, where the benefits of eliminating the root cause are low. However, if significant problems resulting from the rest-of-the-year forecast arise, during the monitoring period or later, after the suggested controls have been implemented, the problem should be revisited.

There are two phenomena, worth mentioning here, regarding MCS packages, when considering the recommended controls. These are interdependence and equifinality. Interdependence, as already mentioned in Section 2.1.4, means that the MCSs affect each other and therefore should always be considered as a combination, that is, a package. Here too, the suggested MCSs are planned to work together and support each other. Therefore, implementing, for instance, only one of them, may not improve the situation at all.

The other important phenomenon is equifinality, which has been attested for instance by Sandelin (2008) and Bedford et al. (2016). Equifinality means that the same end result can be achieved with different combinations of MCSs. For instance, looking at the fault tree in Figure 11, we notice that instead of eliminating the root cause that systematic reporting is not expected, the same end result could be achieved by eliminating the root cause of low understanding of reporting importance. That could be done using trainings, which would fall under cultural controls in the Malmi and Brown (2008) typology. However, cultures change slowly. In this case, there is a technology-oriented culture in the unit and especially in the resource pool, where many of the project managers come from. They have worked in a technical support unit, where, as always with nuclear power, safety has been the first priority (Manninen, 2015). In practice, the focus has been on finding best technical solutions with little consideration to costs. This was also indicated in the interviews, where some of the project managers claimed that their role should not have anything to do with the financial side of the project. The slowness of the change of cultural controls can also be seen in the position of the root cause on the efficiency diagram, which leads to other methods being preferred.

4.4.2 Practical Implications for the Nuclear Services Reporting Process

In this section, we will elaborate on, how the new MCSs, suggested in Section 4.4.1 for supporting the reporting, can be implemented in practice. We will also summarize the practical implications of the suggested reporting process for different roles.

As indicated in the previous section, a prerequisite for successful reporting is an unambiguous reporting process, including a clear division of responsibilities. For the most part, the reporting will take place in a similar technical manner as before the suggested changes. Hence, we will not go into details, where it is not necessary. However, we will look at the roles and responsibilities regarding Nuclear Services reporting on a more general level.

Starting from the top of the Nuclear Services organization, the vice president of the unit has the overall responsibility of the unit, including the profit and loss responsibility. When it comes to reporting, her role as the overall responsible for reporting will remain the

same. She is also responsible for setting targets to the sub BAs. This also includes the targets regarding reporting, as the time spent on reporting is always away from something else and an optimum level should be found.

Moving on to the sub BA heads, the Vice President has delegated the responsibility of their sub BAs to them. This includes the responsibility of the projects of the sub BA and of the sub BA's sales funnel. According to the suggested role division, they should also have a clearly defined responsibility of their sub BA's reporting. This does not mean that a separate sub BA report should be compiled, but that the sub BA head should ensure all necessary data is verified and provided for the unit reporting in time.

The project managers and prospect owners are naturally responsible for their projects and prospects, respectively. Already today, they are also responsible for up keeping the data in relevant IT systems. This responsibility, however, is not strictly enforced at the moment. In addition to this general up keeping responsibility, we suggest that there should be a clear definition that project managers and prospect owners are responsible for participating in the monthly reporting by verifying, and if necessary, updating their data, at a set time of the month.

The business controller has no business responsibility in the unit and is not responsible for the production of data. However, the business controller should continue to participate actively in the reporting according to our suggestion. As the financial expert, at the service of the unit, it is a natural role for the controller to be the one compiling the report according to the corporate standards. More importantly though, the business controller should review the reported data and perform analyses to support the management. As the reporting expert, the business controller should also be able to support other roles in reporting, when needed.

Lastly, there are individuals in the unit, such as the author, who have been participating in the development of reporting and other processes. Even if they are not given any specific responsibility regarding the reporting, they should be clearly named and communicated to the personnel, so that everyone knows who to turn to, in case support is needed. Their workload around the reporting activity is expected to be high, especially, when the unit is still learning the new reporting process. The roles and responsibilities are summarized in Table 2.

Table 2 Suggested roles and responsibilities for reporting

Role	Responsibilities
Nuclear Services VP	NS P&L NS reporting to division Setting targets for sub BAs
Sub-BA Head	Sub BA P&L Sub BA reporting Sub BA projects Sub BA sales funnel
Project Manager	Project Project reporting
Prospect Owner	Prospect CRM updates
Business Controller(s)	Reviewing the data Compiling the report Performing analyses Supporting other roles
Process support personnel	Supporting other roles Developing the process

Another significant factor for correct reporting, recognized in Section 4.4.1, are the instructions. The instructions are suggested to be created in the form of PowerPoint slides. The slides should be created iteratively in cooperation with the end users, ensuring that they are correctly understood. They should be placed in the company intranet somewhere, where they can be easily found and everyone has access to them. There should also be links to the relevant instructions, where they are needed. The instructions should be structured in a way that is concise, but at the same time linked to the instructions discussing related issues for sufficient coverage.

The third piece of the puzzle, ensuring that the process is followed, is the feedback loop. Creating a new feedback loop is essential, as all intra-unit reporting actions take place in IT systems, and no documentation or other easy way of tracking and ensuring the reporting status is currently available. While some of the current IT systems do include a data field, indicating, when the data was last updated, practice has shown that the data of these fields cannot be trusted. There are multiple reasons why the automatic time stamp can be updated, such as systems updates, administrator actions, and partial updates of the data. Therefore, the time stamp does indicate that all of the data fields had been up to date at that point in time and it should not be used for controlling the reporting status.

We are suggesting a feedback loop, consisting of two parts, one for sales and the other one for projects. The sales feedback loop would start with the business controller exporting a list of all owners of active prospects from the CRM system when the reporting starts. The controller would then send an email to the prospect owners with following information:

1. The general purpose of the reporting actions
2. What is expected from the prospect owner receiving the email
3. A link to the CRM system for viewing and updating prospect information
4. A link to the instructions on what to check and how to update the information
5. The reporting deadline
6. Who to contact in case support is required
7. Who to contact if the recipient thinks he or she should not be receiving the email

Upon receiving the email, the prospect owner could use the link to go to a view in the CRM system, listing all his or her active prospects. After ensuring that everything regarding a prospect is in order, or updating the information, in case it is not, the prospect owner would then manually update a field, indicating when the status of the prospect has been reviewed. To stress the importance of the data review, it is suggested to use in communications a metaphor of confirming with signature that the data has been reviewed.

Another view would be created in the CRM system, where the sub BA heads could filter the prospects based on the status review date, sub BA, and other CRM data fields. It would be the responsibility of the sub BA heads to make sure that the prospect owners have filled their duty and take corrective actions in case they have not. The sub BA heads would also be responsible for checking that no prospects are missing from the list.

Similarly for projects, a list of the project managers of all open projects would be extracted from Visma L7 by the business controller. The business controller would then send a similar email to the project managers containing:

1. The general purpose of the reporting actions
2. What is expected from the project manager receiving the email
3. A link to the project list where the status of reporting is indicated by ticking boxes
4. A link to instructions on how the reporting should be performed

5. The reporting deadline
6. Who to contact in case support is required
7. Who to contact if the recipient thinks he or she should not be receiving the email

When a project manager would receive the email, he or she could use the link to access the list of all projects. The projects would be presented as rows in a table, classified under the different sub BAs. The columns of the table would, on the other hand, represent the different pieces of data that need to be updated for the reporting. The project manager could then proceed to check the required pieces of information in the different IT systems and tick the boxes to give confirmation that everything is up to date. Again, the same metaphor of signing should be used, when communicating about the tick boxes.

The sub BA heads would also have access to the same list, where they could monitor the status of reporting. Their responsibility would be to make sure that all projects get reported. They would also be responsible for checking that no projects are missing from the list.

We suggest that the technical implementation of the list would take place in the Keto software, currently used for resourcing projects on the nuclear side at Fortum, but planned to be extended into further project management use. The benefit of integrating the list to Keto would be that the project managers would not have to start using and learn new software. It makes also sense to integrate the project reporting with other project planning and management tools. However, the same functionality could be achieved with an Excel sheet on a shared drive, if there is a will to test or implement the solution quickly.

4.4.3 Nuclear Services Reporting Development Plan

The suggested changes in reporting process, presented in Sections 4.4.1 and 4.4.2, should help the unit to solve the problems in reporting, presented in Section 4.1.2. However, the solutions themselves will not help the situation before they are implemented. The implementation means a change in the reporting practices. The goal of the implementation is to execute the changes and institutionalize them in a way that serves the purpose. The implementation is crucial, as accounting reality does not necessarily always match the theory behind it (Cooper, et al., 1981). Naturally, we cannot know, how the implementa-

tion will proceed a priori. Nevertheless, it ought to be beneficial to plan the implementation according to what we can expect about the implementation based on the interviews and other findings. To discuss the implementation we will use the theory, presented in Section 2.4. We will first dissect change in light of the theory and then give suggestions for handling the potential pitfalls. Finally, we will take a brief look at the smaller reporting issues that were identified during the course of this thesis and propose how to continue development with them. The results have been summarized in Figure 13.

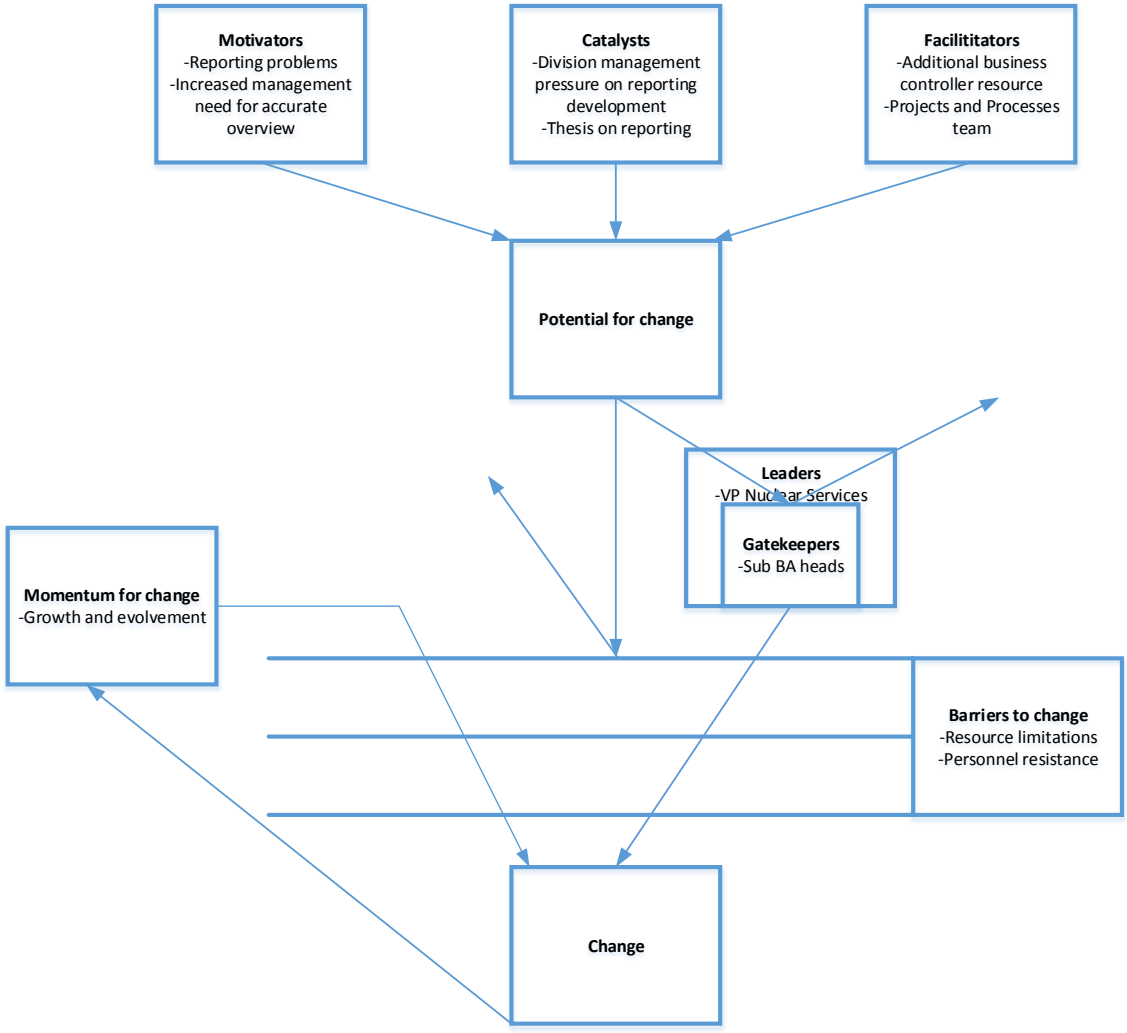

Figure 13 Accounting change model with added gatekeepers based on Cobb et al. (1995)

Looking at the forces advancing the change in the Cobb et al. (1995) accounting change model for this reporting practice change, two significant motivators can be identified. These are the problems in the reports and the increased management need for an accurate

overview of the business, as it has grown. While it used to be easy to keep track of every project in the beginning, the complexity has now increased. Two factors can also be identified to facilitate the change. These are an additional business controller resource that has been assigned to Nuclear Services as well as the Project and Processes team that was formed inside the Sales sub BA at around the commissioning of this thesis to develop the processes of Nuclear Services. Lastly, there are two catalysts for the change. The division management has put pressure on Nuclear Services to improve its reporting. Also, this thesis could be seen a catalyst for change. It was commissioned to study the situation as objectively as possible and hence, it can also be used to legitimize the changes.

As identified by Cobb et al. (1995), change takes place through people and the leaders are the ones carrying out the implementation. In Nuclear Services, these leaders are the vice president of the unit and the sub BA heads. However, based on the interviews and discussions on the results of this thesis, some of the sub BA heads could also be potential barriers to change. One potential reason for resistance is the fear for increasing workload, which has been identified for instance by Granlund (2001). Also Tuomela (2005) noticed that the middle managers resisted a change, where their reporting responsibilities were increased. Indications of this were found in a discussion between the author and one of the sub BA heads, when intermediate results of this thesis were discussed. Similarly to the findings of Tuomela (2005), the sub BA head would have wanted to automate the reporting or transfer the responsibility to business controllers instead of increasing the responsibility of sub BA heads, project managers, and prospect owners. However, the sub BA head did change his mind, when the control aspect of reporting was discussed. This and other discussions indicate that reporting is not widely recognized as a control tool in the unit. It is rather seen as a necessary evil.

The increased transparency may also give rise to resistance among the sub BA heads. Some sub BA heads may dislike the way the change would bring their performance out in the open. Similar findings were indicated by Scapens and Roberts (1993) in their study of the introduction of a new accounting control system.

This case of reporting practice change is probably not the only one, where those who are supposed to lead the change can also act as barriers to change. As proven by the study of Granlund (2001), powerful individuals may prevent the changes. Looking at the role of

sub BA heads in the change, they would probably have the power to water down the benefits of the change, thus preventing it. This gatekeeping role that some of the leaders may have regarding the change is not highlighted in the model of Cobb et al. (1995). As the identification of the gatekeeping roles may be crucial for successful implementation of change, we suggest the addition of gatekeepers into the model. The gatekeepers are those leaders that are necessary for carrying out the change, but may also resist the change, acting as barriers to change. The gatekeeper role has been added into Figure 13.

The other potential barriers to change can be divided into two categories. First, there are resource limitations. The reporting process definition, writing of instructions, and the necessary IT integrations all require time and effort. More importantly, extra support will be needed, when the reporting practices are tried for the first time, as the first impressions are important in building a picture of the new reporting process. If the new process is perceived invalid at the beginning, finishing the implementation may turn more difficult than thought. Second, based on the interviews, some project managers and prospect owners are expected to resist the change.

The resistance of project managers and prospect owners seems to consist of two parts. Similar to sub BA heads, the project managers and prospect owners may have fears of increasing work load, increased visibility of their performance. They may also fear for their competence regarding the new reporting responsibilities. Additionally, looking at the situation from the Burns and Scapens (2000) framework perspective, the current institutions are likely to create some resistance against the suggested changes among the employees. The culture at the nuclear engineering departments at Fortum has traditionally been safety and technology oriented. The projects have mainly been investment projects, where the best technical expert has acted as the project manager and the monetary side of the project has been a secondary matter. This has rooted deep the idea that management reporting is something that the business controllers do, while project managers focus on technical matters. Introducing the new rules against these institutions may be problematic and lead to different kind of enacting and reproduction of the rules and routines than intended.

Lastly, there is similar kind of momentum for change at Nuclear Services, as was discovered by Cobb et al. (1995) regarding the bank they were studying. Nuclear Services is a

young organization that has constantly evolved and gone through changes, which may in part ease the change, as the situation has not been institutionalized to the same extent as in a stable organization.

Based on the expected forces advancing the change and resisting it in Figure 13, the primary enabler for the change is the support of the leaders, that is the sub BA heads. Additionally, a positive experience of the first tests of the new reporting process should be ensured. We suggest selling the idea to the sub BA heads and project managers using the benefits and costs of the new reporting process. The discussion of benefits and costs is especially important, as similar to the findings of Lukka (2007), not everyone in the organization has noticed any need for reporting change.

The benefits that can be used in the discussions can be divided into two categories: MIS benefits and MCS benefits. There are two kinds of MIS benefits. Firstly, as the quality of the data increases, so does the quality of information provided by the reports. This, in turn, means that the reports are more trustworthy and can be better utilized as decision support. The second benefit, in essence a sub category of the previous, is that when the data is trustworthy, it allows the user to concentrate on the contents. This way, attention can be easier directed, where it is needed. The MCS benefits of the reporting, on the other hand, are that the attention of the employees participating in the reporting is directed, where the management wants them to put attention to. In short, the suggested reporting changes allow better utilization of reporting as a MAS as described in Section 2.3. Additionally, the suggested process ought to be clearer, easier, and faster for many parties, when it gets going. The costs of the reporting renewal are related to the implementation work and to the fact that the reporting work load will increase compared to the current situation, where no proper reporting is carried out by many of the parties. The benefits and costs of the suggested changes in the reporting process, as well as the reporting tasks are summarized role specifically in Table 3.

Table 3 The role specific tasks, benefits, and costs of the suggested reporting changes

Role	Tasks	Benefits	Costs
Nuclear Services VP	Initiating the reporting change; Providing highlights, analysis, comments	More reliable decision support; Easier to direct focus; Better unit performance	New reporting process implementation costs; More resources tied to reporting vs. current situation
Sub-BA Head	Supervising sub BA project managers; Checking that all projects are on the list; Supervising prospect owners; Checking the sales pipeline; Commenting	More reliable sub BA decision support; Clearer and easier routine in reporting; Easier to direct focus; Better sub BA performance	Need to supervise and/or remind project managers and prospect owners; More resources tied to reporting vs. current situation
Project Manager	Checking and/or updating the data of the project and verifying it on the list	Clearer expectations and process; Better understanding of own role; Better project performance	Need to fill the list every month at a certain time; More work vs. current situation
Prospect Owner	Checking and/or updating the lead/opportunity data in CRM and updating the verification date	Clearer expectations and process; Better understanding of own role; Better managed lead/opportunity	Need to update the verification date every month
Business Controller(s)	Reviewing the data and performing analyses, Extracting the project and prospect lists; Sending the emails; Compiling the report; Supporting other roles	Less workload in data verification; More time and better data for analyses	Need to create the list and send the emails; Need to support other roles
Process support personnel	Supporting other roles	Clear process to communicate	High workload in the beginning; Need to support other roles

For ensuring a positive first impression of the change and the new reporting process, we suggest that it would be piloted with selected personnel first, before implementing it for everyone. By selecting a sub BA head that is open to change and likely to benefit from the change already at the beginning, together with like-minded project managers, the rules and routines are likely to be enacted and reproduced close to how they were planned, thus already institutionalizing the positive change.

As the project manager resistance to change was discussed with the management of Nuclear Services, someone suspected that the older project managers would resist the change more than the younger ones. This is also supported by the interviews. However, according to Kunze et al. (2013) the age of the employee does not affect the resistance to change, but the tenure in the position does. This makes sense from the institutional theory perspective. Not everyone in the organization shares the same understanding of the institutions, rules, and routines (Roberts & Scapens, 1985). The new employees may not have the same institutional limits to change as the others, and therefore it would most likely be beneficial for the change to involve newer project managers, if the new reporting process is piloted before complete implementation.

Although, the suggested changes should solve the problem and enable wider utilization of reporting as a MIS and MCS, there remains further work to be done. Thus, the reporting development should continue. During the making of this thesis, different kinds of small issues regarding reporting came up. Some of them were related to the processes and roles, and some were technical issues with the project management and reporting related IT systems. A list of the identified problems is presented in Appendix 1. Later, in the root cause analysis, it was revealed that these issues were not the root causes of the errors in reporting. However, it does not mean that they should not be taken into account and solved. While they may not directly cause any mistakes, they do make the reporting less efficient and more time consuming. Also, some of the IT systems are cumbersome and tedious to use, which may play a part in, why some people prioritize other tasks, if reporting is not demanded. If the unit will grow according to the expectations, the technical issues will probably become limiting factors at some point. In the long run, the direction

should be towards more integrated systems, as was also indicated by the benchmarking interviews.

Another area of development in reporting is the contents of the reports. As already mentioned in Section 4.1.2, the contents have heavily evolved through time and are likely to continue doing so. Now, if the suggested changes to reporting are implemented, the increased possibilities for utilizing reporting as a MIS and MCS are likely to affect its contents. Based on the findings from the benchmarking interviews, projects are something that should be more of a focus in reporting, considering that there is no reason, such as superb track record with projects, for not following them.

Finally, the situation should naturally always be monitored, to verify that the wanted effect has been achieved. The functioning and appropriateness of the reporting process and the report contents should also be kept an eye on. If the contingency factors change, different kind of reporting practices or report contents may be required.

5 Conclusions

As presented in Chapter 1, the objective of this Master's Thesis is to develop the management reporting in the Nuclear Services unit at Fortum. The goal was further broken down to two sub-goals. The first sub-goal was to find the underlying reasons for errors that have been troubling the monthly reporting at Nuclear Services and to provide corrective suggestions for eliminating the problems. The other sub-goal was to provide suggestions for developing the reporting further into a direction that would support the business goals of Nuclear Services.

To achieve the first sub-goal, root cause analysis methodology was applied. First, understanding of the problem was increased by mapping the reporting process on a flow chart and pointing out the problems, and by conducting internal interviews with sub BA heads and project managers. Benchmarking interviews were also conducted with reference organizations to get a better picture of problems and practices in comparison to other organizations. Using the gathered information, it was understood that the errors on the reports resulted from errors in the data in IT systems. A fault tree analysis was then conducted to find the root causes for the errors in data. Based on the root cause analysis, three root causes were identified that would be sensible to eliminate to solve the problems in Nuclear Services' reports. These were: the unclear reporting process and responsibilities, the lack of clear instructions, and that systematic reporting is not expected.

As the three root causes were related to employee behavior, it was suggested to eliminate them using MCSs. Three controls were devised and the Malmi and Brown (2008) MCS package typology was used to conceptualize and categorize them. They were classified under administrative and cybernetic controls. Also, practical means for implementing the controls were planned and presented.

As argued in Section 4.4.2, the suggested changes in reporting also fulfil the second sub-goal of the thesis, developing reporting into a direction that would better support Nuclear Services' business. As discussed in Section 2.3, management reporting can be utilized for MIS and MCS purposes. However, the current reporting setup at Nuclear Services supports neither use. After the suggested changes though, the reporting would better suit both

purposes, helping managers decide what to focus on and creating goal congruence between the unit, as well as prospect owners and project managers. Further development possibilities were also identified and they are presented in Appendix 1.

The forces advancing and resisting the suggested reporting practice change were also analyzed based on the findings from interviews and discussions, as well as the management accounting change literature. Based on the analysis, special focus should be put to the potential sub BA head, project manager, and prospect owner resistance towards change. The suggested ways of decreasing resistance are communication of the benefits and costs, as well as ensuring a successful pilot of the changes.

The practical reporting development suggestions of this study are naturally restricted to the situation of the case organization and its contingencies. However, the findings allow some theoretic considerations on reporting as a MAS and reporting practice change.

The results of this study seem to support the idea that reporting could be utilized as a dual-purpose MAS, acting simultaneously as MIS and MCS, developed in Section 2.3. However, this study offers no proof for the claim, as the suggestions were not implemented during this thesis and thus, there is no guarantee that they work as intended. It is also possible that the dual-purpose use requires compromises and leads to sub-optimal performance in both areas. As, dual-purpose use of reporting would be tempting, further studies should be conducted on the subject to find out, whether it is viable.

The way in which MCSs were utilized in this thesis also leads to some interesting conceptual questions. As we stated in Section 2.3, reporting can be used as a MCS. The basis of MCS package literature, that is, interdependence, was demonstrated when additional MCSs belonging in administrative controls and cybernetic controls in the Malmi and Brown (2008) typology were introduced to enable the successful reporting.

On the other hand, instead of talking about three separate MCSs, added into the MCS package, they could also be considered as one MCS. As discussed by Malmi and Brown (2008) as well as Otley (2016), the term MCS package is referring to the uncoordinated nature of different controls that usually exist in a company. Malmi and Brown (2008) argue that if all the controls were designed to function together, the package could be regarded a system instead. In our case, the three controls are planned to be used together,

which would favor use of the word system, when referring to them. Taking the same logic further, the controls suggested here could be encompassed into reporting, which would be regarded as a MCS. As already discussed in Section 2.3, the reporting activity contains elements from multiple areas of the Malmi and Brown (2008) typology. Including the three controls, suggested in this thesis, would not expand the MCS into new domains in the typology.

These conceptual questions represent that the nature of MCSs is fractal, that is, MCSs consist of similar elements on various different levels. For instance in our case, reporting, considered a cybernetic control, consists of administrative controls and cybernetic controls, among others. On the other hand, the cybernetic control, that is, the feedback loop suggested in this thesis, is executed in practice using administrative controls such as instructing the employees with emails.

The fractal nature together with the vague boundaries of the systems make MCSs difficult to conceptualize, which probably is one of the reasons, why so many different definitions and frameworks exist. The quintessential purpose of the frameworks is of course to help the use of MCSs in practice. For the purpose of discussing and communicating the different controls, simplifying them according to their main use is beneficial. However, for a more thorough understanding of MCSs, which might help in developing new control systems, dissecting the fractal systems into elements is of interest.

Another interesting finding was the potential role of sub BA heads as gatekeepers of the change process. While the same phenomenon can be covered by dividing this dual-role of the sub BA heads into the categories of leaders and barriers to change, we feel the gatekeepers deserve more attention, due to their critical role, and should be highlighted in the accounting change model of Cobb et al. (1995). Intuitively, it would seem likely that the gatekeeping role is common also in other management accounting changes and should be further researched.

Current management accounting literature is limited regarding reporting practice. Most of the literature focusing on reporting is textbooks, but even there the focus is usually in the report contents instead of the reporting practice. In MIS literature, reporting is usually bypassed quickly. This is understandable, as the role of reporting is, although crucial, only instrumental for MISs and the focus is usually on the information content itself or

its utilization. More surprisingly, the MCS literature has not had much emphasis on reporting either, even though reporting is, by itself or as a part of another MCS such as budgeting or KPIs, an integral component of cybernetic controls. It may be academically more interesting to study larger entities such as budgeting, comprising both the target setting and the feedback loop, that is, reporting. However, this larger scope often leads to superficial treatment of reporting, which may lead to missing some of the control potential that could be achieved with suitable reporting practices. Also, the focus on more comprehensive MCSs, such as budgeting, ignores those potential middle management practitioners that do not have say on the report contents or the standards they are evaluated against, but have the power to decide on the practical roles and arrangements in reporting.

Literature on effective management reporting practice and reporting practice problem solving is virtually non-existent. On the other hand, for the implementation, there is plenty of management accounting change literature. Although functioning reporting practices may seem trivial from a research point of view, reporting problems are frequent in practice. As argued by Malmi and Granlund (2009), there should be more management accounting research that supports practitioners. Clearly management reporting practice and, especially reporting problem solving, are areas, where more managerial research is required. While the practical implications, derived here, are naturally case specific, this study contributes to the aforementioned need by illustrating, how a root cause approach and MCSs can be utilized to solve reporting problems.

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List of Appendices

Appendix 1. List of identified issues in Nuclear Services Reporting. 2 pages.

Appendix 2. Interview questions. 7 pages.

Appendix 1. List of identified issues in Nuclear Services Reporting

- Forecasting
    - Sales
        - Prospect closing probability in CRM not taken into account in forecasts
        - The management judgement part of forecast used to smooth out variation
    - Projects
        - Detailed Work Breakdown Structure often not constructed
        - Technical vulnerability of the Forecast Excel
        - No integration of order book on sales side and order book project side
        - Project manager receive delayed information of
            - Internal hours
            - External hours
            - Travel claims and other costs
- Actuals
    - Clarity of systems
        - Work-In-Progress lists difficult to project managers due to finance and IT jargon
        - Technical issues with QlikView
            - Revenue recognition correct only for a couple of days at the beginning of the month, which misleads project managers.
            - Errors with budget figures
            - Work hours from different IT systems do not match
            - Errors with graphs
        - Different systems may have a different person as the project manager for the same project
    - Accrual errors due to delays

- Project managers miss information on sub-contractor costs until invoicing
- Line managers approve internal hours. Project managers receive the numbers only after the approval of line managers.
- Line managers approve travel claims and other costs. Project managers receive the numbers only after the approval of line managers.

Appendix 2. Interview Questions

Haastattelukysymykset - Benchmarking

Tausta

1. Mikä on tehtäväsi yrityksessä?

2. Kuinka suuri on yksikön liikevaihto ja kuinka suuri osa liikevaihdosta tulee projekteista?

3. Millaisia projektit yleensä ovat kooltaan ja kestoltaan? Kuinka monta projektia yksikkö tekee keskimäärin vuodessa?

4. Kuinka suuri osuus projektien arvosta on palveluita?

5. Kuinka suuri osuus projektien kustannuksista on alihankintaa?

6. Mitä laskutusperusteita projekteissa käytetään? (Kiinteä, tuntiveloitus)

Raportointi

7. Millaista sisäistä raportointisykliä yksikössä ja yrityksessä noudatetaan?

8. Mitä osia raportti sisältää? (Tuloslaskelma, tase, rahoituslaskelma, ennusteet, tilauskanta, sales funnel, projektien tilanteet…)

9. Mitkä ovat roolit ja vastuut raportointiin liittyen? (Projektipäällikkö, tuotepäällikkö, controller, myynti, yksikön johto, linjajohto…)

10. Mikä on manuaalisen työn osuus raportoinnissa?

11. Miten varmistetaan lukujen oikeellisuus?

12. Ketkä hyödyntävät raportteja työssään?

Ennustaminen

13. Miten yrityksessä/yksikössä tehdään projektien ennusteet?

14. Miten yrityksessä/yksikössä tehdään projektiportfolioiden ennusteet?

15. Miten yrityksessä/yksikössä tehdään tuotealueiden ennusteet? (sub-BA)

16. Miten yksikössä ennustetaan myyntiä?

17. Millainen on koko yksikön ennuste?

Projektin ohjaus

18. Mitkä ovat projektipäällikön vastuut?

19. Miten projektipäällikkö valvoo projektin etenemistä? Mitä työkaluja projektipäälliköllä on?

20. Miten projektien etenemistä seurataan?

21. Miten varmistetaan tuntien, kulujen yms. oikea kohdistus projekteille?

Lopuksi

22. Mitkä asiat ovat mielestäsi toimineet raportointiin, ennustamiseen ja projektinohjaukseen liittyen hyvin ja mitkä ovat haasteellisia?

Haastattelukysymykset - projektipäälliköt

Tausta

1. Mikä on kokemuksesi projektipäällikkönä?

Projektin hallinta

2. Mitkä ovat projektipäällikön vastuut Nuclear Servicesissa?

3. Miten projekteja seurataan Nuclear Servicesissa?

4. Saatko mielestäsi kaiken projektin hallintaan tarvitsemasi tiedon Fortumin systeemeistä? Jos et, mitä muuta tarvitsisit?

5. Mitä mieltä olet käytössä olevista projektinhallintatyökaluista? (KETO, QlikView, Forecast Excel)

6. Onko projektipäälliköllä mielestäsi riittävän hyvä kuva projektille kirjattavista tunneista ja kuluista ja mahdollisuus oikaista väärät kirjaukset?

Ennustaminen

7. Miten Nuclear Servicesissa tehdään projektien ennusteita?

8. Näetkö tarvetta kehittyneemmille ennustusmenetelmille?

Raportointi

9. Osaatko sanoa, mitä Nuclear Servicesin kuukausiraportti sisältää?

10. Mikä on projektipäällikön rooli kuukausiraportoinnissa?

11. Osaatko selittää, miten Nuclear Servicesissa tuloutetaan (jaksotetaan) projektit?

12. Kuinka hyvin koet ymmärtäväsi QlikViewn tiedot ja KET-listan?

13. Haluaisitko raportointia kehitettävän jollain tavalla?

Haastattelukysymykset - Sub-BA headit

Tausta

1. Mikä on toimenkuvasi Nuclear Servicesissä?

2. Mikä on kokemuksesi projekteista ja projektiliiketoiminnasta?

Projektinhallinta

3. Mitkä ovat Sub-BA headin vastuut projekteihin liittyen Nuclear Servicesissa?

4. Mitkä ovat projektipäällikön vastuut projekteihin liittyen?

5. Miten projekteja ja projektiportfolioita seurataan Nuclear Servicesissa?

6. Saatko kaiken tarvitsemasi projektien ja projektiportfolion seurantaan liittyvän käytössä olevista järjestelmistä? Jos et, mitä muuta tarvitsisit?

7. Mitä mieltä olet käytössä olevista projektinhallintatyökaluista? (KETO, QlikView, Forecast Excel)

Ennustaminen

8. Miten Nuclear Servicesissa tehdään projektien ennusteita?

9. Miten Nuclear Servicesissa tehdään projektiportfolioiden ennusteita (sub-BA kohtaisia)?

10. Miten Nuclear Servicesissa ennustetaan myyntiä?

11. Näetkö tarvetta kehittyneemmille ennustusmenetelmille?

Raportointi

12. Mikä on sub-BA headin rooli kuukausiraportoinnissa?

13. Osaatko selittää, miten Nuclear Servicesissa tuloutetaan (jaksotetaan) projektit?

14. Kuinka hyvin koet ymmärtäväsi QlikViewn ja KET-listan tiedot?

15. Kuinka hyvin arvioit projektipäällikköjen ymmärtävän QlikViewn, KET-listan ja tuloutukset?

16. Haluaisitko raportointia kehitettävän jollain tavalla?