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# ABSTRACT

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| Supervisor(s) | D.Sc. Henri Teittinen, M.Sc. Mika Jakovaara | | |


Abstract

The purpose of this thesis was to study a dashboard implementation project and the critical success factors that are related to the success of the project. Dashboards are tools for reporting and performance management that can be used to provide critical information to decision-makers in a visual and interactive format. Critical success factors were chosen as the focus for the study because of a lack of former research on their use with dashboards.

The study is a qualitative case study and it was conducted in one division of a large manufacturing company. The division was in the process of implementing a new dashboard. Data was gathered through taking part in the implementation project and by interviewing project members and other stakeholders. The analysis of the critical success factors was conducted by comparing them to the factors found from earlier dashboard literature, as well as from other technology implementation literature e.g. the balanced scorecard. The aim was to find out which factors are the most critical ones, why they are critical and what does dashboard implementation mean for an organization. As a result a framework of 17 critical success factors was created.

The results indicate that in terms of critical success factors, dashboard implementation shares many similarities with other technology implementation projects. The most often mentioned factors from earlier literature – such as top management support, user involvement and data quality – are also critical in dashboard implementation. User acceptance is the most important issue in technology implementation, and most of the success factors are related to gaining it. Focusing solely on technological factors will lead to problems especially for a tool that is meant for wide use. Factors related to visualization and how quickly information can be relayed to users are of special importance for dashboards. While the case project was small budget-wise, the tool is expected to bring significant improvements to working and reporting practices through e.g. automation and standardization. The increase in the type of technology the dashboard represents is seen as inevitable in the organization. Implementing a dashboard is an extensive project, and defining critical factors in all the different phases of the project may help the organization to succeed better.



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| Key words | Critical success factors, dashboard, implementation, case study |
| Further information | |

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# TIIVISTELMÄ

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Tiivistelmä

Tutkielman tarkoituksena oli tutkia kriittisiä menestystekijöitä dashboardin käyttöönottoprojektissa. Dashboard on työkalu raportointiin ja suorituksen johtamiseen, jonka tarkoituksena on välittää päätöksentekijöille kriittistä tietoa visuaalisessa ja interaktiivisessa muodossa. Tutkielma keskittyy kriittisiin menestystekijöihin, sillä aiempi tutkimus niiden käytöstä dashboardien kanssa on vähäistä.

Tutkimus on kvalitatiivinen tapaustutkimus ja se suoritettiin yhdessä suuren teollisuusyrityksen divisioonassa, joka oli ottamassa käyttöön uutta dashboardia. Tutkielmantekijä oli osallisena tässä projektissa, jonka lisäksi dataa kerättiin haastattelemalla projektiryhmän jäseniä ja muita sidoshenkilöitä yrityksessä. Kriittisiä menestystekijöitä analysoitiin vertailemalla dashboard-kirjallisuuden tuloksia muiden vastaavien teknologioiden, kuten tasapainotetun tuloskortin, kirjallisuuteen. Tarkoituksena oli saada selville mitkä tekijät ovat kaikkein kriittisimpiä, miksi ne ovat kriittisiä ja mitä dashboardin käyttöönotto merkitsee yritykselle. Tuloksena kehitettiin viitekehys, joka sisältää 17 kriittistä menestystekijää dashboardin käyttöönottoon.

Tulokset osoittavat, että dashboardin käyttöönotolla on paljon yhteistä muiden teknologioiden käyttöönoton kanssa. Aiemmassa kirjallisuudessa useimmin mainitut menestystekijät, kuten ylimmän johdon tuki, käyttäjien osallistuminen ja datan laatu, ovat kriittisiä myös dashboardien yhteydessä. Käyttäjien hyväksyntä on kaikkein tärkein tekijä teknologian käyttöönotossa, ja monet kriittiset tekijät liittyvät sen edistämiseen. Keskittyminen pelkästään teknologisiin tekijöihin johtaa ongelmiin erityisesti laajaan käyttöön tarkoitetun työkalun yhteydessä. Visualisointiin ja informaation nopeaan saatavuuteen liittyvät tekijät ovat erityisen tärkeitä dashboardin käyttöönotossa. Vaikka projekti oli rahallisesti pieni, työkalun odotetaan tuovan merkittäviä parannuksia raportointi- ja työskentelytapoihin esimerkiksi automatisoinnin ja standardisoinnin myötä. Dashboardin kaltaisen teknologian yleistyminen nähdään yrityksessä väistämättömänä. Dashboardin käyttöönotto on laajamittainen projekti ja kriittisten menestystekijöiden määrittäminen kaikissa projektin eri vaiheissa voi auttaa organisaatioita onnistumaan paremmin.



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| Asiasanat | Kriittiset menestystekijät, dashboard, käyttöönotto, tapaustutkimus |
| Muita tietoja | |

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# CRITICAL SUCCESS FACTORS IN A DASHBOARD IMPLEMENTATION PROJECT

## Case: Division-level dashboard implementation in Group Plc

Master´s Thesis
in Accounting and Finance

Author:
Mikko Helenius

Supervisors:
Henri Teittinen (D.Sc.)
Mika Jakovaara (M.Sc.)

20.11.2017
Turku

The originality of this thesis has been checked in accordance with the University of Turku quality assurance system using the Turnitin OriginalityCheck service.

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# 1 INTRODUCTION

## 1.1 Introduction

Digitalization and the ever-increasing amount of data generated by organizations have brought about new possibilities for fact-based decision making. However, the change has not come without new problems. Nowadays managers have to deal with a surge of information coming from a variety of sources e.g. enterprise resource planning systems, business intelligence software and performance scorecards. With different types of information arriving at the same time it may be difficult for managers to know where to direct their focus. One of the suggested solutions for this information overload problem is the performance dashboard. (Yigitbasioglu & Velcu 2012, 41–42.)

Dashboards are performance management tools used to provide critical information at a glance. The goal is to visualize actionable information in order to guide the organization towards reaching its goals. Choosing the right things to measure, making the data easy to understand and encouraging the users to take action are among the top issues related with dashboard design. (Skorka 2017.) With the help of performance dashboards, companies aim to reap benefits such as improved decision making and performance, gains in employee efficiency and added employee motivation (Rasmussen et al. 2009, 11–12).

Despite their wide-spread use in organizations today it is not clear whether dashboards actually fulfill their various promises. Many aspects regarding dashboards remain under researched. Possible paths for research include design, measurement selection, effective utilization, the impact on decision making and the critical success factors of implementation. (Yigitbasioglu & Velcu 2012, 53, 56.)

The implementation and diffusion of accounting innovations is often not successful in the organization and the expected benefits to decision making and firm performance do not always come true (Abernethy & Bouwens 2005, 217). Businesses face a variety of barriers standing in the way of successful implementation e.g. organizational, managerial, political and financial barriers (Lueg & Vu 2015). As with all organizational change, new information systems can also stir up user resistance (Kim & Kankanhalli 2009). Implementing a new technology is a complex project where the organization has to take many different factors into account. The most important ones are called critical success factors (CSF), which are often used in implementation literature. CSFs are essentially the things that have to go well in order for a project to be successful (Boynton & Zmud 1984, 17).

This study will focus on the implementation of dashboards with the help of CSFs. Earlier research papers on the implementation of different technologies have their own

frameworks with CSFs that are applicable to them. However, while there are some articles that discuss dashboard implementation (e.g. Pauwels et al. 2009; Skorka 2017), dashboard literature is still lacking a clear CSF framework. This study attempts to create one with the help of earlier implementation literature and a case study. Yigitbasioglu and Velcu (2012, 56) also suggest that a study on the implementation of dashboards and the CSFs within could be valuable.

## 1.2 Research objective

The purpose of the thesis is to study a dashboard implementation project and the critical success factors that are applicable to this particular project. The research is conducted by taking part in a dashboard implementation project in a single division of a case organization. Data is gathered through interviews of project team members, dashboard users and other stakeholders, as well as by gathering information from project related documentation and presentations. Due to a designated time period of six months for the study, the implementation project was not studied in its entirety. The study focuses on the time period that took place between the development of the dashboard and its implementation. During this period the dashboard was being tested and developed further. Plans for the implementation were also made during this time, but the actual implementation of the dashboard had not begun before the study period was finished, and could therefore not be studied empirically. The objective is to gain further understanding of the processes that take place in the organization during a dashboard implementation project and how they affect the success of the implementation.

The analysis is done by utilizing CSF-models from earlier implementation literature of different technologies and projects. These CSFs are collected onto a table where their differences are compared and analyzed. The aim is to find out which factors might be universal to all implementation projects and which ones are dependent on the technology. The factors are then compared to those that come up during the study, in order to find the CSFs that are applicable for dashboards. Finally these dashboard CSFs are compiled in a framework. The research questions are as follows:

- What are the critical success factors in a dashboard implementation project?
- Why are they critical?
- What does it mean to implement a dashboard?

## 1.3 Methodology and methods

This study is a qualitative case study. Qualitative research is often defined by contrasting it to quantitative research, since comparing their differences is easier than defining the methodologies themselves. In general qualitative research - instead of e.g. finding explanations, testing hypotheses and analyzing statistics - is more focused on interpreting and understanding reality. Qualitative research is said to be the appropriate choice e.g. in a situation where the current understanding of a certain phenomenon is only moderate. (Eriksson & Kovalainen 2008, 4-5.)

Both quantitative and qualitative research have their own weaknesses. Quantitative research often seeks to calculate relationships and find correlations between different variables. However, if research is only focused on quantitative methods, it neglects to take into account that these variables are socially and culturally constructed. According to Silverman (2000) quantitative methods alone cannot be used to study many interesting phenomena about "what people actually do in their day-to-day lives". On the other hand the criticism of qualitative methods often mentions the difficulty of categorizing qualitative data and proving its reliability. The reader of a qualitative study can only see small extracts of the full data that was used in the study. Another question is the validity of qualitative research. Critics often mention that qualitative research is based on an anecdotal approach, where e.g. small conversations are used as evidence. (Silverman 2000, 3-11.)

The research questions in a case study are always connected to understanding the case (Eriksson & Kovalainen 2008, 115). The case study is a research method where the focus is to study a contemporary phenomenon and to describe it by finding answers to research questions that are often in the form of "how" or "why". Additionally, as opposed to an experiment, the researcher has little or no control of the studied events. Case studies are conducted in a variety of fields, such as psychology, political science, education and business, to provide knowledge about phenomena related to an individual, a group, an organization, and so on. (Yin 2009, 4, 8.)

The research questions in a case study are always connected to understanding the case in question. Case studies are often interpretive and therefore qualitative, but quantitative data may also be used. It is argued that a case study is more like a research approach than a method. In general case studies are designed to be complex and diverse, and being too simplistic is avoided. The empirical data used in case studies can be quite diverse as well, consisting both of existing data and data produced for the research project. Basing studies on several data sources is also seen as making them more accurate. (Eriksson & Kovalainen 2008, 115-117, 126.)

When doing a case study the researcher has to make his own interpretation of the situation in the organization. This interpretation often relies heavily on descriptions pro-

vided by members of the organization, which are in turn influenced by the members' own interpretations. The result is an interpretation of an interpretation, which cannot be completely objective. Instead of providing an objective truth, the aim of case studies is to provide understanding and to shed light on complex situations. (Scapens & Roberts 1993, 3.)

## 1.4 Thesis structure

The structure of the thesis is organized as follows. The next chapter will provide a closer look into dashboards regarding their definition, design and development, as well as their larger role in the fields of business intelligence and performance management. The chapter will also include a literature review on dashboard implementation.

Chapter three provides a literature review of the past studies on implementation projects of systems and tools that share similarities with dashboards. These include the balanced scorecard (BSC), information and communications technology (ICT), enterprise resource planning (ERP) and business intelligence (BI) systems. Critical success factors of implementing these systems will be discussed and compiled in a table for further analysis. This table is also used as the main framework for analyzing the empirical results in the following chapter.

Chapter four provides the empirical section of this study. It describes the case company, the dashboard project, the collection of the empirical data and the interview results. These results are then analyzed with the help of earlier literature in order to create a CSF framework for dashboard implementation at the end of the chapter. Finally the conclusions of the study will be discussed in chapter five, while chapter six will provide a summary.

# 2 DASHBOARDS

## 2.1 Introduction

Dashboards – sometimes also called digital dashboards, performance dashboards or management cockpits – are tools for performance management and reporting. The term dashboard is a driving metaphor inspired by dashboards in cars and aircraft. (Allio 2012, 24.) A number of definitions can be found, for example according to Yigitbasioglu & Velcu (2012, 42) dashboards are interactive data-driven decision support systems used to provide information to decision makers in a specific format. Eckerson (2010, 4) calls the performance dashboard an "organizational magnifying glass", meaning that it helps the organization focus on the most important issues and guarantee that everyone is moving in the same direction. He also adds that dashboards translate the organization's strategy into measurable objectives, and they enable users to monitor processes, analyze root causes and manage people and business performance.

The emergence of dashboards can be seen as a result of the convergence of business intelligence (BI) and business performance management (BPM) fields. BI is a term used to describe a wide variety of data warehousing and data integration technologies as well as tools for query, reporting and analysis, which together form the BI infrastructure. (Eckerson 2010, 6, 32.) These tools are used to collect data from different information sources, integrate it to a coherent entity, analyze it and make it available to a wide audience. At the base of such systems lies a data warehouse, which is a complex collection of integrated data. (Yeoh & Koronios 2010, 23).

Recently the focus of BI research has been moving more and more from data warehousing to how the information is consumed i.e. the demand side. Even with efficient systems which can collect, store and process large amounts of information, companies still have to be able to use the information effectively. The popularity of visual display tools such as the dashboard shows that information visualization has become one of the key issues in BI. (Bačić & Fadlalla 2016, 77.)

BPM – the other element of the dashboard – refers to a set of management disciplines, processes and tools in the field of performance management, all used to improve the way the organization executes business strategy and steers itself in the right direction. BPM includes many processes that practically all organizations already implement, such as strategic planning, financial reporting, budgeting and forecasting. The vision of BPM is that instead of having these processes run separately in different systems, they are integrated to a cohesive performance management system that steers all the parts of the organization in the same direction. (Eckerson 2010, 23–24).

The next chapter will discuss the purposes and expected benefits of dashboards, how they are used, as well as how they fit in the larger field of business intelligence. A literature review of dashboard design will also be provided.

## 2.2 Purposes and goals

In a study by Pauwels et al. (2009) there are four suggested purposes for implementing a dashboard. These are *monitoring*, *planning*, *communication* and *consistency*. Monitoring refers to tracking performance: who or what has performed well and what can be learned from that. Second, information provided by dashboards can be used to plan goals and strategy through scenario analysis. Third, a dashboard can be used to communicate information to important stakeholders. In addition to communicating key performance information, the dashboard also communicates organizational values through the choice of measures in it. Finally consistency means using the same measures and measurement procedures across the organization and between business units, which can be facilitated with a dashboard in three ways. By organizing and presenting data from different sources and time periods the dashboard acts as a common framework for the company. The dashboard can also give managers better understanding of how the company's inputs are related to its outputs and performance. Finally the dashboard provides consistency by giving a common viewpoint for the whole organization, which makes managers in different divisions and levels view the situation in the same way. (Pauwels et al. 2009, 178–179.)

Eckerson (2010, 5) provides a similar list of purposes for the use of dashboards, which are *monitoring*, *analysis* and *management*. Monitoring is done by comparing performance against corporate strategy, and it is enforced by alerts whenever the performance of critical business processes falls under targets. The information is supposed to be conveyed at a glance. The dashboard enables decision makers to analyze problems and to find out the root cause of them, by highlighting exceptions and drilling down to detail. Finally, management refers to managing people and processes in order to steer the organization toward its goals. It can also be used to improve alignment, coordination and collaboration, much like the consistency purpose in Pauwels' et al. (2009) framework discussed earlier. (Eckerson 2010, 5, 11.)

Velcu-Laitinen & Yigitbasioglu (2012) studied the purposes for dashboards in Finnish companies and their use among sales managers. The reported purposes were similar to the ones suggested by Pauwels et al. (2009): *monitoring*, *problem solving*, *rationalizing*, and *communication and consistency*. In the surveyed companies the most prevalent purposes were communication and consistency, followed by monitoring. The research suggests that the use of dashboards is more oriented towards collaboration than personal

decision making. They aid in communicating company values and goals of the organization to all levels. (Velcu-Laitinen & Yigitbasioglu 2012, 39, 50.)

The purposes for implementing dashboards are linked to their expected benefits, which are many. According to Rasmussen et al. (2009, 11-12) typical benefits of dashboards can be divided to *improved decision making and performance*, *employee efficiency gains* and *employee motivation*. Improved decision making and performance comes as a result of having better performance information at hand. Decision making is thus better informed and managers are better able to identify negative trends. The organization's efficient and inefficient processes become visible. Presenting information visually enables decision makers to analyze performance against goals. Regarding employee efficiency, dashboards are supposed to increase productivity in various ways e.g. saving time from creating and maintaining multiple – often overlapping – static reports. Using a dashboard is also relatively easy to learn, which means that requirements for training are low. Employee motivation is expected to rise as well, because users can spend less time on gathering data and more time on analyzing it. Dashboards are also said to empower employees by making them understand organizational goals and their own role in achieving them more practically. (Rasmussen et al. 2009, 11–12.)

Pauwels et al. (2009, 180) also provide a list of the potential benefits of dashboard implementation. First of all, as said before, defining the metrics to be used also serves in defining and communicating the culture of the organization. For example if the company aims to be customer-oriented, it can communicate that goal with the metrics it chooses to be shown on the dashboard. The dashboard is also expected to provide a framework for recognizing good and bad performance, as well as options for how to move forward. Through the use of metrics dashboards can become a source of organizational learning, which in turn improves performance in the future. Finally dashboard usage is expected to come with profitability increases and a better, more transparent, environment for decision making. (Pauwels et al. 2009, 180.) Another list of benefits can be found in Eckerson (2012, 7–8) but it is very similar to the ones before.

Despite the large number of suggested benefits, there is a lack of empirical evidence about how many of them actually come true (Pauwels et al. 2009, 180; Yigitbasioglu & Velcu 2012, 52.) In the study by Velcu-Laitinen and Yigitbasioglu (2012, 50) conducted in Finnish companies, dashboards were found to bring improvements to the decision making process. Companies that had implemented dashboards improved their performance monitoring, communication and problem solving capabilities. This in turn could speed up and improve the decision making process, giving managers the opportunity to make better informed decisions that are less likely to face resistance. (Velcu-Laitinen & Yigitbasioglu 2012, 50.)

## 2.3 Design features

In their literature review on dashboard design Yigitbasioglu and Velcu (2012, 47) divide previous research on dashboard design to three different streams. First they studied functional and visual design features, and then the presentation format in terms of a) user tasks and knowledge, and b) cognitive styles and personality. Presentation format refers to how the information is presented e.g. tables, graphs or something else. Although most of the literature provided – ranging from 1977 to 2010 – is not exclusively about dashboards, but also about decision support systems, performance measurement systems and presentation formats in general, the underlying themes in the studies are applicable to dashboards as well. The following chapter will go through key findings from each of the three research streams listed above.

Design features can be divided to functional features and visual features, which in the case of the dashboard are both highly important. Functional features define what the dashboard can do i.e. the measures and KPIs used, while visual features deal with how the information is presented effectively to users. (Yigitbasioglu & Velcu 2012, 44.) First we take a look at the functional features.

### *2.3.1 Functional features*

One of the most often cited purposes for a dashboard is monitoring, which can be used to find exceptions in performance data. After such exceptions have been found managers will want to analyze them. This is done by drilling down to detail, which is one of the most important functions of the dashboard. Drilling down essentially means to move from a general level of information to a more detailed level (Pauwels et al. 2009, 183). It is also one of the features that make the dashboard more interactive (Yigitbasioglu & Velcu 2012, 48).

In order to move from graphical information to detailed data, the structure of the dashboard has to be layered. There are in fact three layers of information in a dashboard: graphical, summarized and detailed (Figure 1). The graphical layer is situated at the top and is used for monitoring information. It uses charts and alerts to highlight exceptions in performance. The information in the next layer, the summarized layer, shows a more structured view of the information. The information on this layer can be divided by subject e.g. customer or time, or by hierarchy e.g. country or city. Users are able to drill down into the information to draw further analysis. The bottom layer of information, the detailed layer, finally lets users get to the root cause of problems. On this level the users can inspect detailed data about e.g. invoices and transactions, and find out the underlying reasons for the exceptions in performance. (Eckerson 2010, 13–

15.) Without the drill down feature users might have to switch back and forth between several applications to look for the information, slowing down the decision making process (Yigitbasioglu & Velcu 2012, 52).

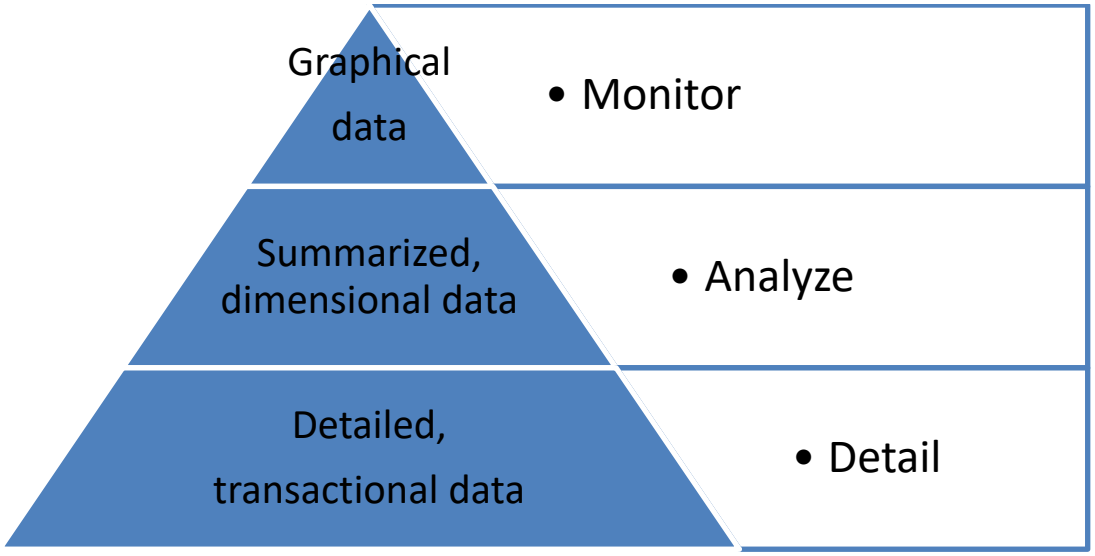



Figure 1 The three information layers of the dashboard (Eckerson 2012, 14)

The figure above – also known as the MAD framework (Monitor, Analyze, Detail) – displays the information layers in a dashboard. The types of information on each layer are described inside the pyramid, whereas the types of actions are described on the right hand side. Going down the pyramid is called drilling down. Each of the layers may also have their own group of users, which is discussed more in the next chapter 2.4 Dashboard types.

The previously mentioned study by Velcu-Laitinen and Yigitbasioglu (2012) also surveyed the most valued features of dashboards according to dashboard users in Finnish companies. The drill down feature was considered to be the most important feature, although based on the high standard deviation in the answers the researchers suggested that many of the respondents had not implemented it in their dashboards. The study also found that the drill down feature increases the productivity of users, and it is therefore proposed that this feature should be included in the dashboard. Another important functional feature is scenario analysis. In the study it was among the top three functions and was also found to increase user productivity along with the drill down capability. (Velcu-Laitinen and Yigitbasioglu 2012, 50–51.)

When designing a dashboard it is important to keep in mind that the functional features and purposes of the dashboard need to fit together. Having a poor fit means that the functional features do not support the purpose e.g. a dashboard with a strategic purpose lacks features that display the organization's strategic goals in a meaningful way. A poor fit may also lead to poorly justified decision making. Having too many or too

few features can both lead to a failed project. Adding features that are unnecessary for the users only serves in increasing complexity without any added value, while having too few features makes it difficult to fulfill the purpose of the dashboard. Therefore the goals and purpose of the dashboard need to be decided before the development begins. It has to be said that defining clear goals can be challenging especially at the beginning of the project. Therefore it is suggested to make the dashboard flexible enough to be open for modifications and upgrades even after implementation has begun. (Yigitbasioglu & Velcu 2012, 44, 52.)

Similarly Pauwels et al. (2009) write about achieving a fit between the *demand*, i.e. users, industry, organizational decision style and interdepartmental relations, and the *supply*, i.e. metrics, visual and functional features, sides of the dashboard. Achieving this fit is crucial for a successful project. For example the type of metrics used should be developed with the user in mind as well as the industry. Also the type of information has to fit with the decision style of the organization. (Pauwels et al. 2009, 183.)

Another functional feature of the dashboard is mobile use i.e. that the dashboard can be used on a phone or a tablet instead of a stationary computer. Tokola et al. (2016, 623) studied the design of manufacturing dashboards and made a survey about their functions. Most of the respondents thought that tablets and other mobile devices are better dashboard platforms than stationary systems. Gröger et al. (2016) point out that there are some tradeoffs between mobile devices and notebooks i.e. notebooks have a higher computing power and they can more easily be linked to larger screens, but mobile devices are handier and easier to carry around. However, the computing power does not need to be very high for a dashboard display since the data-intensive calculations can be done in a different back-end system. Mobile devices were the preferred system in the study because of their mobility, ability to provide information anywhere and anytime, and ease-of-use. The mobile app has to be tailored with the smaller screen size and touch-screen capabilities in mind. (Gröger et al. 2016, 1342.) The mobile version can also be a reduced version of the full dashboard (Rasmussen et al. 2009, 86).

The use of alerts is another functional feature in dashboards. They can be used to alert the user about low performance in certain indicators or about other exceptional incidents. The alerts are often visual in nature e.g. bright colors or flashes. (Yigitbasioglu & Velcu 2012, 48.) Skorka (2017) emphasizes the importance of calling to action, which means that the dashboard should be designed in a way to incite users to take action based on the information they receive. Merely informing is not enough but the dashboard also needs to catch attention. Visual alerts are one way of achieving this effect and it can also make the dashboard interface more user-friendly. Instead of continuously tracking several KPIs management can focus on emerging issues right away. (Skorka 2017, 249–251.)

While not essentially a feature, one important aspect of a functioning dashboard is that the data quality is high. Quality issues may arise when merging and aggregating data from different sources to a single display. The source data may contain errors especially if it is entered by hand. However, it is argued that the almost real-time nature of the dashboard may act as a driver for improving data quality, because it brings the problems in the source data visible to executives and other users. (Eckerson 2010, 63, 100.) In the study by Velcu-Laitinen and Yigitbasioglu (2012) data quality was not held as an issue among the respondents, but they were concerned about how complete the data is. The completeness of the data depends on the users and their tasks, meaning that the same dashboard might be sufficient for some and lacking for others. In the study data quality was seen as a critical success factor that influences whether the dashboard will be used or not.

### *2.3.2 Visual features*

The underlying goal of visualization is that the user of the system perceives the maximum amount of information in the minimum amount of time (Yigitbasioglu & Velcu 2012, 46). Regarding the visual features of dashboards, one of the research paths in earlier literature has focused on how the users' knowledge – e.g. IT or accounting skills – and their tasks should be taken into consideration when designing the presentation format of the dashboard (Yigitbasioglu and Velcu 2012). Regarding the question of user knowledge, Cardinaels (2008) investigated the correlation between cost accounting knowledge and presentation formats in cost-based decision making. The subjects in the study were given a pricing and resource allocation task, where the cost information to be used was provided either in tabular or graphical form. The research concluded that users with low-level cost accounting knowledge performed better when using a graphical format, while users with high-level cost accounting knowledge performed better with the tabular format. It was also found that for the latter type of users, the graphs had an adverse effect on performance. The study indicates that there is no all-purpose way of presenting accounting information, but in fact the system has to take into account the differences in users' cost accounting knowledge. (Cardinaels 2008, 582, 597.)

Similar results regarding the presentation format were found by Davis (1989) but in this case the focus was on user tasks i.e. the type of question the decision maker needs to answer. In the study students were given financial information in four forms – line graph, bar chart, pie chart and table – and asked to answer questions based on it. It was found that the question to be answered and the way the information is presented both affect performance, but that none of the forms works best in all situations. Also performance with the tabular format was found to be equal or superior in most questions com-

paring to the graphical format. However, graphical presentations were found to be better if – but only if – they provide specific visual cues to help the decision maker. (Davis 1989, 495, 504.) Graphical presentations do have other benefits as well. In a study by Diamond and Lerch (1992) it was found that graphical presentations decrease the problem of information overload when compared to tabular information.

In light of these result it's not simple to define which presentation format is superior. Wilson and Zigurs (1999, 49) tested whether giving the users a choice to select between alternative presentation formats has an effect on performance. It was found that the subjects did not perform given tasks better with their preferred presentation format compared to a randomly chosen format. One of tested functions in Velcu-Laitinen and Yigitbasioglu (2012, 50) was presentation flexibility i.e. that users can choose the presentation that best suits them. It was found that it's not common for this feature to be regarded the most important, and it was also not found to improve user productivity. Overall Yigitbasioglu and Velcu (2012, 52) point out that it might be best to build dashboards that are flexible enough to fit the purposes of different user groups, and that can also be upgraded easily.

Some research has been made about the use of colors in dashboards and how it affects decision making. Generally speaking the choice of colors matters so they should not be used randomly. Using too many colors or misusing them may be distracting and have effects on decision making. Overusing colors distracts the user by making them look for meaning that is not there. Generally if there is a variance in colors there should also be a variance in values. Misusing colors in this case means that the colors needlessly guide the users' attention to wrong things. For example using contrasting colors catches the users' attention easily, but if the contrasting is not relevant to the users' tasks, it only provides additional distraction. It was found that the overuse and misuse of colors does not lead to poorer decision making, but it does make the process slower. (Bera 2016, 50–52.)

Based on their literature review Yigitbasioglu and Velcu (2012, 47) provide a set of visual features for dashboards. First of all it is suggested that the dashboard should fit on a single computer screen i.e. using them does not require scrolling, but that they allow interactive drill down features as discussed before. The researchers also propose that colors should be used sparingly, since too many colors may distract, and also that non-value adding visualizations should be left out. It was also pointed out by Amer and Ravindran (2010, 39) that certain types of graphs can create visual illusions which may lead to biases in decision making, but that the use of grid lines mitigates this problem.

Another stream of research presented by Yigitbasioglu and Velcu (2012) is about how the cognitive styles of users and users' personality should be taken into accounting when designing the presentation format. The mental processes of the users vary and it might have implications for dashboards designers. However this type of research is

quite scarce in accounting and information systems literature and it is not clear if it can provide potential research paths for dashboards. (Yigitbasioglu & Velcu 2012, 51.)

It is argued that while the functional features need to be in line with the purposes of the dashboard, the visual features are more universal in nature and therefore should be implemented regardless of the purpose. These visual features include the single page format, frugal use of colors, high data-to-ink ratio and the use of grid lines. (Yigitbasioglu & Velcu 2012, 52.) Eckerson (2010, 249) also says that the visual features should not surpass the purpose of the dashboard, which is to effectively communicate the meaning of the information within. Too many visual tricks could obscure this. In conclusion, effective dashboards are flexible for the purposes of different users, meaning that they can choose between different presentation formats and levels of aggregation, and also interactive, so that it provides enough capabilities for drill-down and analysis (Yigitbasioglu & Velcu 2012, 47, 56).

## 2.4 Dashboard types

Although the dashboard market contains a wide variety of tools for specific purposes and with different functionalities, dashboards can be roughly divided to three main types: strategic, tactical and operational (Eckerson, 2010, 101; Rasmussen 2009, 17). Dashboards differ in for example the type of information they provide, their user base and their purpose, which are shown in Table 1 below.

Table 1 Dashboard types and characteristics (Eckerson 2012, 105; Rasmussen et al. 2009, 20)

| | **Strategic** | **Tactical** | **Operational** |
|---|---|---|---|
| **Main users** | Executives | Managers | Operational staff |
| **Scope** | Enterprise | Department | Operational |
| **Purpose** | Strategy management | Process optimization | Operation control |
| **Metrics and KPIs** | Outcomes | Drivers/outcomes | Drivers |
| **Information** | Summary | Detailed/summary | Detailed |
| **Frequency of updates** | Quarterly/monthly | Weekly/daily | Daily/hourly |
| **Focus** | Future | Current | Past |

The table above presents the different types of dashboards and their characteristics. The characteristics are in part only suggestive. For example while executives primarily

use strategic dashboards, they can use other ones as well. Also the different types are not exclusive and in fact companies may have all three at the same time. Generally speaking the table signifies that different types of dashboards all have their specific uses. Users have varying needs for KPIs and different purposes for using dashboards, meaning that a universal solution is difficult to make. (Eckerson 2010, 105.) Also in the study by Tokola et al. (2016, 619) the need for specific KPIs was found to differ depending on the hierarchy level of the user. The following section will further discuss each of the different types.

*Strategic dashboards* are used to monitor progress toward strategic objectives. The goals and KPIs used are enterprise-wide, and the dashboard itself is often highly graphical, with summarized information, and in addition to company goals it can also be focused on external trends. Strategic dashboards are most often used on the executive level, but they can be used by mid-level or departmental managers as well. (Eckerson 2010, 101; Rasmussen et al. 2009, 18.)

Strategic dashboards are often likened to the balanced scorecard (BSC) created by Kaplan and Norton (Rasmussen et al. 2009, 17–18). The goal of the BSC is to give managers a comprehensive view of the business quickly. It consists of financial measures that are used to view results of past actions, and operational measures, which in turn drive future financial performance. Originally the BSC provided four perspectives to the business: financial, customer, internal business, and innovation and learning. Managers define goals that fit each of these perspectives and then choose measures which help in achieving them. To prevent information overload the BSC forces managers to limit the number of measures and only use the ones that are most critical. (Kaplan & Norton 1992, 71–76.) With the rising popularity of the BSC its role has shifted over the past twenty years from a basic performance measurement tool to a strategic management system. The organization can use it to connect its short-term performance targets to its long-term strategic goals. This is done by finding cause-and-effect relationships between the targets and goals. (Lueg & Vu 2015, 307–308.)

The similarities of the systems are apparent: both dashboards and scorecards are visual tools that utilize charts and graphs to communicate performance at a glance. However they have certain differences. In addition to monitoring performance, one of the key goals of a dashboard is to incite action. Scorecards on the other hand are more focused on tracking and reviewing performance instead of producing actionable information. It’s also indicated that dashboards are used by supervisors and specialists whereas scorecards are for the use of executives and managers, and that the frequency of updates is higher for dashboards. (Eckerson 2010, 11–13.) The distinctions are not perfectly clear though, e.g. does the dashboard stop being a dashboard if it’s used by top management or if it’s only updated monthly? Eckerson (2010, 12) adds that it does not matter which term is used as long as the tool is beneficial for the organization.

Allio (2012, 24) compares the differences of the tools by analyzing what their names might imply. A scorecard is a game metaphor: a game is played, it is won or lost and afterwards executives put points on the board to see who has performed well and who hasn't. The game is then over. A dashboard however, being a driving metaphor, implies constant motion. The organization needs to track critical metrics and KPIs and how well they are performing compared to competition, in order to steer the organization towards achieving strategic goals. The focus is on movement and action, not scorekeeping. (Allio 2012, 24.) All in all strategic dashboards and scorecards may have some differences, but it's quite challenging to define those differences and the definitions are also dependent on the researcher. One difference between the systems is that unlike the BSC, dashboards do not have a specific creator.

*Tactical dashboards* take a more focused look on specific strategic initiatives. The focus is often on an individual department, such as sales, finance or marketing, but it can also be on a specific project or initiative, the progress of which can be measured against a goal. Tactical dashboards can also be used to provide an enterprise view across different departments. The level of detail is higher on the tactical level, so being able to dig deeper into the data is important and it should be taken into account when designing the dashboard. The information is more regularly updated than on the strategic dashboard and the focus is on measuring and optimizing current business processes. Because of this, analysis represents the major emphasis of tactical dashboards and analyzing root-causes is one of their most important functions. In addition to that they can also be used to support monitoring and reporting. The users of tactical dashboards are most often mid-level managers and analysts, but executives may check them as well to better understand the situation at the lower levels. Due to the higher level of detail tactical dashboards are often specified to certain users or user groups, who can only access those parts of the system that are relevant to their work. (Rasmussen et al. 2009, 18; Eckerson 2010, 111–114, 139.)

Eckerson (2010) describes three types of tactical dashboards, which are enterprise dashboard, mashboard and analytical dashboard. They differ in the type of information that is displayed and their functionalities. Enterprise dashboards have the most general level of information, providing a view into the performance of all departments. It can be built on a BI platform with an executive dashboard on top and several departmental dashboards below. Users can only see the dashboards that they have access to. The second one, mashboard, serves workgroups or individuals. It can be used to create custom dashboards by mixing charts and tables from other reports to a single view in an ad hoc manner. Finally, analytical dashboards are for the use of business analysts. Users can explore wide sets of data to identify trends and outliers. Tools for statistical analysis can also be integrated. (Eckerson 2010, 112–113.)

*Operational dashboards* are primarily used by operational staff to e.g. monitor business processes and activities. The events are monitored as they happen, with updates coming daily, hourly or even in real-time. The scope of these dashboards is narrower and the level of detail is even higher than on the tactical dashboard. Due to the timeliness of the information, operational dashboards can also make use of alerts to promptly notify about exceptions and problems. While the focus is to display what is happening at the moment, operational dashboards can also utilize statistical models to display forecasts. For the most part the metrics used in this type of dashboard only have direct significance to operations, but naturally these metrics display information that provides the basis for the information in tactical and strategic dashboards. (Eckerson 2010, 107–109; Rasmussen et al. 2009, 20.)

Eckerson (2010) divides operational dashboards to two subtypes, which are detect-and-respond and incent-and-motivate. The focus of the first one is on optimizing processes and averting problems. They are updated close to real-time. The latter one has a goal of increasing employee productivity, which is done by tracking performance against goals. These dashboards can also be shown publicly on large screens and they are updated often. In certain businesses they can also show a ranking list of employees and their performance and provide a basis for the employee bonus system. (Eckerson 2010, 108.)

Eckerson (2010) conducted research on the types of dashboards used in US companies, and also about which types were the most widely used. The most popular type of dashboard was tactical, followed by strategic and operational. Two-thirds of the companies researched had all three types of dashboard in use. When asked which type of dashboard is most widely used in the organization, tactical ones came first again, but this time operational dashboards surpassed strategic ones. The research suggests that, although being extensively implemented, strategic dashboards are not utilized as intensively as the others. (Eckerson 2010, 102.)

## 2.5 Development

There is some research regarding the most efficient way to develop a dashboard. Pauwels et al. (2009, 180) present the development process in five stages, where they stress the importance of e.g. choosing the right things to measure, how to link the data to the dashboard and how to connect the dashboard to financial consequences. The following chapter will go through the stages in their proposed development process, as well as discuss the themes further.

Dashboard development begins with choosing the right kind of solution for the organization. Organizations can choose from three options: building one from scratch,

buying a ready-made solution and configuring it slightly to fit the organization better, or to buy one and extend it with code to create new functionalities or integrate it with other applications already used in the company. (Eckerson 2010, 104.) There is no recent information on which of these methods is most popular, although according to a study by Eckerson (2010, 104) the trend is that while in the past almost all companies built their own solutions from scratch, the surge in the number of vendors and solutions on the market has made buying or modifying ready-made solutions much more popular.

After the right solution is selected the next step is deciding what to measure. This is done with the selection of key metrics i.e. companies have to identify the right metrics for them and then reduce them to a manageable amount. (Pauwels et al. 2009, 180, 184.) Metrics and KPIs (key performance indicators) are the core of the dashboard, so defining and developing the right ones is highly important for the dashboard's long-term success. Metrics and KPIs are not the same thing. While metrics can essentially be a measure of anything, a KPI is a metric that is used to guide the organization towards reaching its goals. An organization has a wide range different metrics, but only a few KPIs, so it might be challenging for management to decide on the best ones for the dashboard. (Rasmussen et al. 2009, 23–24.)

Metrics that measure progress against a goal can also be called indicators. These types of metrics fit performance management better than regular ones, because the regular ones only show the current situation. Metrics can also be divided to outcome metrics and driver metrics. Outcome metrics are often backward looking and financial in nature. They show past activity that cannot be changed and they are also most often found in strategic dashboards. Driver metrics on the other hand are more focused on the tactical side. They measure current activity and give information that may still be acted upon to improve the outcome metric or a KPI. For example if the dashboard has monthly sales as an outcome metric, it may be useful to have weekly sales as a driver metric. Seeing weak weekly sales, the users are then alerted to make adjustments in order to improve the end of the month outcome. Driver metrics are harder to define than the outcomes. The company can decide to have e.g. customer satisfaction or market share as their outcome metrics, but it is not simple to define what the drivers for reaching those outcomes are. (Eckerson 2010, 198–201.)

The right metrics are essentially the ones that are the most relevant to the users of the dashboard and their tasks. While it's possible to fill the dashboard with countless different metrics, if they are not relevant to the tasks at hand, it provides no extra value and may even make the dashboard harder to understand. Data shouldn't be visualized just because it looks good on the dashboard, but instead it should have a direct impact on the users and incite them to action. (Skorka 2017, 248.)

In general using metrics that show little variation over time, that are too volatile, that add no explaining value to other metrics or that are not leading indicators of financial

success should not be used (Pauwels et al. 2009, 184). Metrics shouldn't be too numerous either so they won't overwhelm users. Less is more in this sense, since the dashboard is supposed to reduce the information overload of decision makers. Metrics should be simple enough for users to quickly understand what they represent. (Allio 2012, 24–26.) It is also worthwhile to note that the metrics and KPIs are often very similar in companies working in the same industry. Therefore the best KPIs may be easier to find by e.g. benchmarking the best practices in the industry. (Rasmussen et al. 2009, 31.)

Overall Yigitbasioglu and Velcu (2012, 55) point out the lack of empirical research on measurement selection and on the functional features of dashboards. However, since the time their article was published there has been some new research on the subject.

Tokola et al. (2016) studied the selection of dashboard KPIs in a manufacturing context. Based on a survey about preferred KPIs, three different manufacturing dashboards – operational, tactical and strategic – were created. The operational dashboard used by workers shows the status of the factory floor and job queue. The time frame for updates is from minutes to an hour depending on the KPI. The chosen KPIs focused on the status of machines and job queue, allowing the user to quickly view the situation on the factory floor. The tactical dashboard for managers is updated daily to weekly. It shows details about machine utilization, the OEE (overall equipment effectiveness), delivery reliability and reclamations among other things. Providing lots of information at this level was found to be important in order to find out the details. Finally the strategic dashboard for executives shows forecasts for deliveries, total productivity, demand information, manufacturing costs and employee-related information. The time period is in a range between a month and a year. Similar to the tactical dashboard the aim is to show lots of information on one page. As seen from the results, different KPIs are preferred on different hierarchy levels. The study concluded that regardless of the position of the user within the organization, reliability and punctuality of delivery were found to be the most important KPIs in a manufacturing environment. (Tokola et al. 2016, 622–624.)

When the company has decided what to measure, the issue then is to decide how and from where the dashboard collects the data (Pauwels et al. 2009, 181). Dashboards act as a sort of lens through which users track and interact with performance data, but the data itself comes from a variety of sources (Eckerson 2010, 11). In order to get the most benefits from the dashboard and to deliver the right information to the right people efficiently, a proper BI infrastructure has to be set in place first (Rasmussen et al. 2009, 53).

BI infrastructure includes a data warehouse. A data warehouse is in essence a repository for all electronic information within the organization. It supports tools for management purposes such as reporting and analysis. Companies have a wide range of needs for information and the data warehouse has to allow both the efficient entry and

reporting of information. How to build to data warehouse is highly dependent on the users' requests and how quickly the information is needed to be updated and reported. (Rasmussen et al. 2009, 53, 79.)

Business intelligence and data warehouse projects are often initiated by managers with great expectations, such as decreasing the time and effort spent on current processes, but also to discover new competencies to give their companies an advantage. However, such projects often fail to deliver the returns that were expected. (Rasmussen et al. 2009, 49.) Building a BI infrastructure is a complex and costly project, which requires constant maintenance and updates (Eckerson 2010, 37). Tokola et al. (2016, 623) note that the dashboard becomes an expensive investment if the company also has to implement data warehouses and ERP systems in order to use it. Having the BI infrastructure is technically not a necessity for building a dashboard. However, most of the benefits of the dashboard, such as delivering clean, integrated and historical data, come as a result of having an effective BI infrastructure as the foundation. Organizations that do not have or choose not to build the infrastructure when implementing a dashboard may also run into problems later on e.g. when attempting to expand the dashboard to different divisions. (Eckerson 2010, 37.)

After selecting the right measures and setting up a sufficient infrastructure, the next phase in the development process is to establish relationships between the dashboard items. This is what transforms the dashboard from a tool for presenting information to a decision support system. (Pauwels et al. 2009, 181.)

Dashboards are expected to evolve over time. They should react to changes in the environment, and the metrics and indicators should be revised from time to time and modified accordingly. Creating a static system is not going to bring long-lasting improvements to the organization. It's also very difficult to get everything in the dashboard right in one go. (Allio 2012, 29–30.) Skorka (2017) describes the creation of a sustainable dashboard as a journey. After implementation leadership should continue to ask questions about how to keep the dashboard beneficial. If some metrics become irrelevant they should be replaced. Continuously improving the dashboard is a way to add value. (Skorka 2017, 262.)

## 2.6 Implementation

Research on dashboards has often focused on the technical design aspects, but few studies have been made regarding the implementation process (Velcu-Laitinen & Yigitbasioglu 2012, 40). While some papers, e.g. Skorka (2017) and Pauwels et al. (2009), and books, e.g. Eckerson (2010) and Rasmussen et al. (2009) touch on the subject, they do

not provide much empirical evidence of implementation projects. Nevertheless this chapter will present the findings from previous literature.

In their framework for dashboard adoption, Pauwels et al. (2009) provide a list of success factors for dashboard implementation. These include, for example, a supportive top management team, cooperative attitude of the IT-department and user involvement. Users should be involved in the development process to ensure that the system is not created with just the functions and features in mind but that user perspective is taken into account too. Another way to involve users is to first launch a prototype version of the dashboard, and then develop it further according to suggestions from the users. Sufficient time and budget should be reserved for this in case the prototype has to be modified multiple times. The process can also prove to be beneficial since it increases collaboration between departments and makes sure that the dashboard is accepted when implementing the final version. (Pauwels et al. 2009, 183–184.)

In order to create a positive disposition toward the system among dashboards users, the organization should focus on the attitude, trust and expectations of the users. One of the key drivers of attitude is the perceived usefulness of the new system; if users are not convinced that the dashboard will improve their performance, their positive attitude towards it will falter. Users also need to be able to trust the system and the numbers it provides. Finally, managing expectations is important. If the users' expectations are set too high, early usage rate may also be high, but when the experience does not live up to the expectations, e.g. the dashboard is buggy or not as easy to use as expected, the dashboard may be rejected sooner. Low expectations – about e.g. perceived usefulness – on the other hand reduce interest and acceptance toward the system. Also mentioned in the list as critical factors are communication, consulting, introduction and training, but they are not elaborated any further. (Pauwels et al. 2009, 184.)

# 3 REVIEW OF IMPLEMENTATION LITERATURE

## 3.1 Overview and terminology

This chapter will take a step away from dashboards and discuss the implementation of different technologies and systems in general. The reason for this is that previous empirical research on dashboard implementation is rather scarce. However, dashboards are connected to many other research fields as well, such as management reporting systems (Bartłomiej 2015), business intelligence (Prasad & Green 2015), decision support systems (Bačić & Fadlalla 2016), performance measurement systems (Pauwels et al. 2009) and the balanced scorecard (Eckerson 2010). Therefore it should be beneficial to study the prior literature of implementing these systems.

This study focuses on the implementation of dashboards, the project which takes place in the organization during implementation and the critical success factors that affect the outcome of the project. First it is important to define what the different terms used in this chapter mean. Implementation means the initiation of a new practice in an organization. The previous research covering such projects often uses different terms with slightly varying meanings, such as adoption, integration or organizational change. (Lueg & Vu 2015, 309.) A project, on the other hand, can be defined as a one-time effort to create a new product, service or result. Projects are not repeated and they should be completed during a definite time, following a predefined budget and with the scope of work clearly defined as well. Time, cost and scope are therefore the project constraints. (Lewis, 2006, 2).

Finally, critical success factors (CSF) are in essence the things that have to go well in order for a project or an organization to be successful. They are used to highlight the factors that need to be given special and continuous attention by managers. CSFs can be created together with skilled CSF analysts and the key personnel of a company. They can be used to support planning processes or requirements analysis. The key strength of using CSFs is that they are intuitive and easily understood by senior management. Management can in turn endorse the application of CSFs in the whole organization to direct the employees' attention to the most essential issues. There are some possible drawbacks to using the method, however. CSFs may be difficult to use since creating them requires highly skilled analysts. They can also be subject to analyst or manager bias, which may affect their validity. (Boynton & Zmud 1984, 17–18.) The use of CSFs is highly common in implementation literature.

The rest of the chapter will discuss the implementation projects of various accounting innovations and information systems, starting with the balanced scorecard. The find-

ings along with other recurring themes of these studies will be further discussed in chapter 3.4.

## 3.2 Balanced scorecard implementation

### *3.2.1 Implementation process*

As already discussed in chapter 2.4 the balanced scorecard is closely related to the dashboard. BSC implementation projects have been studied much more extensively than dashboard projects, partly due to the longer history of the BSC. Lueg and Vu (2015) provided a review of the past BSC literature. They define four distinctive features of the BSC that differentiate it from other management practices: the BSC is strategic, comprehensive, it includes non-financial information in addition to financial and it includes both lagging and leading indicators. These characteristics mean that the implementation of the BSC should be studied separately from other management practices. (Lueg & Vu 2015, 309.)

There is no one correct way of implementing the BSC (Lueg & Vu 2015, 309) but research has suggested different ways of accomplishing it. According to Papalexandris et al. (2005) the different implementation practices vary in terms of sequence, content and the amount of implementation steps, and they are often dependent on specific company and market conditions instead of providing generalizable information. In their own framework the researchers aimed to create a more universal approach that could be beneficial despite contingent factors. Through their studies they have found that the framework is efficient at least in the finance and manufacturing sectors. (Papalexandris et al. 2005, 215, 224.)

The BSC implementation framework consists of six phases. These are 1. preparing for the project, 2. understanding the vision and strategy, 3. identifying the strategic priorities and objectives, 4. selecting performance measures, 5. operationalizing the project and 6. implementing and rolling out the system. In the first phase the project vision is created along with the scope and budget. The organization should assess its readiness to change and establish plans for communication. The second phase deals with e.g. assessing the external and internal environment, clarifying the vision and mission and developing a change management plan. In the third phase the strategic objectives are defined and presented to stakeholders in order to gain approval for the project. In the fourth phase the best performance measures for reaching strategic goals are selected and the possible information technology requirements will be identified. According to the researchers the fifth step – operationalize – is often omitted when implementing the

BSC. It includes e.g. setting targets, developing strategic initiatives, establishing the budget and redesigning performance management processes. The organization should also roughly assess the change impact for the company in order to create a training program. The researchers argue that the fifth phase is what evolves the BSC from a performance measurement tool to a strategic management tool, and is therefore highly valuable. (Papalexandris et al. 2005, 217–221.)

Finally the sixth phase is where the project is rolled out and the BSC implemented to the organization. This part includes setting up performance appraisal systems for employees and compensation plans based on the BSC. Training sessions about the use and requirements of the BSC should also be executed here. The project team needs to ensure that knowledge is transferred to the whole organization and that the use of the BSC begins promptly. If the users do not start utilizing the system quickly after implementation, there is a danger that they never will and the project fails. (Papalexandris et al. 2005, 221–222.) The project phases are presented in Figure 2 below.

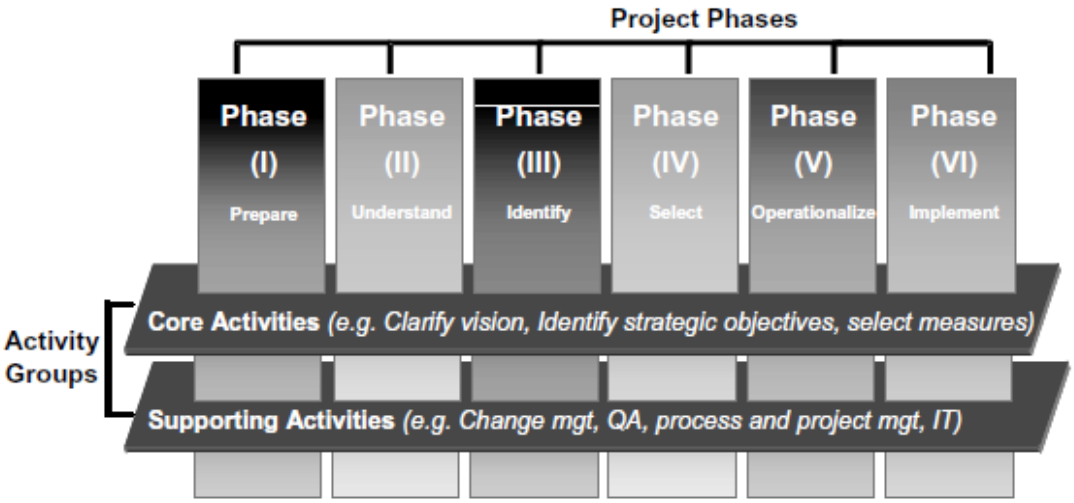



Figure 2 The BSC implementation project (Papalexandris et al. 2005, 215)

In addition to the six project phases the figure above presents two activity groups that are formed for the project. According to Papalexandris et al. (2005) organizations often see the BSC as a seemingly simple concept, and thus they underestimate the difficulties and the required change initiatives needed to put it in place. Thus the activity groups are formed to account for all the possible implementation issues. The core activity group is in charge of all the strategic initiatives of the project, such as analyzing the strategy and objectives of the company, linking these objectives to the selection of measures for the BSC, and creating goals for the project. While crucial, the core activities alone are not enough for a successful implementation project. Moreover the organization needs to

take into account a number of support activities. These are change management, risk management, quality assurance, information technology, and project and process management. The researchers call these activities critical for success and also claim that they are often overlooked in BSC research. (Papalexandris et al. 2005, 216–217, 225.)

In addition to the project phases, there still remain other issues that need to be taken into account in the implementation project. These include the company specific issues such as size, strategy, market and available resources. Other barriers facing many implementation processes are mentioned as well e.g. budget and time overruns, problems in the information used to make decisions and resistance to change. However, the researchers do not provide any discussion about how much emphasis these factors should be given. (Papalexandris et al. (2005, 215, 225.)

Agostino and Arnaboldi (2011) conducted research about the BSC implementation process and how the different actions and approaches taken during that process can shape the structure of the BSC and the ways that the organization uses it. In their case study they defined three different implementation approaches, starting with companies that implemented the BSC in a top-down manner i.e. only top management was active in the change process. Lower-level managers only execute the plans set by top management without having a say in the design or implementation processes. In the eyes of the subsidiaries, the BSC is seen only as a duty since the measures in it are too general to be of value on a local level. Because of this the researchers call the BSC implemented in this way a "ceremonial tool". The subsidiaries only use it to fulfill their duties to the headquarters, not to gain any benefit from it themselves. The measures and KPIs are almost exclusively financial, and the BSC is not linked to reward systems. (Agostino & The second approach found in the study also involves line managers in the implementation, in order to better understand the measures that need to be included. The case company needed to have a monthly overview of the business and the BSC was implemented to do this. However, there was no need to create local BSCs, so the lower level managers were not included. The BSC appeared as a control tool used by top management to control the business, and they only intervene if the results are unlike those expected. (Agostino & Arnaboldi 2011, 109–110.)

The third approach emerges from the need to connect strategy with everyday actions. In this approach user involvement is necessary during the full length of the process. Their needs are taken into account when defining the KPIs. The interaction between different levels is continuous even after implementation and the obtained results and used techniques are analyzed frequently. The measures and KPIs are both financial and non-financial, and the BSC is connected to reward systems. In conclusion, the researchers suggest that management accounting change implemented in a top-down manner directly impacts formal rules, whereas a bottom-up approach has a larger impact on a tacit level. Top management plays a key role in a centrally driven change process from

the initial idea to overseeing the change, whereas in a local change of a decentralized organization the local personnel become the most important actors in designing and driving the change process. Different approaches taken during the implementation process therefore generate different results and shape the outcome of the system. (Agostino & Arnaboldi 2011, 110–111.)

### *3.2.2 Critical success factors*

In their study Lueg and Vu (2015) defined eleven CSFs for BSC implementation and divided them to macro, meso and micro level factors, which can also be described as external, organizational and individual level factors, respectively. The different factors and their levels are described in the figure below.

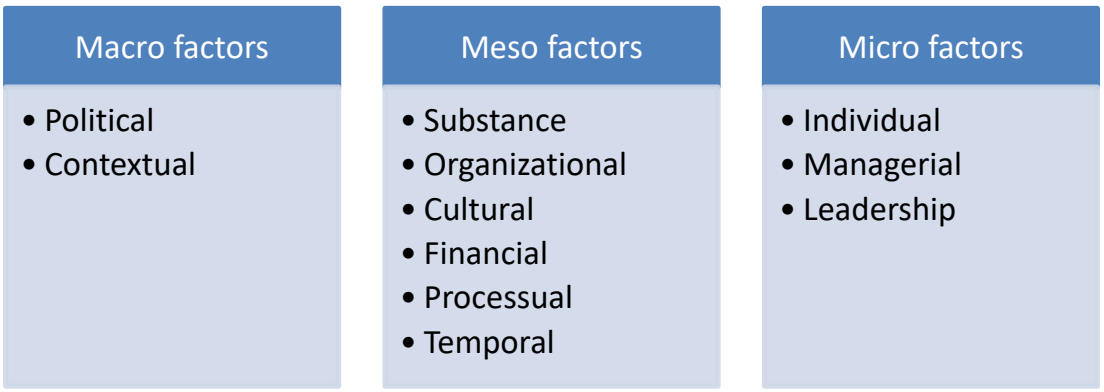



Figure 3 Success factors for BSC implementation (Lueg & Vu 2015, 310)

Starting from the macro level, the first CSF is *political*. Political factors refer to the different interest and power situations between organizational and external actors, e.g. management, the supervisory board or unions, who either try to aid or hinder the implementation. (Lueg & Vu 2015, 310–311.) Political factors may come into play in, for example, measure selection. In a study by Andon et al. (2007) the case company was implementing a performance measurement system with measures that reflect their strategy. The implementation project was hindered by a power struggle between the company's two major shareholders i.e. the government and institutional investors. While the government saw the investment in sometimes unprofitable infrastructure and service beneficial, the investors primarily sought to improve shareholder value and thus could not support unprofitable investments. In short, while both of the shareholders claimed to have the customers' interest in mind, they had very different opinions about which measures were important. The firm was then unable to implement a stable BSC. (Andon et al. 2007, 298.)

*Contextual* factors are connected to wider social norms and they describe whether the implementation is aligned with them (Lueg & Vu 2015, 311). They are the external pressures – such as legislation or popular opinion – to adopt new practices (Buchanan et al. 2005, 196). Kaufmann and Becker (2005) discussed the effect of environmental uncertainty in their study about BSC implementation in Brazilian companies. The BSC requires that the validity of its indicators is monitored regularly. Therefore if the environment is highly prone to changes e.g. there is high inflation, currency fluctuations and changes in interest rates, the validity of the indicators could be affected negatively. Despite the sometimes turbulent Brazilian environment, the case organizations saw the BSC as a useful tool for developing their strategies. In fact the BSC enabled the companies to quickly change their indicators if any major changes occurred in the environment and it made them more agile to react to these changes. In order to get this benefit the indicators have to be reviewed and adjusted regularly i.e. every month. (Kaufmann & Becker 2005, 53–54.)

Moving on to the meso-level CSFs, the first critical factor, *substance*, is concerned about how the BSC is designed. The selection of measures and defining causal relationships is especially difficult. This factor also describes the role of the BSC and whether it becomes the basis for managerial action through strategy alignment. Design factors of the BSC have an effect on how well the implementation goes. (Lueg & Vu 2015, 313.) For example in Modell (2009, 76) the BSC was found to be too theoretical and not in line with everyday operations, and thus employees did not understand the purpose behind it. This proved to be an obstacle for implementation.

The BSC can be designed by using measures that are already in use in the organization. This approach is beneficial in the sense that it allows the utilization of previously collected data and also that employees can continue working with metrics that are familiar to them. The existing measures should be evaluated according to how well they are connected to strategy. By designing the BSC in this bottom-up way the previous effort that has been put into performance measurement will not go into waste. (Lueg & Vu 2015, 313.) In a study by Decoene and Bruggeman (2006) a company was implementing a BSC, but in this case in a top-down manner. Mid-level managers found the measures to be overly aggregated to be relevant to their work, since the objectives were represented from a corporate viewpoint instead of an operational one. Thus the managers could not see how they could affect the scorecard outcomes positively and saw the measures as uncontrollable. Moreover the mid-level managers received compensation based on the objectives of the upper organization level instead of operational objectives, which further lowered the managers' motivation to improve their individual performance. In this system the managers could receive a bonus despite their efforts, or not receive one despite a successful project. (Decoene & Bruggeman 2006, 444.)

*Organizational* CSFs contain a wide variety of factors affecting the whole organization, such as policies, mechanisms, procedures, systems and structures (Buchanan et al. 2005, 210). Due to it being quite open to interpretation what all the different factors under this umbrella might be, Lueg & Vu (2015) provide a list of more concrete organizational factors, which are resources, training, rewards and resolution of conflicts. First, resources refer to the tangible and intangible resources – e.g. money and time – that have to be invested for the BSC project. The need for resources can often be a reason not to implement the BSC at all. In addition to the actual implementation process, introducing and understanding the BSC concept may require more resources than expected. Other reasons for cost increases can be e.g. hiring external consultants who have enough experience in BSC implementation and the time spent on making the data reliable enough. (Lueg & Vu 2015, 316.) Second, the training of users is a critical factor for a successful implementation (Ahn 2001, 459). Training in workshops helps to clarify the purpose of the BSC and define the implementation approach to users. Presentations allowed different units to receive feedback and to learn from each other. Third, having proper reward systems in place is very important in order to reduce resistance and ensure staff commitment. Linking rewards to accomplishing strategic objectives motivates employees. However, if the reward system is connected to a limited or an irrelevant set of measures it might create dysfunctional behavior, such as focusing on some important areas while neglecting others. The fourth and final organizational CSF is conflict resolution. If the project objectives are set separately by different units instead of top management it may create conflicts. Conflicts may also arise from lack of cooperation between departments and it can create a challenge for the implementation process. (Lueg & Vu 2015, 317.) Cooperation can be increased by having unit managers and top management as a part of the implementation team and giving them responsibility of the project goals (Chang et al. 2008, 1151.)

*Cultural* factors refer to the underlying beliefs, norms and values in organizations that have an effect on actors' behavior. Studies on the cultural factors regarding BSC implementation are rare since it is difficult to measure how much organizational culture actually affects the BSC. (Lueg & Vu 2015, 311, 317.) In a study by Kasurinen (2002) the case company implementing a BSC was heavily influenced by an engineering culture. Under this culture the BSC was seen primarily as a measurement system combining financial and non-financial measures, not as a strategic system combining measures and strategy. This undermined the strategic goals of the project, such as communicating strategies to everyone in the organization and connecting operational goals to strategies. (Kasurinen 2002, 334.) In a study by Modell (2009, 77) the case company had a pragmatic culture driven by informal communication and decision making, which was at odds with the formal number-driven nature of the BSC. In Kaufmann and Becker (2005) it was found that it was unusual to have reward systems based on individual ef-

fort in Brazil, because the local culture is very collective. Therefore attempting to increase employee motivation though BSC-based reward systems was not considered an option in such an environment. The researchers suggest that the cultural differences have to be taken into account and possibly favor team-based compensation over individual rewards depending on the culture. (Kaufmann & Becker 2005, 57.)

*Financial* factors refer mostly to cost-benefit analyses done before the implementation process begins and any resources are spent. Surprisingly according to Lueg & Vu (2015) there are no case studies in academic journals where companies have executed such an analysis and thus made a decision to implement the BSC based on proper calculations. Instead, the benefits of the BSC are often simply assumed to surpass its costs. (Lueg & Vu 2015, 318.) Ahn (2001, 460) calls it impossible to predict the value of the BSC before implementing it.

*Processual* factors refer to following the objectives, measures and strategy of the implementation process. Studies have been made about how companies review the BSC after its deployment. In a study by Ahn (2001) the case company uses the BSC as an information gathering tool designed to keep management informed about how current strategies are implemented. Actual values are compared to objectives regularly, and in case of negative deviations management can consider whether strategic measures have to be optimized. The company also annually reviews the causal relationships between presumed driving factors and expected results, and adapts them accordingly. (Ahn 2001, 454.) According to Lueg and Vu (2015, 319) in order to be successful companies should put an effort in the review process since the BSC should be adapted regularly.

*Temporal* factors are about the flow of events and the time frame in the implementation process (Lueg & Vu 2015, 311). In the study by Ahn (2001) one of the problems in the implementation process was that gathering the data to be used in the BSC required a great amount of time and resources. Because of this the BSC measures were introduced step by step into the organization in order to better manage the situation. (Ahn 2001, 453.) Kaplan and Norton (1996, according to Lueg & Vu 2015, 311) suggest that in order to ensure timely completion of the project and to preserve pace, the BSC should be implemented within a period of 16 weeks. In a study by Andon et al. (2007, 297) a case company tried to implement a working scorecard in eight weeks. However, during this time the company could only come up with a rough plan including an analysis of existing measurement limitations and requirements for new measures, which was far from having a working BSC solution.

The last set of critical success factors are at the micro level. *Individual* factors are about the actors who take part in the implementation project. For example the actors' capabilities in enacting change and their openness or resistance towards it all affect how successful the project will be. Resistance to change can be divided to willingness and ability to change. (Lueg & Vu 2015, 311.) Low willingness to change may arise for a

number of reasons, such as being skeptical about the expected benefits (Papalexandris et al. 2004, 354). In the study by Ahn (2001, 453) one problem was the employees' reluctance to accept the new measures brought by the BSC alongside the numerous performance measures they already had in the organization. The abilities to change may hinder the implementation even if motivation is high. For example employees need to understand how the chosen strategies affect different parts of the organization, so that they understand how to turn their enthusiasm into action. The BSC risks becoming irrelevant if the employees do not see the link to their everyday work, and keep relying on past routines instead. (Lueg & Vu 2015, 314.)

In Kaufmann and Becker (2005) one of the implementation barriers was lack of commitment, which can be a result of e.g. poor communication or misunderstanding the system. In their study about BSC implementation in Brazil, many employees saw the BSC as just another fashionable management tool that would later be dropped. The biggest fear of the employees was that the BSC would primarily be used to control their personal efficiency. These kinds of fears will reduce motivation and make implementing the BSC difficult. Using experienced consultants was found to mitigate this problem. (Kaufmann & Becker 2005, 47.)

*Managerial* CSFs refer to the competency and abilities of managers. Accepting and addressing problems in the implementation and finding solutions for these problems are important for the success of the project. Managers also have a role in creating trust and credibility for the BSC, by e.g. leading by being an example. Managers in charge of implementation should be critical towards the BSC and question its validity during the project. This way the tool becomes more sustainable. (Lueg & Vu 2015, 311.) Also in a case by McAdam and Walker (2003, 886) it was found that some managers were oversimplifying the implementation process, which led to a credibility loss for them and the whole project.

Finally the last CSF, *leadership,* is concerned with securing top management commitment and support, in terms of both spirit and resources. Leadership has a role in creating a clear vision for the implementation project as well as goals and priorities. (Lueg & Vu 2015, 311.) Top management support is often described as the most crucial success factor, and the lack of it as a common source of failure (e.g. Kaufmann & Becker 2005, 48). Top management is the main source of resources and therefore having their support greatly facilitates the implementation process. It is a critical factor but not sufficient alone. (Lueg & Vu 2015, 316.)

In addition to the list of CSFs Lueg and Vu (2015) also discuss which of them are overrated or underrated in previous research. Being overrated in this case means that a CSF has received attention in literature as being crucial, but that its relevancy has not been supported by empirical findings. First the researchers consider processual and temporal factors as having received too much attention. While Kaplan and Norton (ac-

cording to Lueg & Vu 2015, 323) have emphasized the importance of these factors, empirical studies have not. Individual, leadership, substance and organizational factors are considered intuitive i.e. they should be actively managed and controlled. They are also held in the same regard in both conceptual and empirical literature. (Lueg & Vu 2015, 323–324.)

The rest of the CSFs – managerial, cultural, political, financial and contextual – form a so called "blind spot" in BSC implementation research. The blind spots can be invisible to managers and only become apparent when challenges appear. Managerial skills, such as being critical toward the BSC and admitting problems and mistakes when they arise, are often neglected. Other neglected areas in BSC implementation are e.g. proper financial analysis about costs and benefits, internal and external power structures that might affect the implementation, changing the culture if it's critical toward e.g. strategy driven by non-financial measures or performance measurement in general, and learning how to separate fashion trends from genuinely good ideas. The blind spots should be prioritized and further explored by managers. (Lueg & Vu 2015, 324.)

## 3.3 Research on other implementation projects

This chapter will provide an overview of the previous literature on other implementation projects than dashboards or the BSC. The chapter is divided to ICT, ERP and BI implementation projects. All of them have certain characteristics that make them closely related to dashboards and can thus prove to be useful in understanding dashboard implementation.

### *3.3.1 ICT*

ICT (information and communications technology) has many definitions in different contexts. It is often used to describe information and communication systems with various functionalities, such as decision support systems, database management systems, office information systems and communication systems. ICT can also refer to technological tools used for personal communication. (Van Wart et al. 2017, 528–529.) Based on these definitions it can be said that a dashboard fits both of them: it is an ICT system for decision support and communication within the organization, and it can also have capabilities that enable personal communication. While ICT is a broad concept, all ICT tools and systems share at least some similarities. For example users have to be convinced about the benefits in order to make them accept the new system, and also taught how to use it, no matter how big or small it is. A tool only becomes beneficial if people

actually use it, and thus achieving that use is a key issue in any technology implementation project.

ICT implementation projects have certain features that differentiate them from other project types especially in terms of complexity. The complexity of ICT projects is a result of three key factors. First of all the projects include several functions of the organization, each with their own specific requirements that have to be considered. Second, these functions also have different priorities regarding the implementation of the technology. Third, the newly implemented software has to fit in with other programs already in use, which adds to the complexity of time and budget management of the project. (Jagodic et al. 2009, 292).

Leaders select ICT tools for their personal use as well as for organizational use. The organizational tools may or may not be used by the leaders themselves, but their implementation affects the whole organization, consumes money and time to implement and has high rates of failure. Therefore leaders have an important role in the success of ICT projects in organizations, and they need a certain skillset to select the best ICTs for both organizational and personal use. Leaders also act as an example to others through their personal use of the ICT tool in question. (Van Wart et al. 2017, 529.) Also according to Rahayu (2012, 28) the most important factor in determining information system success is the commitment from top management.

In a study by Venkatesh et al. (2003) the acceptance of technology in an organization is seen as a two stage process, the stages being intention to use and actual use. First there are a number of factors which make users acquire an intention to use ICT. This intention is an important determinant of actual use, but other factors have to be taken into account as well. The factors driving the intention to use are performance expectancy, effort expectancy, social influence and facilitating conditions. Performance expectancy is the perceived usefulness of the system i.e. how much it helps the users in their tasks, and effort expectancy is the perceived ease-of-use of the new system. Social influence is the degree to which the user believes that other people believe that he should use the system. The other people can mean people who are important to the user or people who influence his behavior. Facilitating conditions mean how much the user believes that organizational and technical infrastructures support the use of the system, e.g. in terms of training or knowledge about ICT. It was found in the study that the effect of performance expectancy is stronger for younger workers and men, whereas effort expectancy has a larger effect on older workers, women and employees with limited experience. These same groups of people were also more affected by social influence. Facilitating conditions were not found to be significant since their effect was captured by effort expectancy, but they do, however, have an effect on turning the intention to use to actual use, especially for older workers with experience. Thus the findings suggest that younger workers and men put a higher value on the usefulness of the system,

while older workers and women put a higher value on its ease-of-use, and that they are more likely to be affected by social influence. Once the intention to use has been achieved, organizational and technical infrastructures can aid in turning the intention into actual use. (Venkatesh et al. 2003.)

In their study Van Wart et al. (2017) discuss how to turn the factors introduced by Venkatesh et al. (2003) into a leadership model. They take the three factors – social influence, performance expectancy and effort expectancy – and turn them into leadership skills: awareness of ICTs, quality of ICT evaluation and willingness to expend effort, respectively. Social influence affects leaders in a way that makes them either voluntarily copy new ICT practices or adopt them out of legislative coercion. However, the researchers suggest that good leaders are not swayed by social influence and that they should have an active awareness of ICTs. This way they could adopt new technologies without being influenced by social pressure, or refuse trendy technologies if they do not provide sufficient benefits. The researchers propose better evaluation of ICT in order have a better base for performance expectancy. This could mean a cost-benefit analysis or the use of professional staff and consultants to better understand different ICTs prior to adoption. Good leaders should also understand the relationship between effort and benefits better. Most of the effort in ICT adoption takes place in the short-term while the benefits begin to appear only in the long-term. Therefore leaders should not be scared of the initial high effort needed. This requires characteristics from the leaders such as willingness to commit time for ICT implementation and an appreciation for the long-term benefits. The facilitating conditions in Venkatesh et al. (2003) are substituted by change management competencies. For a moderate-sized ICT implementation there are a number of change management issues, such as establishing the need for change, building internal, external and top management support and institutionalizing change. These change management competencies are affected by the leadership skills discussed above. Like the facilitating conditions in the Venkatesh et al. (2003) model, the change management competencies directly affect the actual use of the ICT system. In conclusion, the researchers suggest that the actual use of ICT systems is therefore dependent on the intention to use ICT and change management competencies, both of which are affected by skills of the leaders. (Van Wart et al. 2017, 530–534.)

In a study by Jagodic et al. (2009) the researchers suggest that an ICT implementation project in the organization is divided to formal and informal processes, meaning that the process of ICT diffusion is driven both formally and informally. The formal processes are steered by planned project management phases, such as initiation, planning and execution. However in addition to the formal processes, a number of informal ones appear as well. These informal processes are invisible and occur spontaneously, most often taking the form of face-to-face conversation. One of the key findings of the study is that these informal networks enable a quick spread of knowledge for free in

implementation projects, and should thus be utilized. Informal networks also provide a way of acquiring information about new innovative technologies on the market, which is beneficial due to the quickly changing environment of the ICT industry. Acquiring information through formal channels alone may be too slow in this new environment. Formal processes are already widely used in organizations, but the proper utilization of informal networks is often lacking. Informal networks provide support to the formal ones, but they may also contradict official guidelines. Organizations should nevertheless acknowledge the value of informal networks in order to carry out quick implementation projects, to stay informed about new technologies on the market and to remain competitive. Another finding is that it can take a lot of time before a technology is rejected or accepted by employees. (Jagodic et al. 2009, 299–301.)

### *3.3.2 ERP*

ERP (Enterprise Resource Planning) systems are used to integrate all the functional areas, business processes and data within an organization. The information is in one central database, in one application and it can be viewed on one common user interface. Having all this information in one system facilitates e.g. communication and cooperation between departments. However, ERP projects are notoriously complex and costly. The implementation of such systems takes long and is therefore highly risky. The high failure-rate of ERP projects is well-known, with only around 39 % of them being finished successfully, but despite this the popularity of ERP systems has not faded and they are seen as a necessity in large corporations. (Jenko & Roblek 2016, 145–146.) While implementing an ERP system is likely to be a much larger undertaking than implementing a dashboard, the implementation projects may have some similarities.

Jagoda and Samaranayake (2017) provided a framework for ERP implementation as well as critical success factors and common causes of failure. Their framework consists of three phases: pre-implementation roadmap, implementation phase and post-implementation. The pre-implementation roadmap includes *choosing the system* e.g. full, partial or minimal implementation, *selecting the methods* e.g. develop in-house or access the system on an external server, and finally *assessing the organization's ERP readiness*. Choosing the system is often based on a cost-benefit analysis of a given time period between the different systems, whereas selecting the methods is more based on organizational requirements rather than costs. The last part, however, is the most important. A major cause of ERP failure is not knowing the organization's readiness before the project. The readiness assessment includes a requirements analysis as well as a failure-risk analysis between the different alternatives. The implementation phase consists of *selecting the partner*, *preparing an implementation plan*, and finally the actual

*implementation* of the ERP. The implementation plan should include a schedule for staff training and education. The organization should also build a good relationship with the ERP vendor, as well as recruit skilled personnel to see the implementation through successfully. Finally at the post-implementation stage the financial, technological and organizational outcomes of the project are evaluated, variances to expectations are analyzed and the possibilities for future improvements of the system are assessed. (Jagoda & Samaranayake 2017, 97.)

Jenko and Roblek (2016) created a CSF list for ERP implementation based on a literature review. The CSFs are grouped into human, organizational and technical factors. The researchers found out that the human factors – competence, behavior, team composition and communication – have the biggest effect on project success, and out of those factors competence is the most important. Competence refers to the knowledge, skills and experience of the organization and the project team. Knowledge can be seen as a unique resource in the organization that cannot be copied by competitors, which makes it an important advantage to have. Implementing an ERP system requires a wide range of knowledge from people with different skills and experience. The needed skills are individual skills such as decision making, team work, communication, leadership, programming and teaching. (Jenko & Roblek 2016, 151, 155.)

ERP systems can also diffuse accounting logics throughout the organization. Accounting logics are underlying principles that include beliefs, assumptions and ideas about the design of accounting systems. In short they define how accounting should be performed. If the accounting logic in question is very specific it may create challenges for subunits. In one internationally active case company the introduction of an ERP system led to the replacement of various ICT systems and tools, increased integration between production plants and countries and higher transparency within the organization. Various country-specific accounting logics which were prevalent before were replaced by one single logic driven by the ERP system. Subsidiaries in different countries were now using standards issued by the HQ instead of using their own systems. (Heinzelmann 2017, 162, 178.)

### *3.3.3 Business intelligence*

As discussed before, business intelligence systems contain a broad selection of tools for gathering, storing and analyzing data. BI system implementation has similarities with the implementation of infrastructural ICT systems and other complex systems such as ERP. Implementing a BI system should be regarded as a complex project that requires proper infrastructure and resources over a long time period, and similar to other ICT

projects, it is not merely a question of purchasing the right combination of hardware and software. (Yeoh & Koronios 2010, 23; Yeoh & Popovic 2016, 134.)

According to Villamarín García and Díaz Pinzón (2017, 48) BI implementation projects have a high rate of failure as a result of problems in both technology and management. The failure rate can be as high as 70% to 80 %, and BI projects are also often abandoned. According to the researchers the problems in implementation can arise from project leaders, sponsorship, design, training, data, user needs and so on, as with all technology projects.

Critical success factors in BI implementation have been the subject of a few research papers (e.g. Yeoh & Koronios 2010; Yeoh & Popovic 2016; Villamarín García & Díaz Pinzón 2017). According to Yeoh and Popovic (2016, 146) understanding critical success factors is very important for a successful BI system implementation. The researchers suggest that the CSFs have a direct effect on the implementation process and should therefore be addressed.

Yeoh and Popovic (2016) have created a framework including seven CSFs for BI implementation. The factors are divided to three dimensions, which are organization, process and technology. The seven factors and their corresponding dimensions are presented in the figure below.

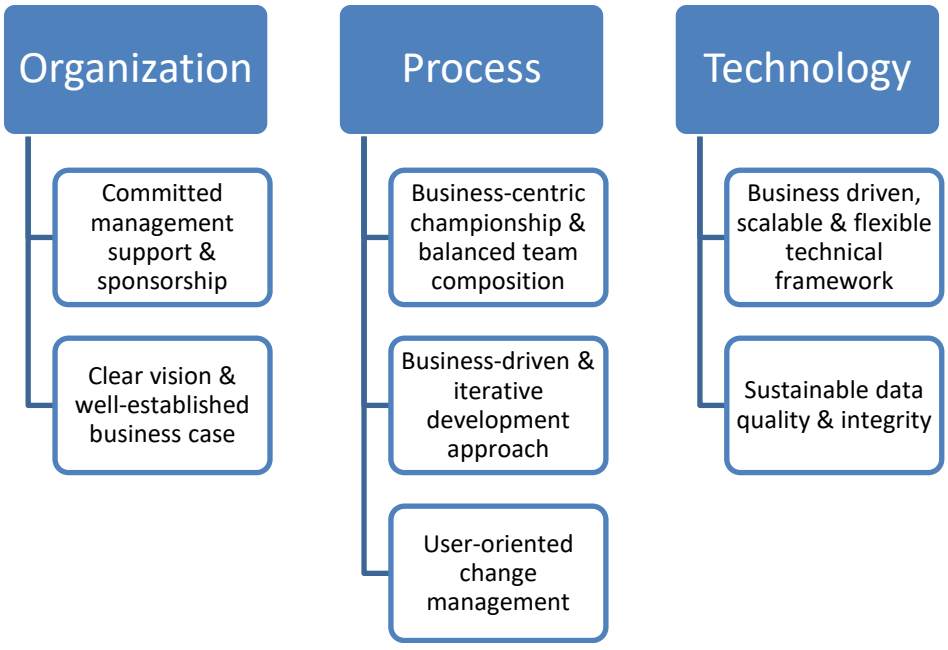



Figure 4 Critical success factors of BI implementation (Yeoh & Popovic 2016, 136)

The CSFs in the framework address many of the same issues that have been discussed before in other CSF frameworks, highlighting the importance of e.g. top management support, having a clear vision, building a balanced team, keeping track of busi-

ness requirements in the development process, change management and data quality. According to the researchers the organizational dimension seemed to be the most significant for project success. Having top management support and a clear vision was found to be crucial for implementing an enterprise-wide BI solution. In successful companies the organizational factors acted as a basis for the whole implementation project, and thus the researchers suggest that the organizational factors should be addressed before any others. For example one of the case companies focused primarily on the technological side of the system and neglected the organizational factors. This resulted in a failed project. (Yeoh & Popovic 2016, 145.)

Another list of critical success factors for BI implementation was provided by Villamarín García and Díaz Pinzón (2017) which was created with the help of a literature review. Comparing their list of 12 CSFs to the CSFs by Yeoh and Popovic (2016), many appear to be similar. These include top management support, having a sponsor, connecting the BI system to business, having a clear vision and strategy, change management and various technological factors. However, they do put more emphasis on external factors as well as individual skills and competencies. They introduce the environment CSF, which takes into account the internal and external factors that have an effect on the project and the people involved in it. Environmental conditions may create either barriers or benefits to implementation, and the project must adapt accordingly. As for the individual CSFs, the researchers introduce intellectual resources, meaning that in order to work effectively the project team needs to have enough technological knowledge about the BI field. They also emphasize the importance of learning during the different steps of the project. Another new factor is professional networks. Taking part in professional discussions about BI topics and keeping up with professional networks is seen as beneficial for professional and personal development, which are related to more successful BI projects. Professional networks may aid in conquering certain personal and organizational barriers related to implementation projects. They also help by enabling continuous learning through third party connections and sources. (Villamarín García & Díaz Pinzón 2017, 60–65.)

## 3.4 Key findings from previous research

### *3.4.1 Critical success factor frameworks*

Implementation literature puts a large emphasis on critical success factors, and many of the studies discussed earlier provide their own list of factors for different technologies. The use of critical success factors seems to be relevant regardless of the technology or

tool being implemented. The lists do, however, focus on different things and therefore it should be interesting to compare their findings in Table 2.

Table 2 Critical success factors in implementation literature

| | BSC | BI | ERP | ICT | Dashboard | | |
|---|---|---|---|---|---|---|---|
| Critical success factors | Lueg & Vu (2015) | Villamarín García & Díaz Pinzón (2017) | Jenko & Roblek (2016) | Van Wart et al. (2017) | Pauwels et al. (2009) | Skorka (2017) | **Σ** |
| Top management support | X | X | X | X | X | X | **6** |
| User training/support | X | X | X | X | X | X | **6** |
| High data quality | X | X | X | X | X | X | **6** |
| Clear vision and objectives | X | X | X | X | | X | **5** |
| User involvement/orientation | X | X | X | | X | X | **5** |
| Sufficient economic resources | X | X | | X | X | | **4** |
| Cross-unit cooperation | X | X | X | | X | | **4** |
| Open communication | X | X | X | X | | | **4** |
| Organizational culture | X | X | X | | | X | **4** |
| Easy-to-use system | | X | X | X | | X | **4** |
| Using consultants | | X | X | | X | | **3** |
| Balanced team | | X | X | X | | | **3** |
| Project management | | X | X | X | | | **3** |
| Individual competencies | X | X | X | | | | **3** |
| Change management | | X | X | X | | | **3** |
| Monitor and measure progress | X | X | | X | | | **3** |
| Managerial competencies | X | X | X | | | | **3** |
| Expectations management | | X | X | | X | | **3** |
| Readiness and ability to change | X | | | X | | X | **3** |
| Building a prototype/pilot | | X | | | X | | **2** |
| Professional steering committee | X | | X | | | | **2** |
| External environment | X | X | | | | | **2** |
| Testing | | X | | X | | | **2** |
| Risk management | | | X | X | | | **2** |
| Upgradable, flexible technology | | X | | | | X | **2** |
| IT infrastructure stability | | | X | | | | **1** |
| Business driven development | | X | | | | | **1** |
| Business-oriented champion | | X | | | | | **1** |
| Cost-benefit analysis | X | | | | | | **1** |
| Professional networks | | X | | | | | **1** |
| Political factors | X | | | | | | **1** |
| Vendor support | | | X | | | | **1** |

The table above depicts the critical success factors presented in earlier literature on BSC, BI, ERP and enterprise-wide ICT implementation projects, as well as two articles about dashboard implementation which also mention CSFs. The CSFs are listed on the left, the sum of their appearances is represented by the numbers on the right, and the articles and technologies are shown above the table. The research articles were chosen because they all have gathered their CSFs by doing a literature review of earlier studies from their respective field, allowing them to include more CSFs and to better analyze which ones are the most critical. Since a similar article for dashboard implementation CSFs could not be found, it was decided to add two articles that touch on the subject: Pauwels et al. (2009) and Skorka (2017). The CSF lists on these dashboard articles were a lot less comprehensive than on the other articles, but nonetheless they provide a useful point of comparison to the others, and act as a basis for analyzing which factors best suit dashboard implementation. Some of the CSFs have been taken directly from the articles, while some of them have been named by the author in order to link together similar sounding factors from different studies. Next the differences and similarities between the lists will be discussed further.

Starting with the similarities in the lists, the three most often named CSFs are top management support, the training and supporting of users, and high data quality, which appear in all of the six studies. Top management support is perhaps the most commonly mentioned CSF in all implementation literature. As discussed before, it is difficult to implement anything without top management support, since they set the goals for the project and grant the needed resources (Lueg & Vu 2015, 316). In previous literature poor data quality is linked to both stalling the implementation project (Lueg & Vu 2015, 316) as well as decreasing the users' trust towards it (Pauwels et al. 2009, 184). If the data is wrong there will be no users for the system and thus the project fails.

When comparing the CSF lists some differences can be found. BI literature seems to take various business needs into account the most, as well as put a larger emphasis on technological issues. Only BI literature has mentioned the need to have business-driven development and a business-oriented champion. Perhaps BI tools are more clearly developed for directly solving specific business issues, whereas the other technologies affect business in a more indirect way. As for the project champion, according to Villamarín García and Díaz Pinzón (2017) a project champion is the leader of the project i.e. the project manager: an influential person in charge of the project with technical, operative and strategic knowledge. While Van Wart et al. (2017) and Jenko & Roblek (2016) also mention the need for a project champion, they do not specify the need for business-orientation.

As for technological CSFs, ERP literature mentions that the stability of the organization's existing IT infrastructure has to be taken into account. Related to this Yeoh & Popovic (2016, 143) found out that BI implementation is easier if the company already

had an ERP infrastructure in place, which implies that the existing technological infrastructure matters for BI as well. The systems' ease-of-use was also addressed by four of the articles. Having the technology be flexible and upgradable was mentioned in BI literature as well as Skorka (2017). Making the dashboard flexible and easily upgradable was also one of the key proposals of Yigitbasioglu and Velcu (2012, 52), and based on this it seems that flexibility could be critical for dashboards. Building a prototype or a pilot is another technological CSF mentioned in BI and dashboard literature. Pauwels et al. (2009) suggest that users should be allowed to test a prototype of a dashboard before implementing the final version, and that this would also increase user involvement and acceptance. Finally on this list of technological CSFs is testing, which was mentioned BI and ICT literature. Putting aside enough time to test the system directly affects data quality and therefore the usefulness of the system.

Organizational culture is another often recognized CSF. However, the articles usually do not clarify it further, but instead only state that it should be taken into account (e.g. Villamarín García and Díaz Pinzón 2017, 51), or that it matters but is hard to measure (Lueg & Vu 2015, 317). Skorka (2017, 244) says that corporate culture is connected to business success, since culture has great impact on e.g. communication and behavior in the organization. According to the research corporate culture therefore also affects the requirements for dashboard design. Another CSF that may be difficult to measure is the external environment, mentioned by Lueg & Vu (2015) and Villamarín García and Díaz Pinzón (2017). According to the latter researchers, environmental conditions can create both benefits and barriers for the implementation.

Interestingly many of the CSFs that are related to the execution of the project – such as project management, balanced team, managerial competencies, monitoring progress and professional steering committee – are omitted in dashboard literature. Project management includes processes such as planning, executing, monitoring and controlling, which are undertaken to meet the project requirements (Lewis 2006, 4). These tasks seem fundamental to any implementation project, and there's no reason why dashboard implementation would be different. The CSF called "balanced team" means that the project team members have a mixed set of skills (Villamarín García and Díaz Pinzón 2017, 50) or that they come from different departments and backgrounds (Jenko & Roblek 2016, 151). Having a wide set of skills at its disposal can be beneficial for the project team, but whether it is also necessary to have people from different departments depends on the size of the project and how widely it is supposed to be implemented. For example in an ERP project this seems beneficial, but since a dashboard implementation is usually a smaller project, it should be considered whether this factor is critical. As for managerial competencies, there are a few different approaches. In Lueg & Vu (2015, 311) the managerial factors meant that the implementing managers should be skillful in finding solutions, creating trust and delegating tasks, as well as retaining a critical mind

toward the system and its purpose. In the other articles it's only mentioned that managers should be "well-qualified" (Villamarín García and Díaz Pinzón 2017, 50) and "capable" (Jenko & Roblek 2016, 149). Another project related CSF is monitoring and measuring progress, which according to (Villamarín García and Díaz Pinzón 2017, 65) relates to metrics that can be used to set goals and to know the current situation of the project. The role of the professional steering committee is not further analyzed in the articles.

One interesting critical factor is cost-benefit analysis, which is only suggested by Lueg & Vu (2015) as a part of their financial factors. Van Wart et al. (2017, 531) also mention it briefly as one way for managers to build a better basis for their performance expectancy of the new technology, but the authors do not clearly state that doing such an analysis is critical. On the other articles costs and benefits are treated separately. For example many of the articles mention that budgeting is important and that implementation projects in general tend to overrun their budgets in terms of time and money. Having enough economic resources is mentioned by all except Jenko & Roblek (2016) and Skorka (2017), who for some reason don't mention money as a factor at all. The benefits on the other hand are related to CSFs such as "having a clear vision and objectives". Knowing what the system is to be used for implies that the expected benefits are known as well. However, weighing these benefits against the costs at the start of the project is only mentioned in one of the articles. As discussed before, Lueg & Vu (2015, 318) write that it is not very common for companies to do this analysis and it is common to just assume that the benefits of BSC implementation are greater than the costs.

While the lists by Pauwels et al. (2009) and Skorka (2017) are the shortest on the table, they can be used to draw some conclusions about dashboard CSFs. First, all of the CSFs mentioned in these two articles are mentioned in the other ones as well, and in fact most of them are mentioned in several others. Based on this there doesn't seem to be unique CSFs for dashboard implementation, but that it shares similarities with other implementation projects. Second, the CSF list that resembles Pauwels et al. (2009) and Skorka (2017) the most is Villamarín García and Díaz Pinzón (2017). This makes sense since the dashboard is also a BI solution. Building a prototype is mentioned only in these articles, making it possibly an important CSF for this kind of technology. However, it is difficult to draw solid conclusions from this comparison as the lists vary so much in scope.

Change is an inherent and important theme in implementation projects. While change management is specifically mentioned in only three of the articles in Table 2, many of the other CSFs have something to do with the subject of organizational change and how it can be accomplished successfully. Milis & Mercken (2002) divide change management to change that happens within the project and change that is provoked by the outcome. The first one refers to changes in e.g. the project scope during the project. New

requirements need to be included to the project plan, formalized and properly communicated by the project manager. The second one, change provoked by the outcome, is related to dealing with user resistance and securing the commitment of all parties involved, i.e. the project team, users and top management. (Milis & Mercken 2002, 111.) Therefore it seems that change management is connected to other CSFs such as top management support, open communication, training, user involvement and readiness to change, to name a few. Change-related CSFs will be discussed together in the following chapter.

### *3.4.2 Success factors related to change*

Most of the literature on implementation projects discussed earlier (e.g. Papalexandris et al. 2005; Villamarín García and Díaz Pinzón 2017; Van Wart et al. 2017) agree that proper change management measures are needed for a successful implementation project. Change, in short, is an alteration in the way that things are done, and it happens through change agents such as people, structures and technology. The need for change can result from a number of internal and external forces. Change management is the act of managing processes that bring changes, such as implementing new technologies, business processes or structures. The goal of managing these processes is e.g. to reduce risks and costs of the implementation and to optimize benefits. People are a major focus point in organizational change, since it is ultimately up to them whether the change is a success or a failure. Therefore in order to facilitate large scale organizational change, managers first have to achieve change in individuals by means of e.g. measuring, motivating and rewarding their performance. (Murthy 2007, 3, 22–23.)

Individuals react to change in different ways, but essentially it presents itself to them as either an opportunity or a threat (Murthy 2007, 145). Change may also appear differently for people on different levels of the organization. For top management change is often a new opportunity, but for lower management and employees it might not be as welcome. Therefore managers should try to understand what the particular change means from the viewpoint of the employees. (Kasurinen 2002, 326.) Managers implementing accounting innovations often claim that the innovations will support the needs of different organizational levels, such as the decision control needs of top management and the managerial needs of lower management, while in reality the new innovation may turn out to primarily serve their own interests. While innovation in decision control potentially creates value for top management, at the same time it creates negative value effects for lower level management. In these lower level managers the innovation may cause resistance, and the system will therefore not succeed in achieving its objectives. (Abernethy & Bouwens 2005, 217.)

User resistance has been identified as one of the main reasons for implementation failures (Kim & Kankanhalli 2009). Resistance to change is not irrational, even though it might seem like that to the project managers. In fact resistance may be a result of actual fears and uncertainties that arise from organizational and historical factors. It is only through understanding these factors that the reasons for resistance can be examined. Trying to overcome resistance by using force may result in a fight for control and bring up even more resistance. (Scapens & Roberts 1993, 30.)

Kim and Kankanhalli (2009) studied the reasons behind user resistance in large-scale information system implementation, focusing especially on the time period before implementation. The researchers created a theoretical model for user resistance by combining technology acceptance and user resistance theories, as well as a status quo bias perspective. Status quo bias theory attempts to explain why people prefer to keep their current status or to stay in their current situation, i.e. why they are biased towards it. The main finding of the study is that switching costs directly and indirectly increase user resistance. Switching costs represent the perceived costs that a user would incur in case they change to the new system that is being implemented. These costs are a combination of the short and long term costs of changing to the new system, the uncertainty avoidance of people and the negative psychological effects that result from it e.g. favoring the safety of the current system over the uncertain new system, and finally the sunk costs that have already been invested in the current system. The researchers state that switching costs critically affect user resistance both directly and indirectly though their effect on the perceived value of the new system. These costs should therefore be reduced in order to reduce user resistance. It was found that one way of decreasing switching costs for users was to have a positive colleague opinion. Opinions of other colleagues affect the beliefs of users in situations of uncertainty. Management can try to generate positive opinions by e.g. persuading opinion leaders to accept the system first, who can then act as examples for others. Switching costs are also reduced by boosting the users' confidence in their abilities to adapt to new situations i.e. their self-efficacy to change. Self-efficacy can be increased for example by training, which boosts both skills and confidence. Providing enough time and resources for training is also said to increase the organizational support for change. (Kim & Kankanhalli 2009.)

Continuing with training, it is connected to clarifying the purpose of the new system, whereas the lack of it is a barrier to success (Lueg & Vu 2015, 317). Similarly Milis and Mercken (2002) say that training "demystifies" the project. The more users are taught about the new application and its possible advantages, the more accepting they become toward it. User satisfaction is connected to extensive, high-quality training. (Milis & Mercken 2002, 111.) Another CSF – readiness and ability to change – also relates to this. Despite high motivation to use the system the employees might still have difficulties to act on it because of their limited understanding of the system. Ability to change is

then also connected to clearly understanding the project vision and goals. (Lueg & Vu 2015, 314.)

How extensive the training should be, however, depends on the users. In Yeoh and Popovic (2016) it was found that ongoing support after implementation was more important than training sessions. This was because the users of the new BI tool were already familiar with its technology and functions, which meant that a lack of extensive training was not considered a critical factor. However, supporting users upon request was found critical especially during the early stages of implementation, and that it influenced system use. (Yeoh & Popovic 2016, 143.)

One of the most often proposed change management practices in implementation projects is user involvement (e.g. Agostino & Arnaboldi 2011; Lueg & Vu 2015) or user orientation (e.g. Yeoh & Popovic 2016), which was mentioned in five of the articles in Table 2 as a CSF. While not exactly the same thing, in this study user orientation and involvement are connected under the same CSF because they are very similar: user orientation refers to designing and implementing the system based on the needs of the end user, which implies that users also participate in those processes. According to Abernethy and Bouwens (2005, 232) getting users involved in the development and implementation processes minimizes resistance and greatly increases their use of the system. Also according to Lueg & Vu (2015, 315) the support of individuals is increased when they are involved in the implementation process. The researchers write that user involvement enables users to set their own objectives and choose the measures to be put on the new system, which in turn makes them more committed to the project.

There are some studies about the setbacks related to not involving users in the development process. Milis and Mercken (2002) present a case where top management expected that the users would resist the new system, and thus decided to keep them off the project. When users could not give input to the development process the mistakes in the system did not appear until late in the project. Additionally the users did not feel that the application was made for them and were not committed to using it. It turned out that when expecting resistance, keeping users out was not the right thing to do. (Milis & Mercken 2002, 111.)

The need for change management varies during the implementation project cycle. It is most apparent during the first and the last phases. In the beginning a lot of effort is needed to get the commitment of all relevant parties, whereas in the end of the project the system needs to be sold to the stakeholders and all the relevant knowledge needs to be transferred forward. (Papalexandris et al. 2005, 225.) Also according to Lueg and Vu (2015, 315) having the users involved in the project particularly at its early stages is beneficial for reducing resistance to change and increasing motivation.

Jenko & Roblek (2016) write about a shift in focus in ERP implementation literature. At the same time as the technology has matured over the years, the focus in implemen-

tation literature has shifted from technical skills and IT infrastructure to human factors. The importance of e.g. user involvement and open communication as critical factors has therefore become more widely accepted. (Jenko & Roblek 2016, 147.)

However, as much as user involvement is praised in implementation literature, it too may have some negative side-effects. For example in Andon et al. (2007) a company was implementing a new performance measurement system with metrics that were co-developed by the employees. The new metrics created a situation where individual performance targets for customer service personnel were given a higher importance than the quality of customer service itself. The measures were time-based and started generating extra pressure for the employees, who adapted to this pressure by inventing ways to game the system in order to make their own performance ratings appear higher. The employees also started to share these techniques with each other. (Andon et al. 2007, 287.) Reward programs are proposed by Papalexandris et al. (2005, 217) as a way to reduce resistance and to better motivate managers to gain ownership of the project. Lueg and Vu (2015, 317) also write that rewarding reduces resistance and ensures commitment. The authors also state, however, that companies should be careful when setting up reward systems, since they can lead to dysfunctional behavior if poorly designed, as was seen in Andon et al. (2007).

Expectations management was mentioned in three of the articles as a CSF. As already discussed, managing user expectations is crucial to success: too high expectations may lead to higher usage rate in the beginning, but if the system does not live up to its expectations it will be rejected, whereas too low expectations reduce motivation to use the system at all (Pauwels et al. 2009). How expectations can actually be managed is not discussed in detail. Villamarín García and Díaz Pinzón (2017) write that user expectations should be well defined and that the implemented solution has to fit user expectations. This is connected to many other CSFs, such as user-orientation, clear vision and objectives, and open communication, which is discussed next. According to Van Wart et al. (2017, 532) communication should be effective, open and transparent. According to Jenko and Roblek (2016) communication can mean the communication skills of an individual or the efficient exchange of information which creates knowledge sharing, continuous improvement and learning within the project. The researchers name communication as one of their primary human CSFs, and note that it has to be open, honest and efficient. They also state that communication and collaboration should be at the core of the implementation process. Collaboration between departments is also increased the more communication there is between them. (Jenko & Roblek 2016.)

Finally, success of implementation projects is affected by users' satisfaction of the system and their attitudes towards it. These are discussed next. Wieder et al. (2012) discuss user satisfaction regarding the use of BI systems and present a paradox. People who use BI systems frequently and are more advanced in their skills tend to explore the

boundaries of such systems and ask more difficult questions. They are therefore more likely to find mistakes in the system compared to the average user, and consequently they are likely to become less satisfied with it. When exploring the real potential of the BI system they run into more problems, and become more taxing to handle for the IT-department. On the other hand the average users, who never venture beyond the standard functionalities that fit their everyday needs, are more likely to be happy with the system. While these satisfied users seemingly provide evidence that the system works, according to the researchers they more likely indicate that the system is not used properly. These kinds of users are in fact underperforming and thus the full potential of the system is not experienced. (Wieder et al. 2012, 26.)

As already discussed user acceptance of new systems is related to the users' willingness to change and their attitude toward the new system. Some negative attitudes can be changed by the CSFs discussed before, such as open communication and user-orientation, but negative attitudes may arise from a variety of places that may be unrelated to the project. While these attitudes may be impossible to change, their effect on project success can be significant. The causes of these attitudes and their effect on the project will be discussed next.

Campbell and Grimshaw (2016) studied user attitudes toward information system implementation. When people are not motivated nor able to process information for decision making, the logical step is to rely on *heuristics*, e.g. rules of thumb, intuition and educated guesses, and *peripheral influences*, i.e. easily available information, such as how credible the information source is and how well the information is presented. If the user's attitude toward a new system is based on these factors, it is weaker and less durable than an attitude based on facts, figures and logic, i.e. the *central influences*. Unfortunately it is common that the attitudes of users toward information systems form like this, and are based on what system champions may see as irrelevant issues. The researchers state – similarly to Wieder et al. (2012) – that these types of users who do not think deeply about the system are a barrier to implementation. (Campbell & Grimshaw 2016, 179–180.)

Campbell and Grimshaw (2016) go on to discuss a wide variety of these heuristics and peripheral influences that affect implementation projects. First of all is the habitat i.e. influences coming from the wider environment. People tend to want something better than what their neighbors – in this case competitors – have. If the employees think that other parties have something better, it may cause resentment toward the new system, and conversely they might be very accepting, if the system is deemed better than what competitors have. Industry trends have a large effect too, and people who are affected by them think that the rest of the industry must be doing it right. Therefore instead of going through large amounts of information to make a decision, companies copy each other. Brand names and loyalty to past providers also affect user acceptance,

since users are more likely to accept systems by reputable brands or providers they already have a close relationship with. Factors affecting user acceptance related to the functions of the system include interface aesthetics, user comfort, personalization and control options, and even physical beauty and location in the case of hardware implementation. The last set of factors – called primeval by the researchers – is related to the tendencies of humans to favor their own people and react emotionally. Tribal behavior can appear in strong loyalty to region, country or religion, and prejudice toward others. For example remote locations with smaller populations may be more loyal to their local community than the company. Sexism is another type of prejudice that may affect implementation, along with suspicion or unrelated antipathy toward the people in charge. An example of this is resistance to propositions by new authority figures who have arrived as a result of mergers or takeovers. (Campbell & Grimshaw 2016, 187–190.)

# 4 DASHBOARD PROJECT AT THE CASE COMPANY

## 4.1 The case company

The case company, called Group, is a manufacturing company headquartered in Finland. Group has around 25 000 employees working in over 30 different countries. The company consists of five divisions which differ in their business and products. The divisions are further divided into segments, sub-segments and business units i.e. factories.

The study took place in one of the divisions of Group, simply called the Division. Of the five divisions of Group, the Division is the largest in terms of revenue and the second largest in terms of personnel. Its production plants are situated in Europe along with one factory in Asia. The Division aims to beat its competition by being better able to meet customer needs, as well as by improving operational efficiency and profitability.

## 4.2 Case overview and data collection

The study took place between April and October of 2017, while the author was an employee at the case company. During this time the Division was implementing a dashboard for use at the divisional level. The initiation for the study came from the side of the company, as they wanted to hire someone to write a Master's thesis that would be related to the implementation project. At that time the suggested topic for the thesis was "Digitalization of reporting and change management". In the beginning a few different ideas for the thesis were discussed before deciding the final topic.

The dashboard project can be roughly divided to three phases, which are development, testing and implementation. Most of the development was done before the study period began, but some of it was being done simultaneously with the testing phase. Testing began in late May and continued until the end of the study period. During this time new dashboard reports were being released for testing from time to time. The actual implementation of the dashboard – meaning e.g. the beginning of its use and user training – had not started before the study period was over. Therefore the real consequences of using the dashboard in the short or long term could not be studied. This was a known possibility at the beginning of the project, and thus the focus of the thesis was the dashboard project itself and how different actors in the organization experienced it. The critical factors related to the actual implementation are based on past experiences of interviewees and plans that were made during the study period.

Two teams were created for the execution of the project: the project team and the steering team. The project team is in charge of the execution of the project and the run-

ning tasks involved, whereas the steering team is in a guidance role. Other actors that are often mentioned in this chapter are the Group Leadership Team (GLT), which is the highest organizational level in the company led by the CEO, as well as the Division Leadership Team (DLT), which is in charge of the Division. The project team consists of six people: a business controller, a factory controller, a director of reporting and analysis applications, a credit manager, the author of this thesis, and the project manager who is also a business controller. The steering team is led by the SVP (Senior Vice President) of Division controlling, and it also includes a factory director, a head of risk management and a sales manager.

The research data was gathered using semi-structured interviews. Semi-structured interviews use a defined set of topics and themes, but it is possible to change the questions and their order for each interview. The advantage is that the interview is closer to a natural conversation than a structured interview. However, the interviewer has to make sure that all the planned topics are discussed and that there is also time for more in-depth questions. Due to the fact that the questions are different or at least presented differently in each interview, the interviewees might interpret them differently, and thus comparing results may be more difficult than by using a structured interview. (Eriksson & Kovalainen 2008, 82.)

Interview questions can be divided to positivist, emotionalist and constructionist questions, based on the types of research questions in the study. Positivist questions seek to find out the facts and therefore the focus is on gathering information, and to compare this with data from other sources to analyze the "truth" of the situation. Emotionalist questions are more focused on the experiences of the interviewees as well as their personal views. Constructionist interviews are designed to focus on the interaction between the interviewer and the interviewee. Instead of following a well-defined question set, the interview resembles normal conversation, and can go into many directions depending on the interaction. (Eriksson & Kovalainen 2008, 79-80.) Based on these definitions, the interview questions in this study are mostly positivist and emotionalist in nature, but the interviews were also at least partly constructionist. The questions were designed in order to gather information about the dashboard and the implementation project, as well as to find out how the interviewees personally were experiencing the situation. A question set was prepared for each interview, but the goal was not to rigorously follow this set. Instead, the goal was to let the discussion branch out if there seemed to be more to discuss about a certain topic, but if not, the question set was followed as a guide to cover all the important areas. Below is a table of the interviews that were conducted for the thesis.

Table 3 List of interviews

| Person | Date | Position | Role in the project | Interview theme | Duration |
|---|---|---|---|---|---|
| Int1 | 31.5.17 | Business controller, Division | Project manager | Project overview and goals | 30 min |
| Int2 | 5.6.17 | SVP, Division controlling | Chair of Steering team | Project overview and goals | 60 min |
| Int3 | 4.8.17 | Area sales director | Not involved | Dashboard, past projects | 45 min |
| Int4 | 21.8.17 | Factory director | Not involved | Dashboard, past projects | 60 min |
| Int5 | 21.8.17 | Factory controller | Not involved | Dashboard, past projects | 50 min |
| Int6 | 19.9.17 | VP, Group Special projects | Not involved | Dashboard, Group projects | 60 min |

The interviews took place during different phases of the project. Interviews were conducted in Finnish, and the question sets and answers were later translated to English for the thesis. All of the interviews were conducted in a live situation: interviews 1–3 and 6 took place at the company headquarters, while interviews 4 and 5 were conducted at one of Division's factories. All of the interviews were also recorded and later transcribed.

The first two interviewees were involved in the implementation process, the first one being the project manager and the second one the head of the steering team. They were interviewed in order to better understand the dashboard system, the course of the project and the underlying situation in the company. Based on the results of the first two interviews it was decided that interviewing future dashboard users from sales and from the factory level would be interesting for the study. Int6 was interviewed to further elaborate the role of dashboards and digitalization in the Division as well as Group. The results of the interviews are discussed in the following chapter.

As mentioned before, during the study period the author was an employee of the company and a member of the project team implementing the dashboard. This created suitable conditions to get a closer view of the project and to get access to versatile material for research, which would have been difficult to get otherwise. Arranging interviews with organizational members was also made easy, and they could all be conducted face-

to-face. The interview results are, however, personal and subjective experiences of the interviewees, and therefore generalizing these results is not reasonable. The main limitation of the study is the time frame. As user training and launch had not begun before the study period was over, it was still unknown whether the dashboard would be successful or not. This limited the possibilities to verify which critical success factors are the most critical for this particular project. However, as the main benefits are not likely to appear in a short time after launch, it might not have made a major difference for the results of the study even if the dashboard had been launched during the study period. Finding out how widely the dashboard is being used and whether users are satisfied with it might also take a long time and therefore not possible to achieve within the time frame given for this thesis.

## 4.3 Dashboard project

### *4.3.1 Functional and visual features of the dashboard*

The new dashboard is divided to mobile reports, paginated reports and Power BI reports. Paginated reports are similar to the old divisional reports used in monthly reporting. They are essentially printed versions of the dashboard with some design changes and can be accessed offline. While not interactive, the goal in creating the new paginated reports is to standardize monthly reporting and to automate it. The mobile reports on the other hand can be accessed online on the computer or a mobile device. There are around 15 mobile reports in total and they are divided to different areas e.g. cash flow, EBITDA and net fixed costs. When opening e.g. the cash flow report the user can examine the specifics of cash flow on the segment, sub segment or factory level, as well as look at monthly, quarterly or yearly trends and comparisons. Finally, the Power BI reports have even more interactive functions to facilitate analytic tasks for controllers. Users can for example drag and drop different items to create their own dashboard reports. Not all of these reports are open for everyone, however. User restrictions are put in place to ensure that only the relevant information for each user is visible for them.

In addition to copying the Group dashboard, the Division also wants to add new functionalities to it. These include mobile use, being able to add comments, and also to export standardized PDF and PowerPoint documents for monthly divisional reporting needs.

The new dashboard aims to become the primary tool for management reporting. It needs to be understood not only by controllers or business people, but by people from other disciplines as well. According to the project plan the objectives of the implemen-

tation project include the improvement of reporting efficiency and transparency, the development of a self-service tool for understanding business, and having a high-quality and stable system support for the business owners.

The dashboard is supposed to collect and visualize data from a variety of information systems and databases. The main source of data is a management reporting system containing mostly financial data. Along with that the dashboard will include sales data, results of customer satisfaction queries, data about accidents, KPIs and some other tools. Later on the dashboard is supposed to be linked to the SAP ERP system. At the time of the first interview the link to SAP was at a test phase. (Int1.)

When the dashboard is ready and functional it should be in the use of 50–100 people. These include management teams of different levels: the DLT, segments and functions e.g. sales, finance and production, as well as controllers on the divisional and factory levels. (Int1.)

### *4.3.2 Background*

The current dashboard project is not the first attempt at creating a dashboard for the Division and in fact they used to have another dashboard in use a few years ago. However, the previous dashboard failed to reach its goals due to a number of problems in development and implementation, e.g. it was only used by a very limited group of people, and it was lacking in features such as interactivity, ease-of-use and visual style. (Int1). According to Int2 what the project was lacking the most was change management. The implementation was too focused on the technology and not on changing the daily practices of users or the reporting culture in general. (Int2.) However, neither Int1 nor Int2 were directly involved in the previous project.

The previous dashboard was based on a platform created by a software company called Datazen. Datazen has since been acquired by Microsoft, and the platform has subsequently been greatly improved. After seeing this new and improved platform the CEO of Group started to push the idea of developing a dashboard for use at the highest organizational level i.e. the GLT. After having seen this Group dashboard the Division thought that a similar tool would be useful for them as well, and thus they started the project of developing and implementing one. (Int1.)

Int6 has firsthand experience of the Group dashboard and its implementation. The dashboard has been in use for a bit over a year, and during that time all of the Group-level reporting has been made automatically in a dashboard-environment. The dashboard can also be used to create ready-made presentation materials, which can be used offline and as attachments in meeting transcripts. The project has been long but the GLT is said to be very pleased with the new system. (Int6.)

When asked about why is right now the time to create the Division-dashboard, Int1 says that it fits with the overall changes in the Division. Recently there has been a lot of changes in the Division's finances, and a judicial separation of the Division from Group has taken place. The platform has also improved in a way that it could now be more useful and beneficial than it has been before. Especially the interactive features have been developed further, so that the dashboard is not just a static collection of graphs and numbers anymore. (Int1.)

Int2 also mentions the improvement of the platform as one of the key reasons for implementing it right now. While the idea of a performance management tool is not new and in fact there have been other similar tools in use before, he has not seen this type of platform before that would fit their scale of business, allow mobile use and be available in an app form, all at the same time. Int6 also mentions the improvement of the technology as a major reason. All divisions have their own dashboard projects and next year there is supposed to be even more. Another reason is that there has been a lot of background work in systems and databases in Group and the division, which has made it possible to gather information reliably from different sources. A properly functioning infrastructure provides the basis for dashboards. The knowledge about dashboards also increases the more people develop them around the company, which has made it possible to increasingly rely on the company's own resources in developing and implementing them. (Int6.)

When discussing with the other interviewees it became clear that the reasons for implementing the dashboard had not been clearly communicated to them yet. Therefore the interviewees were asked to make their own conclusions about the Division's aims with the project. The answers turned out to be quite similar to those of Int1 and Int2. Int3 sees that the dashboard technology is a part of the present-day and is similar to other digital technology projects being undertaken in the Division. In the opinion of Int4 getting more information online and increasing transparency seem like probable goals for the Division. Int5 thinks that the aim is to make information the same for everyone and to have it in the same system. Int5 also mentions that copying Group must be a big reason as well as making the Division less reliant on Group-level systems.

### *4.3.3 Purpose and goals*

The dashboard is hoped to provide a series of benefits, the most important of which can be divided to time saving, standardization of reporting practices and making information more available and accessible within the Division. Under current reporting practices a lot of the work time of divisional controllers is spent creating Excel and Powerpoint documents and forwarding them around in emails. The time spent on that could be

spent on something else, such as analysis. The dashboard would facilitate this change. (Int1; Int2.)

Int2 further stresses the importance of standardization. At the moment there are many parallel information systems and ways of presenting performance data, especially on the factory level. Each factory has their own internal reporting practices which makes it difficult to draw comparisons between them. Different systems can create alternate versions of truth, or shadow costs that are visible in some systems but not in others. The dashboard, providing a standardized reporting platform, is hoped to change this. In a few years' time the dashboard is supposed to replace these old systems – if not completely, then for the most part. (Int2.)

Int4 – a factory director – sees the main benefits of the dashboard similarly. Through standardization the dashboard would make it possible to compare financial information between factories. This information would be useful for DLT as well as factory leadership teams, provided that the numbers themselves are comparable. Int4 sees the dashboard as an improvement of the monthly reporting package: making it automated and adding interactive drill down features. However, the time saving benefits will be for the Division, not the factories. (Int4.)

As for the goal of replacing factory systems, Int4 says that with its current functions and scope the new dashboard could not replace any systems they are currently using at the factory for running their operations. The main reason for this is that their need for detail is much higher than on the divisional level. For example, on the dashboard the user can view variable costs for specific factories and see what they consist of – e.g. raw materials and energy – but they cannot drill down to the components of those costs. This sort of information is crucial for running operations, making the dashboard unusable for operative purposes at the factory level. Factories are also operating around the clock, which means that when something goes wrong, corrective measures have to be taken instantly. The dashboard is only updated monthly, making reliance on such information impossible. Thus the dashboard could only replace the current factory systems if it could provide all the information they can, and as quickly as they can as well, which it cannot do in its current state. However, as a tool that is used to give an overview of the situation at the whole Division, the dashboard works well. The dashboard reports should be short enough and to quickly provide critical information e.g. through the use of graphs and colors. (Int4.)

Int1 sees the dashboard project as being a part of an overall change process in the company as well as of the current digitalization trend in society. Digitalization is also seen as an extremely important part of Group strategy. As an example of this Int1 mentions an annual conference that took place last week prior to the interview, where ca. 300 company employees along with many top management members discussed digitalization for a whole day. As much as digitalization is discussed, however, a great amount

of the financial reporting even on the higher level is being done by manually producing Powerpoint presentations. Recent improvements in management reporting systems – e.g. the systems becoming more interactive and requiring less manual labor – are also a part of digitalization. (Int1.) Int1 clarifies the strategic meaning of the dashboard and its role in reporting in the following way:

*"There is a lot of information within the company. We just have to learn to use…decide how we want to use it, learn to use it and then get the tools for it."* (Int1.)

According to Int2 promoting digitalization is high on the agenda of the DLT and the dashboard can be seen as a concrete example of this digital change. However it is only one project among others, and a small one at that in terms of budget. The DLT goes through the projects once a month. Despite the small size of the project the technological potential of it is considered to be high in the coming years. (Int2.) Int6 also sees a link to company strategy through digitalization. The dashboard supports the tracking of strategic objectives and also helps in achieving them. He also says that while monetarily dashboard implementation is a small project, the changes it brings to processes and work practices may be remarkable. (Int6.)

Int2 sees another link to the company strategy, saying that the current role of the Division in the company is to provide good cash flow. Based on the outlook that the demand for the Division's products is slowly declining globally and continues to do so in the coming years, the Division is not executing a growth strategy. With the real sales price declining every year, good cash flow cannot be achieved without improvements in cost-efficiency and profitability. In these circumstances it is very important to see how cash flow is developing, and therefore a tool that can be used to closely analyze cash flow and the factors affecting it has strategic meaning for the Division. (Int2.)

Another effect of having a mobile reporting tool is the increased accessibility to critical information. Managers could now view performance information anywhere and anytime. As an anecdote, Int2 says that it is startling to sometimes notice how many people in the Division who are in leadership or management positions cannot name the specific costs they are supposed to be managing. With the dashboard that sort of information can, if necessary, be accessed anytime on the screen of a phone or a tablet. The dashboard then also serves as a control mechanism used to increase knowledge about costs and profitability in the organization. (Int2.)

Int3 sees the mobile use and commenting as welcome functions for the dashboard, as for any other organizational tool for that matter. According to her, if the dashboard can be used anytime and anywhere, it should also be required to do so. For that to work the system needs to work flawlessly even with a weaker connection. However, in addition to a number of useful tools and the benefits that they have brought to working practices,

digitalization has also brought changes to the customer base and their needs, which poses challenges for the Division. Digitalization has been a driving force in the decrease of sales in some product groups in recent years and in the future. (Int3.)

There are some issues that are linked to mobile use. Having all information available all the time may lead to further blurring the difference between work time and free time. Another issue might be information overload, although the dashboard should only contain the most relevant information and therefore help with this issue. Mobile use has also raised the question of security. Losing a phone may potentially be a security risk if the data gets into wrong hands. Therefore there needs to be someone who can quickly restrict the user's access to the dashboard if an accident happens. Having personal PIN-codes and training users to be more disciplined with their devices are also ways to solve this problem. (Int6.)

Int5 says that mobile use will be interesting or important mostly for people who spend much of their work time travelling, such as sales people and the leadership team. On the other hand people who spend most of their work time on a stationary computer will rather use the dashboard there, making mobile use unimportant for them. (Int5.)

As for the commenting feature, Int6 says that it is one of the best features of the dashboard. Adding comments to reports is becoming more important in business controlling and in fact one of the biggest setbacks of previous dashboards has been that they haven't included a prebuilt commenting feature. (Int6.) Int6 has this to say about commenting:

*"Adding comments is---an equally important or a more important part than the numbers there. The numbers themselves don't necessarily tell much if there is no background information."* (Int6.)

The commenting feature is the most promising feature for Int5 as well, and it should also bring the biggest change to work practices if it works well. Being able to clearly see what figures specific comments are referring to is a critical factor though, otherwise the feature becomes useless. (Int5.)

### *4.3.4 Development*

In the Division the dashboard project is driven forward by the Finance & controlling function. The function receives strong support from the financial and reporting leadership of the Division, which Int1 names as the biggest driver of change. Int1 also names communication with the DLT as one of his responsibilities as project manager, and says

that communicating with them is important in order to get users for the dashboard when it's ready and functional. (Int1.)

Int2 also sees that the business controlling function is driving the change and that they are supported by the highly committed DLT. He is not certain how relevant the tool is to other parts of the divisional organization. Mostly people who have a regular need to track and analyze the factors behind financial data will find the dashboard interesting and benefit from using it. (Int2.)

Int4 and Int5, a factory director and a factory controller, see the tool being mostly beneficial for people at the Division, not the factory. Int4 says that the data on the dashboard is too general to be of use in factory operations; they have their own systems for gathering that sort of information. Int5 says that some of the dashboard reports could save some time from her work, but that overall most of the information is not detailed enough to be useful. In her opinion the dashboard can show what something is, but it cannot show why.

The project goals have been set by Int1 along with his superior, who is a member of the steering team, and Int2. The proposed goals set by the controlling organization have then been verified with the DLT. Further input and verification has been asked from the factory controlling network. (Int1; Int2.) The programming of the dashboard is done by an external organization. The project manager discusses technology-related topics with the company's own IT-resource, who then forwards the information to the external organization for execution. (Int1.)

According to Int1 the future users have been taken into account in the development process. Different functions of the DLT have been interviewed about what they want to have in the dashboard. Also the steering team consists of representatives from different functions, such as production, finance and sales. The discussions with DLT have mostly been about functional factors e.g. what metrics should the dashboard have. There has also been some discussions about functions, regarding how the measures should be presented e.g. in millions of euros, euros per ton or something else. As for visual factors, comments have been few. Generally speaking the DLT has commented that the dashboard looks good, but they haven't provided further requirements for how they would want it to look. (Int1.)

Int2 has somewhat different views about how well the different users have been included in the development process. People who use the current financial reporting package are spearheading the dashboard project, but regarding the involvement of other types of users, it is not so clear if it has been done well enough. He sees this as a possible area for development. (Int2.)

Int6 sees that user involvement is crucial throughout the project, also during development. The project team shouldn't decide by themselves what to include in the system, but instead they need to regularly discuss with end-users. Regular discussions keep the

project fresh in everyone's mind and ensure that people are already familiar with the system at launch. (Int6.)

### *4.3.5 Implementation*

In the opinion of Int1 and Int2 the problems in the implementation of the previous dashboard have been taken into account this time. Int1 says that this time there is a bigger emphasis on user training, instead of "throwing them a link and telling them to start using it". The technology has improved since last time, which should also serve in making the tool appear more valuable to users. In addition to that the different functions in the Division have been involved more in the development process. (Int1.)

Int2 agrees that previous problems have been considered, but he is unsure whether the actions taken have been enough. The success of the project is reliant on the implementation and the risk is highest in that area. He has no doubt that the technology will work. Even if all the planned features are not completely usable today, they will be after a few years. The new technology is simply so much handier compared to current practices that it will eventually replace them. Despite the superiority of the tool it will, however, take time for management and key personnel to adopt it. (Int2.)

The financial leadership of the Division is the biggest driver of change for the project (Int1). Ensuring that leaders and other key personnel adopt the dashboard first is highly important, because when they have accepted it and started using it, they can in turn start requiring its use from others. This could possibly start a snowball effect in the adoption process. If for example a manager is looking at a certain set of figures from the dashboard and inquiring about them from e.g. a factory controller, it's better for the controller to be looking at the same set of figures, instead of figures provided by a separate factory-specific system. (Int2.)

On the flip side, the biggest threat for the success of the project is that – for some reason – convincing the leadership team will not work out. One of the reasons could be that they see it as extra work. In the eyes of the leadership team, reporting already works well. Currently they receive readymade reports by email, but with the dashboard they would have to use the app themselves to get the information. Even if they are adept at using technology they still might not see the benefit of the dashboard compared to earlier practices. However, the spirit of the DLT toward the project is said to be positive, and Int2 says that all the key personnel think that the dashboard is going to work. The change will, however, not happen overnight. (Int2.)

Int3 discusses some the biggest threats for the implementation. For example if the system doesn't work or it works too slowly, if it's not simple enough to use or if there is no user support for beginners, the motivation to use the system will die very quickly.

Beginning users may ask seemingly very simple questions, which are nonetheless very critical for them. Thus there has to be support personnel to answer them. After the initial excitement for the tool wears off, users have to be able trust the system and the data it provides to ensure continuous use. (Int3.)

Similarly to Int3, Int5 names data quality as the biggest obstacle for implementation. Reliability of the system is the most important thing, timeliness of the information second. Regarding past IT implementation projects in the company, she says that a common issue has been that tools are launched when they are incomplete i.e. insufficiently tested and full of bugs. Tools are pushed out under time and financial pressures, which often results in mistakes. Unfulfilled promises have been another source of problems. For example the implementation team may promise to fix certain problems in the system without fully knowing the capabilities of the technology. If it later turns out the problems cannot be fixed, users become disappointed. Regarding long term use, Int5 thinks that people will continue using the tool as long as the data is correct and timely. One possible negative effect of the dashboard would be a decrease in communication. If the dashboard gave people an idea that they don't have to talk to anyone anymore in order to find information, but instead used the dashboard as a "crystal ball" where they can find everything, it would be problematic. However if this happened the blame would be on the users, not the system. (Int5.)

For Int4 the most critical factors for implementation are to have clear objectives, to know what the system is used for, and to properly communicate this to the users. The system has to be tested and ready with all non-working functionalities removed at the time of launch. Even with all that being done, there will always be something left to fix in these kinds of systems at the time of launch, since the mistakes only begin to appear when people start using the dashboard. Therefore the project should not be stopped at launch, but in fact there should be someone who is responsible for handling user feedback and making corrections to the system. Regarding user acceptance, Int4 says that no matter what the system is like, some people will use it and some will not. If the launch is handled well and the objectives are communicated clearly – i.e. the system is not sold as something that it's not – the possible dissatisfaction should be minimized. (Int4.)

Int6 says that there should also be a clear chance management plan, which contains information about e.g. who the key stakeholders are and what kind of communication or guidance they need concerning the project. It's important to identify the users that are likely to be the most negative toward the project. The project team also needs to have plans about what to tell the stakeholders and when, in order to have the process working fluently and to prevent situations where contradictory information about the project is given out. (Int6.)

In late September the specifics of user training had not been planned yet. The goal in early June was that the users would be trained live on the spot during different events

(Int1). The aim was also to focus the training on the matters that were the most relevant to each user group.

Regarding training, Int6 says that it is useful to give different training options for the users, such as good training materials and a possibility for further training. On top of that there should be key users who are familiar with all the calculation logics behind the numbers and who can be contacted in case something goes wrong. Not all users are as familiar with financial figures as the project team members. What type of training is best depends on the project, the users and the content of the system. (Int6.) Int5 also mentions that taking different user groups into account and planning the training accordingly is very important. Some employee groups may not be familiar with certain financial figures, so there can be no doubt left whether the figures on the dashboard represent e.g. millions of euros or percentage compared to previous year. Another problem that has come up in past training events is that the presenter has only had knowledge about how to navigate the system, but no knowledge about how it could be used to solve business cases. User support cannot be neglected in implementation. (Int5.)

Regarding how well different user groups are going to adopt the new dashboard, Int1 says that financial people will probably accept it the quickest and also serve in pushing the system to others. Int2 agrees with this and also adds that people from non-financial functions who are handy with new technology and tools won't have problems adopting it either. Int6 thinks that in general people whose job is to develop and steer business – e.g. leadership, controlling and finance – will accept the dashboard first and also act as the drivers of change. Getting users from below e.g. factory management will require that more detailed information is added to the dashboard.

As for the most challenging type of user to sell the dashboard to, Int1 says that it's difficult to name any specific type of user. Trying to convince some people who are not used to using tools themselves, but instead always ask help from others, will be difficult. After thinking for a while he says that sales leadership will probably prove to be the biggest challenge (Int1). Int2 says that he cannot name any specific "showstoppers" for the implementation process. If someone e.g. a factory director fails to see the benefits of replacing the current practices with the dashboard, it becomes a matter of selling and marketing it better to them (Int2).

"*I doubt that anyone will question it (the added value of the dashboard), but we always have to look at it through the mind of the users."* (Int2).

Int6 says that technology acceptance depends on the individual. There will always be people who think that reports do not help them at all. People can be so used to their work habits that changing them will be very hard. However, since the technology has developed, many arguments that could be used against dashboards a few years earlier

are not valid anymore. The quality of the source data remains the biggest issue. If the source data does not provide anything useful for the users they will continue to use the old systems. These could be people who are used to working with weekly, daily or real time information. (Int6.)

### *4.3.6 Implications for future*

Interviewees were asked to evaluate the possible consequences of the project in the Division, both in the case of the project being a success or a failure. Int1 sees that if the project is successful the dashboard could be – for many users – an easy first step towards digitalization. He adds that with a useful tool at their disposal these users could see that digitalization is not so difficult or complex in practice.

Int6 sees that a successful dashboard implementation increases a general understanding and interest toward financial figures. According to him the Group dashboard has generated better discussions about financial issues, since people with different backgrounds can now easily access the same information and bring their own viewpoints to the discussion. Knowledge about where money is coming from and where it's being spent is beneficial for everyone, and brings people to the same level of understanding. Standardization and transparency are likely to increase with the dashboard. (Int6.)

In the case the project turns out to be unsuccessful – which Int1 and Int2 saw as being a result of problems in the implementation rather than the technology – the consequences in the Division would not be very remarkable. According to Int1 the likely story would be that if people didn't use the dashboard, it would first be forgotten and then resurfaced again after some time with someone else trying to implement it. Int5 shares this same notion, and adds that the new dashboard is already a good example of such a process, as it too was once forgotten and now brought back again. Int6 points out that trying to bring the project back after a failed attempt would be much more challenging. He says that these types of systems have to succeed on the first attempt, because otherwise user trust might be lost for good.

Int2 points out that the reporting situation in the Division is not bad to begin with, so instead of coming to fix everything, the dashboard would only be used to take matters forward. He sees the event of an unsuccessful implementation similarly as Int1 and Int5:

*"If this doesn't work out now, then it's going to work out---in the form of some app in the coming years. So the question is mainly about the schedule."* (Int2.)

Int2 sees that new tools will inevitably affect the way traditional ways of reporting, such as Excel, are used. Developing new tools may become a source of competitive

advantage, but it is also a necessity to stay with the competition. While being at the forefront of innovation may create competitive advantage, advantages can also be achieved through productivity improvements and cost reductions resulting from systematically adopting new tools and constantly improving the ones in use. While cost cuts may be achieved through the functions of different applications (i.e. a credit rating application that analyzes the credit risk of customers to avert bad debt situations), cost-efficiency through productivity increases is the likelier path to competitive advantage. (Int2.)

Int2 describes the organization as quite conservative, which means that technological change is challenging to carry out without proper change management. Comparing the company to others in terms of information technology adoption Int2 says that they are not in the forefront but not the worst either and that in their own industry they are one of the best.

How the role of the dashboard will evolve in the company after a few years from implementation is uncertain. Int2 says that the process is at the beginning. He sees that in a few years their basic reporting package, including e.g. financial, sales and production information, could be run in a dashboard environment. He hopes the change would happen faster but also says one has to be realistic about it.

Int1 sees the dashboard's future role similarly. He hopes that in about 6–12 months after launch the dashboard would be widely used in the Division and also that it could be further developed. He sees the current dashboard project as a basis, over which new functions and features could be added later. These could be links to new information systems such as SAP. Adding new linkages is not cost-effective though. Support from Group would be very important in this case, and Int1 sees that Group will have a big role in the future development of the dashboard, since they already use the same platform. (Int1.)

One of the biggest future improvements for Int1 and Int2 could be the inclusion of production information from individual machines in the factories, which could be gathered by connecting the dashboard to different factory information systems. These machine efficiency figures could be useful for the Division, but having them in this first stage of the dashboard is not relevant (Int1). Int2 also mentions this as a possible future project and says that some factories have already showed their interest towards it. However the interest has only been sparked in a handful of people in specific factories, not in the whole Division. Launching a Division-wide system would require that everyone is on board. (Int2.)

Int4 says that they would be ready to ditch their current factory reporting practices if the same information could be found in the dashboard. He describes the dashboard as a good, easy-to-use package, and that any kind of online information is welcome at the factory. However, the benefits of the current dashboard system at the factory are very

limited due to their high need for more detailed information. (Int4.) Int5 says that comparing the factory system to the dashboard is not very sensible to begin with. The factory system is primarily used to run the whole production operation, and in addition to that it can be used to export reports, whereas the dashboard is only a reporting system. Currently the difference in the reports of these systems is also enormous: the dashboard is mostly concerned with monthly figures, whereas the factory system can go as far down as to the millisecond. It can be argued whether anyone would want to view such information on a dashboard. (Int5.)

Int2 discusses the current project and IT projects in general. He says that the dashboard is one part of a larger change that's happening during a long time period, a "long road", as he puts it. This means that if something better comes along later the dashboard may very well be replaced. However, it doesn't undermine the importance of the current project. According to him it's important to make constant smaller steps toward a larger change, to make sure that the organization is moving in the right direction. Even if not all project goals are met this time, if the overall direction has been right, the benefits are likely to arrive at some point. (Int2.)

## 4.4 Critical success factors of dashboard implementation

This chapter will discuss the critical success factors of dashboard implementation based on the analysis of previous literature as well as the interviews and observations during the project. The result is a CSF framework for dashboard implementation, which is presented at the end of the chapter.

All of the interviewees were asked to name the biggest threats for the success of the project. These threats are similar to critical success factors, since it is critical for project success if the threats are realized or not. Some of the threats named by the interviewees are very similar to the CSFs presented on Table 2 while some are less so. The factors that were directly named in the interviews are discussed next. The list includes:

- top management support
- user involvement
- user support during and after implementation
- training
- marketing
- clear vision and objectives
- keeping promises
- proper communication of project goals
- continuing project after launch
- IT infrastructure

- testing
- correct data
- system ready at launch
- timeliness of information
- system stability
- system speed
- easy-to-use system
- easy-to-understand system
- change management

*Top management support* is a widely accepted CSF in literature and the results of the interviews do not challenge its importance. Not being able to convince the leadership team is seen as one of the biggest threats for the success of this particular project. Leaders can serve in pushing the use of the system forward by starting to require it from others and by acting as examples. The DLT is said to be highly committed to the project and to have a positive attitude, at least according to the interviews. The future development of the dashboard is also seen as being dependent on the support of both DLT and Group. Top management support is therefore chosen as one of the dashboard CSFs.

*Clear vision and objectives* was mentioned in five of the articles on Table 2. In the interviews there were similar factors such as *clear objectives* and *keeping promises.* As was discussed in Chapter 2 dashboards can be developed for a variety of uses e.g. strategic, tactical or operational, and for different departments such as finance, marketing or sales. Depending on these choices the users and the purpose for the use of the dashboard are different. In the interviews especially Int4 and Int5 pointed out that during launch the system cannot be sold as something it is not, because it will lead to disappointment and dissatisfaction with the system. In order to avoid this, management has to understand what the system can and cannot do. This can be difficult for two reasons. First, the possibilities of dashboards are not completely clear yet, so the project team might not have all the information. Second, the development is done by an external company, which means that they have most of the technical knowledge, whereas the project team and users have the business knowledge. These fields of knowledge are difficult to connect. If the implementing party or the person in charge of training is not certain that some feature that the users want is impossible to execute, instead of saying no, it could be tempting to leave the matter open or to say that it might be possible in the future. However, in the long run this is detrimental to user satisfaction and may lead to feelings of betrayal. In conclusion, having clear objectives and goals is critical for the success of the project, as it will ensure that the users and the project team know the reasons behind the new system as well as what the managers are expecting to achieve.

Many of the interviewees brought up user-related success factors, such as *user support* and *user orientation. User involvement* was discussed by Int1, 2 and 6. Users, es-

pecially from the finance and controlling function and DLT, were involved in the development process, and they are also considered the main driver of the project. Members from the factory controlling network were also said to have been involved, but when interviewing a factory controller (Int5), it was found that she did not know much about the system except that it was being developed. This on top of the concerns about whether different members of the organization had been involved enough, and the high status of user involvement in previous literature, seems to suggest that user involvement could be a CSF in dashboard implementation as well. Asking for user input about what the dashboard should be like seems crucial for attracting users, and in literature user involvement is linked to gaining commitment and decreasing resistance, both of which are important for user acceptance.

Perhaps even more crucial than user involvement for gaining acceptance is *user orientation*. User orientation appears in many different areas of the implementation process, and it was mentioned as an important factor in relation to e.g. training, marketing and user support. According to the interviews user training should be designed with the needs of each user group in mind, the marketing should be done better if some users fail to see the value of the dashboard, and users should be supported during and after launch. As can be seen, user orientation is beneficial during the whole project cycle. Because of this, user orientation in itself seems too vague to be named as one of the CSFs. Instead, it should be considered as an underlying approach for the whole project. User support is more concrete and should be added to the framework.

While the *training* of users hadn't started before the study period was over, there were plans about how it should be done. The training should be focused on teaching the skills that the users need the most, i.e. what they spend most of their time on. Teaching what to do in every niche situation is not worthwhile. As was discovered in the interviews, focusing on business cases instead of navigating the system should also be an effective approach. While the dashboard is fairly intuitive to use, beginner users need to have someone to answer even simple questions. Another possible problem that was raised in the interviews is the understandability of the system. Confusion may arise from the figures and metrics used, especially for users who are less used to reading financial information. Therefore in order to be more user oriented, training could be complemented with material about the meaning of these metrics or alternatively some sort of glossary could be integrated into the dashboard. In conclusion the quality of training affects many different elements that are critical for success, and it is therefore named as one of the CSFs.

The next issue is *marketing and selling*. This was discussed by Int1 and Int2 as an important part of the implementation phase. Since they believed the technology of the dashboard was superior to current practices and that the data would be correct, selling the dashboard to the users was seen as the riskiest part of the project. There were some

suggestions to how the marketing should be done e.g. to first get top management to use the dashboard and have them start requiring it from others, and what the marketing should be like, e.g. to clearly communicate the objectives of the project and to keep the promises made. Marketing and selling is evidently an important part of the project and it is also related to other factors that were mentioned, such as top management support. Marketing is therefore added to the list of CSFs, but with the addition of clarity and honesty, as their importance was stressed in the interviews, and because without them marketing may have negative effects.

Moving on to technological factors, the most important one is the *correctness of data* i.e. high data quality. Having faulty data was mentioned by most of the interviewees as a threat for the success of the project, whereas correctness of data was cited as e.g. being the foundation of the system's credibility and a driver for its use. High data quality was also mentioned in all of the six articles on Table 2. Therefore it is added to the list of dashboard CSFs.

A factor related to high data quality that came up in the interview of Int4 was *having the system ready at launch,* i.e. tested and bug-free. It is understandable that the goal at launch should be to convince and train people to use the dashboard, which is greatly hindered if the system is buggy or showing wrong data. Implementing unfinished systems was also mentioned by Int5 as a mistake that has been made before and as something that reduces motivation. However, Int4 also said that there will always be mistakes in these types of systems and that some of the mistakes will only appear after launch. Therefore it seems that launching perfectly ready systems might be impossible, but the system should be as ready as possible, so users would not get the feeling that testing has been outsourced to them. Actions taken during development and after launch should help with this problem. For example involving users in the development process would ensure that all the unnecessary features are removed before launch, and testing the system thoroughly would increase data quality and reveal bugs. After launch – as mentioned by Int4 – the project should not be stopped, but instead there should be someone who is responsible for gathering feedback and fixing the mistakes that are found. Because of the fact that having a perfect system at launch seems unrealistic and because mistakes can be fixed later, it seems that having a less than 100 % ready system at launch does not necessarily turn the project into a failure. Therefore it is not a CSF in itself. However, it should be an important goal for the project, because it does increase user motivation and make the system useful right after launch.

*Upgradable and flexible technology* was named in two of the articles in Table 2. The implementing party has plans to develop the dashboard further after it's launched by adding new features and connecting it to new databases. However, it was not mentioned whether the system's inflexibility represents any sort of threat or whether upgradability is linked to project success. For short term success it might not be critical, since for

achieving initial use the dashboard does not need to be upgradable. But for long term success – in order to keep the dashboard relevant for its users – the ability to add new features and to make the system able to respond to environmental changes may be very critical. Therefore this factor will be added to the list of dashboard CSFs.

The rest of the technologically oriented factors from the interviews include e.g. *system stability, system speed* and *timeliness of information*. System stability is related to the reliability of the system, which affects user motivation to use it. System speed was mentioned in relation to mobile use, in that the dashboard has to work well even when the connection is weak. Timeliness of information means that that the dashboard is updated on time. Since it is updated once a month, this factor is perhaps not as critical in this dashboard, as it would be in a dashboard that conveys critical information in real time. These three factors fall under a general *system quality* CSF, which essentially means that the dashboard should function as it was designed to function.

The next technological factors – *easy-to-understand system* and *easy-to-use system* – are more closely connected to system design. The goal is that the dashboard is easy-to-use, that it could be understood by a variety of users from different backgrounds, and that the measures used are quick to comprehend. While dashboards can be used for different purposes, one of the general goals of dashboards is to provide critical information at a glance (e.g. Skorka 2017). This suggests that in addition to the quality of the information, the speed at which the dashboard can convey it is also critical. Therefore the word "easy" is replaced by "quick", i.e. the system should be *quickly comprehensible.* The ease-of-use of the system was mentioned by one of the interviewees as something important, but many others thought that users probably won't have problems using it, because the technology has evolved into a very user-friendly form in recent years. Since it seems unlikely that the system would be too difficult to use, instead of being its own CSF, this factor falls under *system quality.*

*IT infrastructure* was mentioned by Int6, who said that the recent development of databases and systems in the company has made it possible to implement dashboards. Efficient IT infrastructure is a prerequisite for successful dashboards – especially if the aim is to automate reporting and reduce manual labor – and therefore it should be one of the CSFs.

Finally, *testing* was mentioned in a few of the interviews and it seems to be a crucial part of any technology implementation project. For example in this project one of the three phases was called testing. It is also an integral part of achieving *data quality* and *system quality*, and should therefore be added to the framework.

The last of the factors that were directly discussed in the interviews is *change management*. As was discussed in a previous chapter, change management is the act of managing processes that bring changes, such as implementing new technologies, business processes or structures (Murthy 2007, 3). Based on this definition change man-

agement appears more like a general term for different ways of bringing about change, instead of a concrete act. Saying that change management is needed does not say much about what is actually needed and it is therefore too vague to be called a CSF by itself. Some other CSFs – such as clear and honest marketing, user involvement and clear objectives – can be seen as a part of change management, but they show more clearly what actions are needed.

When re-examining Table 2 it is evident that many of the CSFs from the top have already been mentioned. However, the table contains many CSFs that were not discussed in the interviews, at least not directly. The first one from the top is *sufficient economic resources*. It is often mentioned in literature how implementation projects of different technologies have a tendency to fail due to budget overruns (e.g. Jenko & Roblek 2016; Villamarín García & Díaz Pinzón 2017). While the dashboard project is said to be small when compared to other technology projects in the Division, it might still fail because of a lack of resources. From this point of view it would seem that having sufficient economic resources is a CSF. While no one mentioned it in the interviews, it can be argued whether the interviewees considered it too obvious to be discussed. It is however unclear what can be considered "sufficient". The safest way could be to assume at the beginning of the project that something unpredictable will happen, and prepare accordingly with a buffer of extra resources.

*Organizational culture* was discussed in a few of the interviews. In previous literature culture has been mentioned as a CSF quite often, but there are problems with measuring its effect. Considering e.g. the study by Kasurinen (2002, 334) where there was a clash between the engineering culture of the organization and the BSC, the situation at the Division is somewhat different. The dashboard project is driven by the finance and controlling department and it contains mostly financial information to be used mostly by financial people. The logic of the dashboard is heavily influenced by the needs of the financial department and the Division leadership. It is therefore unlikely that the dashboard will create clashes within the financial department. However, as was mentioned in the interviews, some of the DLT members might not see the benefits of the dashboard, since it does bring a change to their work practices in the form of extra work. Perhaps the prevalent culture within the DLT is that they are serviced by the controlling organization, and the dashboard could be seen as a cultural change towards increased self-service, at least concerning monthly reports.

Another possible cultural issue might exist between the Division and the factories. While the factories are a part of the Division, it became evident in the interviews conducted at one of the factories that the tasks and focus of these actors are quite different. Int5 mentioned said that they are responsible for the lowest-level financial transactions in the Division, meaning that the level of detail is very high, as well as turning the vision of the Division into practice. One of the benefits of the dashboard is the added

transparency and being able to make comparisons between different factories. Int5 said that this could be dangerous, meaning that it has to planned well who will get to see such information. The new features of the dashboard, especially mobile-use, may also have an effect on organizational culture. While culture is difficult to measure, it seems that different cultures within the organization have to be taken into account in the design and implementation of the dashboard. Organizational culture is added to the CSF framework with the addition that it should be in favor of change.

Table 2 contains many CSFs that are connected to project members, managers, employees and the project itself, but these factors were hardly mentioned in the interviews. Their relevance will be discussed next.

*Balanced team* means having people with different skill sets and from different departments in the project team. The project team only consists of people with finance and controlling background, but based on this study it is difficult to analyze whether this is a threat for success.

*Cross-unit cooperation* was mentioned in four of the articles. The interviews highlighted the importance of communicating with top management, the business units and the users, but it can be argued whether CSFs such as *top management support* and *user involvement* already include elements of cooperation, meaning that it might not necessarily need its own CSF.

*Project management* was mentioned in three of the articles on its own and various other CSFs can be seen as being a part of it. As was argued in chapter 3.4.1 project management is an important part of any project, and the quality of it affects project success from beginning to end. Therefore it should be one of the CSFs.

*Monitor and measure progress* was mentioned in three articles. The project team at the case company does monitor progress through charts where the completion of different parts of the project, e.g. testing, is shown. This is important for keeping everyone updated about the project, but it seems like a task that should be included in proper project management, and therefore does not merit its own CSF.

The CSFs *individual competencies* and *managerial competencies* are both mentioned in three articles. While these factors are arguably important, they also seem too obvious to be mentioned separately.

*Readiness and ability to change* was also mentioned in three articles. This CSF is interesting, since it contains both cultural and individual factors. The organizational culture and the individuals have to be ready for the changes the dashboard brings, and the individuals need to be able to make these changes happen. While this factor contains elements from other CSFs such as *organizational culture* and *clear vision and objectives*, it contains something that the other CSFs have not considered. Being motivated to change without the ability to do it, or being able but not willing, will both lead to project

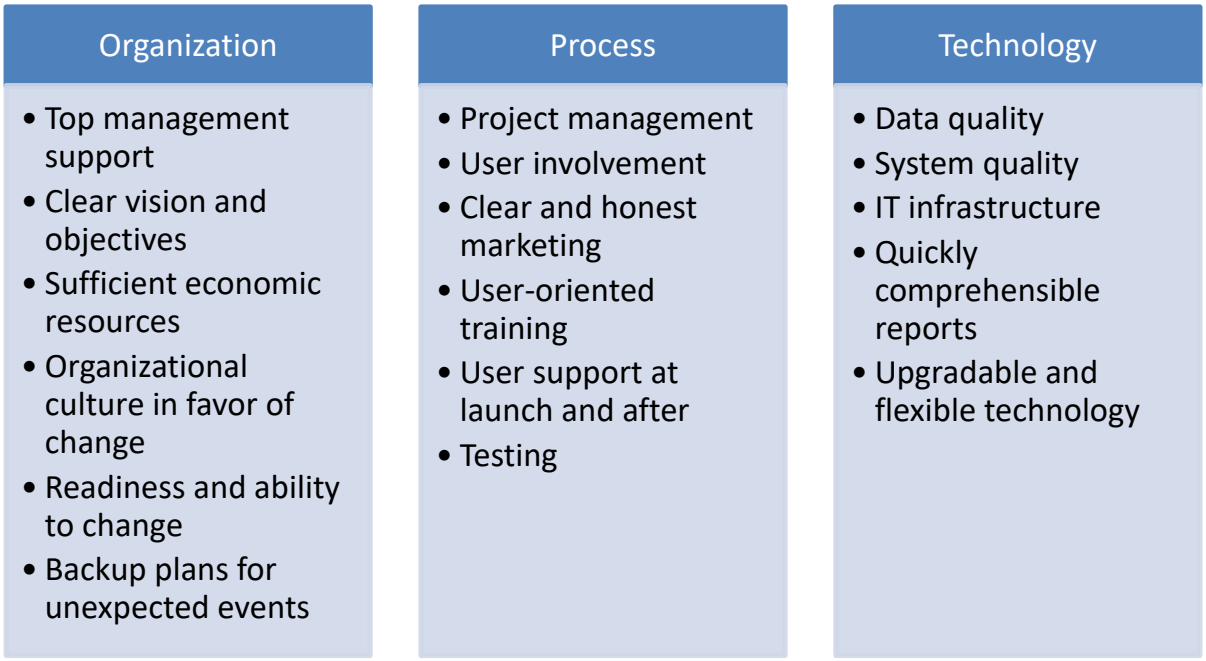
failure. Therefore it should be highlighted that readiness and ability to change are important both for individuals and the organization, and it should be one of the CSFs.

*Expectations management* is connected to marketing, change management and communication. Mentioned in three of the articles, it seems like an important way to increase user acceptance. However, it can be argued whether it is already included in *clear and honest marketing*, since marketing is a way to manage expectations and honesty ensures that the employees are not expecting too much or too little from the dashboard. Clear objectives along with project management can also be used to manage expectations.

The CSFs from Table 2 that were only mentioned in one or two of the articles still remain to be discussed. In many cases their applicability to dashboards was difficult to verify based on this study, or that no evidence was found that they were critical. These include *external environment, political factors, vendor support, professional networks, cost-benefit analysis* and *professional steering committee* among others. There are important ones too, however. In chapter 3.4.1 it was argued that *building a prototype* could be an applicable CSF for dashboards. However, the CSF *upgradable and flexible technology* seems to achieve the same benefits, meaning that if the dashboard is not completely satisfactory at launch it can still be fixed and new measures can be added later. Therefore a prototype would not be required as such. Finally, *risk management* was mentioned in two of the articles, but it was not further elaborated how it relates to implementation projects. Risk management is connected to what Int6 said about having plans for what to do in case of failures and unexpected events e.g. structural changes in the Division, in order to fix all possible mistakes from the dashboard each month before the reporting deadline. This is in line with what Int4 said about not stopping the project at launch but having someone responsible for fixing mistakes and handling feedback. Preparing for changes and having someone ready to make those changes to the dashboard ensures the continued use of the system, and is therefore critical for long-term success. This factor also highlights the idea that building a working dashboard is not the final objective in itself but rather a step forward. Instead of risk management, this factor will be called *backup plans for unexpected events.*

This concludes the discussion about critical success factors from earlier literature and the interviews. The findings from this chapter are combined into the framework that is presented below in Figure 5.

Figure 5 CSF framework for dashboard implementation




The framework contains 17 CSFs that are divided to organizational, processual and technological CSFs in the same ways as in the business intelligence CSF-framework by Yeoh and Popovic (2016, 136). The organizational CSFs include the prerequisites for the success of the project, such as a favorable culture and organizational resources e.g. money and support. The processual CSFs are factors that are needed throughout the project cycle e.g. project management and user involvement, or different actions that take place during the project e.g. user-oriented training. Technological CSFs describe what to take into account when developing the dashboard, e.g. system quality and up-gradability, and what has to be achieved during the project, e.g. data quality.

# 5 CONCLUSIONS

Critical success factors of implementation projects are studied frequently in academic research. CSFs can be used to direct the managers' focus and effort toward those project areas that are the most crucial for success, and they are therefore a useful method in approaching implementation projects (Boynton & Zmud 1984). After taking part in a dashboard implementation project in a case company and studying the CSFs of past literature and the case project, this chapter will conclude the discussion of dashboard CSFs and attempt to analyze what dashboard implementation actually means for an organization and how significant of a project it is.

The case project, while a small one budget-wise, was still considered by the implementing party to have a significant effect in the coming years. This effect would be a result of the changes and benefits the dashboard brings, such as automating reporting, moving the tasks of controllers from routine work to analysis, standardizing information, increasing financial knowledge throughout the organization, promoting transparency and having a new reporting platform to build upon in the future. The main purposes for implementing dashboards according to Pauwels et al. (2009) are monitoring, planning, communication and consistency, which are very similar to the expected benefits of the case project. While the current reporting practices at the company are also used for these purposes, the dashboard should take things forward especially through automation and standardization. If the quality of reporting in a company is already fairly high, it could be said that rather than being a whole new innovation, a dashboard is closer to an improvement of existing practices.

While the project team sees change as beneficial, the users might not initially see it the same way. The implementation is the most critical part of the project, since even if the product works perfectly there is still no guarantee that end-users will accept it. Therefore a lot of the success of the project hangs on convincing different key stakeholders and users about the benefits of the system and thus reducing user resistance. Top management has to be convinced first in order to convince others, after which the users have to be convinced. The importance of user acceptance cannot be highlighted enough since the success of the whole project is dependent on gaining it. In fact all of the other CSFs are related to it in one way or another. Technological factors, while important as well, mostly have instrumental value in gaining user acceptance. For example the data has to be correct in order to gain user trust, and the system has to be easy to understand to gain user satisfaction. The stability of the system, system speed and different features also serve users in the end. Planning a technology implementation project focusing solely on the technology will lead to problems, especially when implementing a tool for wide use within the organization. Focusing too much on the technology was a problem brought up by both earlier implementation literature (e.g. Yeoh &

Popovic 2016, 145) and the interviewees, and it was also one of the reasons why the previous divisional dashboard project failed.

It was noteworthy in the interviews that different people view the dashboard project from their own perspective and with their own responsibilities in mind. For example the project manager and the head of the steering committee mentioned top management support as the most critical success factor and considered data quality as a given. However, the factory controller named data quality as the most important factor and did not mention top management support at all, perhaps thinking that DLT support for a division-level project is a given. While the project manager and the head of the steering committee also consider data quality as a critical success factor, they are at the same time very confident that there will no problem with it, whereas the factory controller has experience of past IT tools that have been implemented unfinished and therefore does not take the credibility of the system as guaranteed. The relative importance of different CSFs is therefore dependent on the person's role in the project and their position in the organization.

The technological potential of the case dashboard is considered to be high in the future. All of the interviewees agreed that the type of technology that the dashboard represents – automatic, interactive and mobile – will be increasing in the coming years. For the implementing party the change in reporting practices appears as inevitable. Even at the factory level – where the dashboard in its current form was only seen to bring to minor benefits if any – the technology itself was considered superior compared to current reporting practices. It remains to be seen how the standardization goals of the dashboard will be realized at the factory level. It is unclear how much of the reporting in the factory could be integrated to the dashboard, and if it would even be reasonable because of the difference in scope. Nonetheless this would be one of the future development projects with the highest potential.

Based on the CSF lists on Table 2 and the interview results, dashboard implementation seems to share many critical success factors with other technology implementation projects. Some of the most often mentioned CSFs from earlier literature – e.g. top management support, data quality and user involvement – apply to dashboards as well. This study aimed to find success factors that could be especially important for dashboards or even unique to them. Regarding uniqueness, no evidence could be found of a CSF that would be applicable only to dashboards. However, despite their similarities to other technologies, dashboard implementation CSFs have their own areas of focus. Perhaps the most important of these areas are visualization and the speed at which information is relayed to users. Since one of the major purposes of dashboards is to visualize critical information and present it in an easily comprehensible form, it means that the visual design choices during development and the speed and reliability of the system need special attention, perhaps more so than with other tools. This was depicted by the CSFs

*system quality* and *quickly comprehensible reports* in the framework on Figure 5. Also the dashboard is only as good as its source data, which means that data quality and the efficiency of the underlying IT infrastructure need to be taken into account. It seems that while technological CSFs should not be highlighted more than others, the technological CSFs such as system quality and IT infrastructure mean something different for dashboards than for other technologies, and are therefore something that separate dashboard implementation from other implementation projects.

Another difference when comparing to other implementation projects could be organizational culture. The underlying culture – and whether that culture can be changed – is a major factor when considering whether a new technological tool will succeed or not. Comparing to the current reporting practices in the Division, the dashboard should change the culture toward increased transparency and self-service, as well as a higher focus on analytical work due to the elimination of some routine tasks. These kinds of cultural differences may appear e.g. between the Division and the factories, or between employees and the Division leadership.

In conclusion, this study has been made in an attempt to understand what it means to implement a dashboard and what should be taken into account in such a project. As the CSF framework from the previous chapter suggests the implementation project should be looked at from different angles. Instead of merely introducing a new tool, the project team has to consider what the current situation and culture is at the company, and what kind of changes the dashboard will bring to the work practices of the users and the organization as a whole. In addition to creating a reliable system with correct data, the team has to decide on clear objectives and different ways to convince users of the system's benefits. Involving users in development, testing the system thoroughly and spending time to train users all affect the outcome of the project. Neglecting any of the organizational, processual or technological success factors may lead to project failure.

Introducing a dashboard is an extensive project that affects employees and their working practices in many different areas of the organization. The implementation project itself consists of different phases all with their own areas of focus and critical success factors. Defining these success factors and taking them into account may help organizations to better understand the different aspects of dashboard implementation and to better succeed in such projects. The framework created in this study could be used as a basis for analyzing what to take into consideration in dashboard implementation.

# 6 SUMMARY

Dashboards are reporting and performance management tools that have grown more popular in recent years. They are used to provide critical information to decision makers via an interactive and visual platform. (Yigitbasioglu & Velcu 2012, 42). Pauwels et al. (2009) define four purposes for implementing dashboards, which are *monitoring* past performance and learning from it, *planning* of goals and strategy through the analysis of different scenarios, *communication* of information and organizational values to key stakeholders, and promoting *consistency* in the measures and measurement practices used in the organization. (Pauwels et al. 2009, 179.) In addition to these benefits dashboards are hoped to improve employee efficiency and motivation through the elimination of routine tasks, such as manually gathering information and maintaining static reports (Rasmussen et al. 2009, 11–12).

Academic studies about dashboards are still few. Yigitbasioglu and Velcu (2012, 53, 56) point out the lack of research about e.g. the functional and visual features of dashboards, their effective utilization, their effect on decision making and performance management, and finally the critical success factors of their implementation, which was chosen as the direction for this study.

The literature review of the study focused on past implementation projects of different technologies that share similarities with dashboards, namely BSC, BI, ERP and ICT. Critical success factors, which are often discussed in implementation literature, were used as the main theoretical tool for the study. According to Boynton and Zmud (1984) critical success factors are the things and areas where a project has to succeed in order to be successful. The CSFs from earlier implementation literature were studied and compiled into a table along with the few dashboard CSFs that were found. Among the most often mentioned CSFs are e.g. top management support, user training and support, high data quality, clear vision and objectives, and user involvement, which were connected to all the studied technologies. The goal in creating the table was to compare the CSFs of different technologies and try to find CSFs that were best applicable to dashboards.

The empirical part of the study was conducted by participating in a divisional dashboard implementation project in a case company called Group. The study was conducted in a six month period during which the finance and controlling department of the Division was in the process of introducing a new dashboard. Data was gathered from six themed interviews with project team members and other stakeholders, as well as by studying project-related documentation. The results of the interviews were analyzed with the help of the literature review and the CSFs of other technologies. In the end a total of 17 CSFs for dashboard implementation were selected. The CSFs are divided to organizational, processual and technological success factors, and they comprise all the

different phases of the implementation project from planning and design to post-launch user support and further development.

Based on the study results, dashboard CSFs are similar to the CSFs of other technologies. In addition to the most often mentioned CSFs from past literature e.g. top management support, user involvement and high data quality, some other areas were highlighted as well. Success factors connected to the design of the dashboard, such as system quality and speed, should be given extra attention, since the dashboard loses its purpose if it doesn't contain relevant information in a quickly comprehensible form. Another finding was that despite the small size of the project it could bring a considerable change to the case organization. These changes primarily affect reporting practices, but the dashboard can also affect the underlying culture in the organization by moving it towards increased standardization and transparency. If the cultural differences between organizational areas are not taken into account, the full potential of the dashboard may not be fulfilled. Sources of cultural differences could appear between different functional and geographical areas of the organization, or between employees and leadership. Also the future users might see the new system very differently than the implementing party, especially if the purpose for the dashboard is not clearly presented and the benefits of the dashboard are not properly communicated. Finally, the technology itself should not be the only focus in dashboard implementation, but instead it is critical to know what changes the new system will bring to the organization, how these changes should be managed and how could the users be made to accept the new system.

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# APPENDICES

## Appendix 1: Interview themes

Basic questions
- Name, position, tasks

Dashboard project
- Role and tasks in the dashboard project
- Background for the project
- Purpose and goals
- Significance of the project
- Connection to company strategy

Dashboard development
- Functional and visual features
- Drivers of change
- User involvement

Dashboard implementation
- Threats and possibilities
- Training and guidance
- User support
- Taking different user groups into account
- User acceptance
- Change management
- Possible consequences of project success and failure
- Implications for the future

Previous dashboard project and other implementation projects
- Involvement in the previous project
- Problems in the previous project
- Experience with other implementation projects