TAMPEREEN TEKNILLINEN YLIOPISTO
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JENNI KANGAS

INFORMATION SYSTEM IMPLEMENTATION FRAMEWORK IN GLOBAL PROJECT MANAGEMENT

Master of Science Thesis

Examiner: Prof. Samuli Pekkola
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ABSTRACT

JENNI KANGAS: Information System Implementation Framework in Global Project Management
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The main research question of this thesis was: What should be included in the implementation framework in order to reach the objectives of an information system implementation? The aim was to design an information system related artefact, an implementation framework, for the new project portfolio management software that was going to be implemented for the Case company. The purpose of this framework was for it to be utilizable and enable the organization to execute changes according to their objectives.

This thesis uses scientific research methods in the field of information systems and design science research which emphasizes a problem solving paradigm. The theoretical part of the study was created parallel to the empirical phase, in part using an iterative method where the design was constantly evaluated. The theoretical part was done by using scientific literature as source material. The aim was to cover the most important themes of information system implementations on a strategic and an operational level, in respect of the case company's situation. The empirical part used solely qualitative methods. Current problems and objectives of the case company were determined through semi-structured interviews and observations. The evaluation of the framework design was done by semi-structured interviews and participant observations along with a case study method to describe organizational challenges and objectives. The hierarchy of criteria for framework evaluation was constructed in terms of goal, environment, structure and evolution. Internal interviews and participant observation evaluated the ability of the framework to be consistent with people, the organization and technology, validity and structure. The purpose of external interviews was to evaluate the validity and generality of the framework.

The result was an evaluated implementation framework designed for the cloud-based project portfolio system implementation in Case company's global context. It was a combination of strategically relevant critical factors and attributes which the theoretical and empirical research highlighted, and which were fitted in the project management design and to the schedule. The framework was designed to be a dynamic which should be iterated. It includes the cloud system implementation on the provider's server and the integration to the company's enterprise resource planning system. The central focus of the framework was an incremental change by underlining resource management, constant benefit realization and evaluation. As a result, the evaluation is still incomplete. A recommended action of this thesis is to apply the framework to the planning, continue experimentation and to do iterative corrections to the design in the case context.

TIIVISTELMÄ

JENNI KANGAS: Tietojärjestelmän käyttöönoton viitekehys globaalissa projektien hallinnassa
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Avainsanat: Suunnittelutiedetutkimus, tietojärjestelmä, projektinhallinta, käyttöönoton viitekehys, käyttöönottosuunnitelma, tietojärjestelmä pilvipalvelua

Tämän diplomityön päätutkimuskysymyksenä oli: Mitä tietojärjestelmän käyttöönottosuunnitelmaan tulisi sisällyttää, jotta käyttöönotolle asetetut tavoitteet saavutetaan? Työssä tarkoituksena oli suunnitella tietojärjestelmäperustainen artefakti, käyttöönoton viitekehys, uudelle projektien portfoliohallinnan sovellukselle, joka otettaisiin käyttöön Case-yrityksen globaalissa projektinhallinnan kontekstissa. Viitekehyksen tavoitteena oli toimia käyttökelpoisena suunnitelmana ja mahdollista muutos organisaatiossa.

Päätutkimusmetodina diplomityössä käytetään informaatiotieteisiin soveltuvaa ongelmanratkaisukeskeistä suunnittelutiedetutkimusta, jonka puitteessa hyödynnetään laadullisia tutkimusmenetelmiä. Teoreettinen osuus luotiin samanaikaisesti empiirisen osuuden kanssa. Teoreettinen osuus sisältää tieteellisen kirjallisuuskatsauksen, jonka tarkoituksena oli kattaa tärkeimpiä strategisia ja operatiivisia aihealueita tietojärjestelmien käyttöönottoon liittyvissä aihepiireissä Case-yrityksen kannalta. Empiirisessä osuudessa hyödynnettiin laadullisia menetelmiä: Case-yrityksen nykytilan ongelmat ja tavoitteet määritettiin puolistrukturoitujen haastatteluiden ja havainnoinnin avulla, ja koostettiin tapaustutkimusta hyödyntäen havainnolliseksi tapaukseksi. Näin ollen viitekehyksen evaluointi ja arviointi puolistrukturoitujen haastatteluiden ja havainnoin avulla oli mahdollista. Viitekehyksen arvioinnissa käytetty hierarkkinen arviointiasteikko jakoi arviointiulottavuudet neljään kategoriaan: päämäärän, ympäristöön, rakenteeseen ja kehittymiseen. Sisäisten haastatteluiden ja havaintojen perusteella pyrittiin arvioimaan viitekehyksen ympäristöllistä vaikutusta, kuten kykyä olla johdonmukainen ihmisten, organisaation ja teknologian kanssa, sekä viitekehyksen validiteettia ja rakennetta. Ulkoisten haastatteluiden avulla pyrittiin arvioimaan validiteettia sekä yleistettävyyttä.

Tuloksena oli evaluoitu projektien portfolion hallintaan suunnatun, pilviperustaisen tietojärjestelmän käyttöönoton viitekehys yrityksen kontekstissa. Viitekehys sisälsi strategisesti tärkeitä attribuutteja, joita teoreettinen ja empiirinen tutkimus korostivat. Attribuutit sovitettiin projektiin ja aikataulutettiin osaksi suunnitelmaa. Viitekehyksestä luotiin muuttuva, jota tulisi jatkuvasti iteroida. Siinä huomioitiin pilvipalvelun käyttöönotto tarjoajan palvelimella, järjestelmän integrointi osaksi yrityksen toiminnanohjausjärjestelmää. Viitekehys keskittyi inkrementaalisen muutokseen mahdollistamiseen, jossa huomio oli resurssien hallinnassa, hyötyjen realisoinnissa ja evaluoinnissa. Työn lopputulos osoittaa viitekehyksen evaluoinnin olevan kesken. Työn toimintasuositus ehdottaa viitekehyksen hyödyntämistä käyttöönoton suunnittelussa, testauksen jatkamista sekä korjaavien toimenpiteiden tekemistä suunnitelman kehittämiseksi.

PREFACE

This Master of Science thesis was made during eight months in the company that commissioned the thesis. These eight months were an eye-opening experience that taught me about large-scale project management and information system implementation challenges, as well as, how demanding their alignment could be. I was very delighted about the possibility to work with this interesting and challenging subject, and moreover, to get to know interesting people.

I would like to thank Professor Samuli Pekkola for his guidance during this process and for examining this thesis. I want to express my deepest gratitude particularly to Senior Manager Frederick Reynaud, who gave me this topic and has mentored, supported and encouraged me during this project. I am sincerely thankful to partner companies, Valmet and KONE, which were willing to be involved in this research. I would also like to thank all of the people in the company's organization who have participated in this project and have shared their great ideas, knowledge and attitude.

I am greatly thankful for the support of my family, relatives and friends, and for their understanding of the time-requiring studies. My sweetest and warmest thanks go to my Antti whose help is indescribable. I cannot wait see what the future holds for us, maybe a glass of the finest wine with sparkles.

Tampere, 21th March 2016

Jenni Kangas

TABLE OF CONTENTS

ABBREVIATIONS AND NOTATION

DSR	Design Science Research
BPR	Business Process Re-engineering
BIS	Business Intelligence System
ERP	Enterprise Resource Planning
IoT	Internet of Things
IS	Information System
IT	Information Technology
KPI	Key performance indicator
MIS	Management Information System
MS	Microsoft
PMO	Project Management Office
POC	Proof of Concept
PPM	Project Portfolio Management
SaaS	Software as a Service
SLA	Service Level Agreement
SQL	Structured Query Language
WBS	Work Package Structure

1. INTRODUCTION

Project management in global business has become more multifaceted and major projects may not only include equipment sales but also a great amount of integrated automation services. Production sites can be located in several while the customer site is on the other side of the globe. In addition, there is also a continuous demand of knowledgeable human resources to satisfy the customer needs, as well as, engendering the business value. Some level of the work may have been performed by sub-contractors as well. All of these factors affect the project organization and project management complexity, while the scope, cost, quality, budget, risk and schedule are affected. The complexity may generate business requirements, such as the visibility of work to enhance the decision making, which may require the interaction of information technology, people and processes.

Hevner et al. (2004) clarify information systems implementation to improve the organization's efficiency and performance. Business organizations are goal-oriented entities existing in social and economic scenery. The aim is to maximize the profit (utility), and often this aims is achieved by reducing costs or increasing revenue through the design of effective business processes. The design of organizational information systems plays a significant role in enabling efficient business processes to achieve these goals. On the other hand, from a social perspective, to interact with new technology, people must make sense of it. Therefore, the sense-making process is inevitable for people to develop particular expectations, assumptions, and knowledge of the new technology in order to maintain efficiency (Orlikowski and Gash 1994).

1.1 Motivation

This research is done because of the need to solve information system-related problems and to produce an implementation framework that will guide a cloud-based information system implementation project towards success in the Case company's context. As stated by Handler et al. (2015), information technology (IT) organizations are stressed by the ever-increasing pace of digital-induced change. To handle the change, project portfolio management (PPM) leaders, such as project management office (PMO) directors, resource managers and portfolio managers are looking to implement suitable PPM software solutions. According to Stamford (2016) from Gartner, worldwide cloud services acquisitions keep growing with a rate of 16,5%, where Software as a Service solutions has grown over 20%, despite Gartner's forecast for worldwide dollar-valued IT spending growth in 2015 has been revised to negative 5.8% (Gartner 2016). However, more

and more IT acquisition projects are published as failures. A study made by Tietotekniikan liitto, Ohjelmistoyrittäjät and Celkee Oy (2013) concentrated on Finnish public and private sector IT acquisitions in which the result indicated that 55% of participating companies felt IT acquisitions failed. Only 20% of the companies felt that they were often succeeding in the IT projects.

This distressing number of failed projects is certainly something that interests IT managers, even though the field of enterprise resource planning (ERP) and information system (IS) implementation literature is bursting with best practices (e.g. Yeo 2002; Bingi et al. 1999; Robey et al. 2002; Handler et al. 2015), change and organization transformation practices (e.g. Holbeche 2006; Laamanen 2001) and learning outcomes of failed and prosperous projects. Pekkola (2013), for example, stated that success highly depends on the measures and should be measured with clear criteria and after an adequately long time after the implementation has done (Pekkola 2013).

Despite the current PPM solutions are designed to be implemented quickly and smoothly (Handler et al. 2015), there is a still risk of failing the implementation which may lead to economic loss and disable the benefit realization. Therefore, planning requirement specification and concept development are key, without forgetting benefit realization capabilities (Ashurst et al. 2008). However, there are still challenges to determine, which attributes and phenomenon are the most relevant and should be included to IS implementation processes. (Hyötyläinen and Kalliokoski 2001). In this thesis, the aim is to discover these attributes in the respect of Case company's situation.

It is also relevant to understand, the information systems are realized in the implementation. This enhances the possibility for the organizations to see the implementation as a continuous improvement process which aims to develop methods and IT features, in compliance with business and user needs. (Hyötyläinen and Kalliokoski 2001) All the best practices and critical factors should be utilized through a carefully designed implementation plan before the unnecessary costs are raised, or destruction done. (Tietojärjestelmien hankinta Suomessa 2013).

1.2 Case company

This research is done in cooperation with a Finnish large capital company in the manufacturing industry, named Case company. The company has 5 000 employees around the world making the business environment global. The research focus area in the Case company is in project business capabilities, which is illustrated in Figure 1 as 'business area A'. The company has different solutions to different customer needs, and those naturally affect the project size. Key enablers for must-win battles in reaching the strategic objectives are highlighted in red. Digitalization, operational excellence and people are the main enablers from the company's perspective.

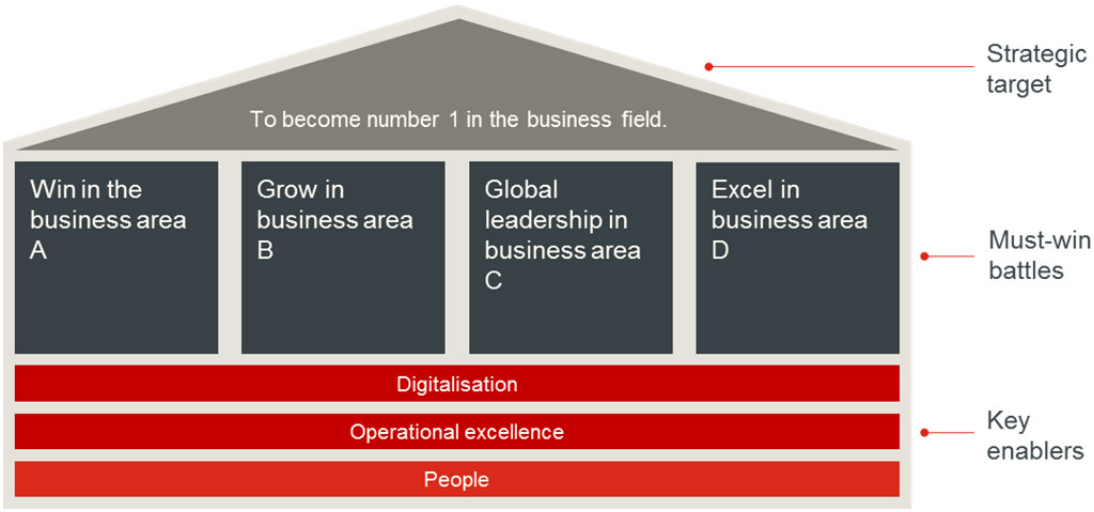

Figure 1. *Case company's business strategic targets, must-win battles and key enablers*

The project business is supported by the operational excellence function where this research is located. The company believes that the greatest results can be achieved only by being open and working closely together with the customers, partners and colleagues. Thus, the company values the method "let's do it together". The project delivery business, in this thesis, is focused on the projects which require a wide range of project organization. The structure of an organization depends on the project types. The hierarchical project organization is in the matrix, where the temporary project needs people from different line organizations: project directors, controllers, managers, work breakdown package owners (WBS) are reporting to the line manager.

The aim of Case company is to have common processes and tools to manage and monitor a portfolio of projects and programs in a global scale. This requires the organization to implement new cloud-based PPM software integrated into ERP system. Consequently, the research focuses on solving the IS related problem. Therefore, strategic requirement specification, implementation and improvement are all considered important: strategy and requirements are realized in the implementation and improvement is realized in the iteration (Hyötyläinen and Kalliokoski 2001). The research focus area is shown in Figure 2.

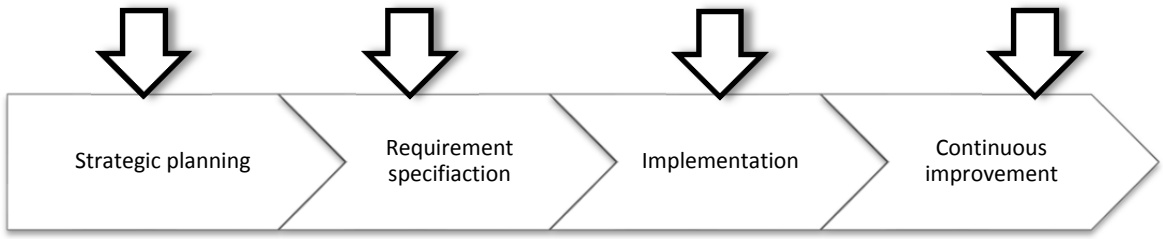

Figure 2. *The lifecycle of IT implementation process from customer organization perspective (adopted from Hyötyläinen and Kalliokoski 2001).*

According to Hyötyläinen and Kalliokoski (2001), the implementation considers IT system configuration and conversion. It also includes all of the tailoring, training, exercises and organizational involvement. Continuous improvement is considered as the ongoing development of people, IT and the business processes.

1.3 Research problem, objectives and restrictions

The main purpose of this research is to design an implementation framework, a plan for the new project portfolio management software which is integrated in the enterprise resource planning system and implemented as a system as service from service provider cloud. The objective of this research is to create a plan which will be utilized as a path for the implementation and which considers Case company's implementation context. This requires the plan to be utilizable, and reconciled to the implementation schedule. The Case company request that the goal of the thesis is to create a plan that enables an organizational change with new designed resourcing process and new information system. The expression "utilizable" in this instance means that the objectives of the implementation are achieved. Therefore, the design is related to the construction of an information system related artefact, the implementation framework, and the main contribution of the research is the artefact itself. Thus, qualitative data is used for the identification of current problems regarding the implementation context of global project management, organization's primary strategical and operational requirements and artefact evaluation.

The outcomes of this research are the implementation framework as an artefact and attributes that are the validation criterion for the implementation framework. Consequently, the research tries to solve the following problem:

- There is no complete implementation framework for the new project portfolio management software that considers the objectives.

Subsequently, the research question is the following:

- **What should be included in the implementation framework in order to reach the objectives of an information system implementation?**

In order to answer the main research question, the sub-questions are following:

- What are the main objectives and drivers for implementation?
- What are the main challenges in the implementation context?
- What are the critical factors affecting IS implementation?
- What kind of attributes should be considered when evaluating the implementation framework?
- How should the different attributes be weighted?

This thesis has several restrictions. As information system implementations processes consider wide perspective of different attributes, this thesis covers only few of them. First, the thesis is related to the company's schedule which is likely to change for the reasons that may not be predictable and manageable. This circumstance dictates that the research fits the company's time manners which have an impact on the time-sequence. Second, this thesis covers a short space of time which sets a restriction on the research about long-lasting evaluation, while the implementation project covers two to three years. Third, due to the broadness of the subject, the thesis excludes several important theoretical aspects regarding implementation and information systems. These topics are for example, financial and technical aspects of information system implementation project, information system acquisition and complete stakeholder management during the large scale of implementation projects. As a result, the ones with respect to Case company's current situation are chosen and the focus is more on strategical and organizational change. Therefore, financial perspectives such as profit and cost attributes are not included. Nor are technical perspectives such as detailed PPM software solution, cloud technical description or its integration to ERP in technical level. The theoretical chapters include both general level and context specific literature and their purpose in this thesis are introduced in next chapter. Finally, the Case company's organizational size gives a limitation to cover wide range evaluations, thus the evaluation is done with smaller amount of participants.

1.4 Theme of thesis

The main theme of this thesis is the information system implementation where the aim is to execute an organizational change according to strategical and operational objectives in the end user organization. As Hyötyläinen and Kalliokoski (2001) state, the information system implementation is a phenomenon which is difficult to conceptualize, and there can be challenges to discover the relevant attributes of the IS implementation. As they also argue, the different types of attributes and their determination are seen relevant in order to increase the knowledge in the field of IS implementation and benefit enterprises and their practical needs. According to them, the IS implementation encompasses strategical, technical, financial and organizational questions and solutions, and this thesis focuses mainly on strategical and organizational attributes.

In this thesis, the information system implementation covers a cloud-based project portfolio management system adaption to Case company's organization. The implementation, therefore, covers more than just implementation. As illustrated in Figure 2, the strategic planning, requirement specification, implementation and continuous improvement are included in this thesis. The main theme is divided to six major topics that are strongly present in the case implementation context: data-driven decision making, organizational transformation and IT alignment, business process re-engineering and management, cloud system implementation, critical taxonomy and success factors and

evaluation. As illustrated in Figure 3, the chosen topics structure the implementation different phases accordance of IS implementation process (illustrated in Figure 2). These topics are chosen to provide basics for cloud system implementation framework in accordance of Case company's situation. Each of these topics is discovered closely in theoretical framework in Chapter 3 and Chapter 4.

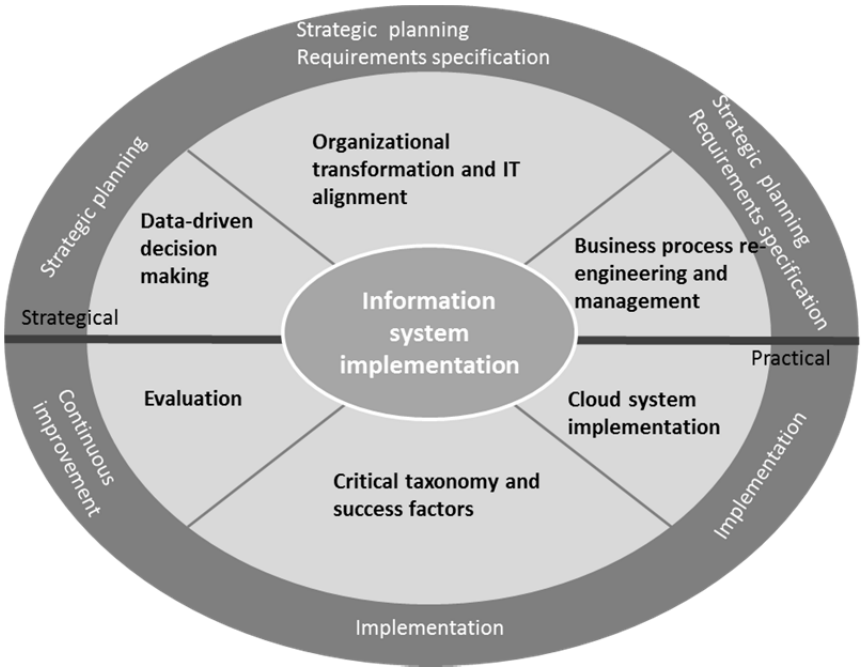

Figure 3. *Theme of thesis*

As illustrated in Figure 3, the information system implementation is also categorized to strategical and practical viewpoints, where the first three topics are seen more strategical ones and the last three more practical ones. To summarize the theme and theoretical framework, Chapter 3 answers the question '*why* are organizations transforming because of information technology?' and Chapter 4 answers the question '*how* could organizations adopt information system related transform?

The first topic chosen as a part of strategic planning is the data-driven decision making. As Hyötyläinen and Kalliokoski (2001) state, the business and information strategy should go hand in hand to support company's main business objectives. Therefore, this is an important topic since it is strongly guiding Case company strategical objectives to gain visibility to project management in digitalized environment, where knowledge has a strategical role in the companies' decision making (von Krogh 2012) and potentiality lies in developed data storage systems and databases. The aim of this topic is to highlight how could the information systems support the decision making when the objectives are to enhance PM processes and create visibility to delivery projects, and therefore understand better the main drivers and objectives of Case company.

The second topic chosen as part of strategic planning and requirements specification is an organizational transformation and IT alignment. This topics is to chosen to understand IS-related change more cautiously from organizational view point in order to plan strategical objectives and specify requirements for the implementation. As Hyötyläinen and Kalliokoski (2001) debate the IS implementation is also a social incremental or punctuated change. In addition, a strategical alignment is chosen to highlight how business and IT could support each other effectively to realize the benefits of the implementation (Al-Mashari et al. 2003; Chan and Reich 2007).

The last strategical theme is a business process re-engineering and management. This topic is also seen an important in order to highlight how business processes should be considered when new information systems are implemented in the organization as argued by Hyötyläinen and Kalliokoski (2001) and Al-Mashari et al. (2003). This theme tries to highlight the importance of business process re-engineering when new systems are implemented on organization. The process walkthrough is seen beneficial to discover and visualize workflow activities in regarding Case company's situation to visualize their resource management process with the new system.

A practical instance in this thesis is brought to acquire the deeper vision of pragmatic approaches in an implementation phase. The first practical topic discovered in thesis is a cloud system implementation. As Hyötyläinen and Kalliokoski (2001) state implementation considers information system configuring, data migrating, training and other testing. The aim is to start using the new system to operations planning and executing. This theme is chosen as a respect of Case company's situation to implement cloud based information system. Therefore, the critical aspects of cloud system implementation lifecycle model are discovered. Under this theme the cloud implementation specific topics are emphasized such as cloud security and maintenace. In addition the implementation practises are underlined since they affect organization and IS adoption.

The second implementation related topic is the critical taxonomy and success factors of an implementation. Hyötyläinen and Kalliokoski (2001) state the implementation phase also considers how the whole organization should be involved to implementation and change. Therefore, this topic emphasizes practical features such as change communication and project management capabilities (Al-Mashari et al. 2003) from organizational and managerial perspective and how to avoid mistakes and pitfalls of the implementation.

The last topic in the thesis is an evaluation that is considered closely relating to continuous improvement of the information system. As stated by Serafeimidis and Smithson (2000) the information system evaluation can contribute the organizational change. This topic is not only chosen to emphasize the challenges and multi-layered structure of information system evaluation but also to highlight the project sponsors should be con-

vinced of implementation project accomplishments. Therefore, topic's purpose is to highlight IS evaluation practises.

1.5 Structure of thesis

Figure 4 presents the thesis structure and research time scale. The following chapter provides an insight to the research materials, and the methods used in the qualitative design science research are also presented. The chapter describes how the research was conducted by using different data collection methods, and how the data was analyzed to construct the IT artefact.

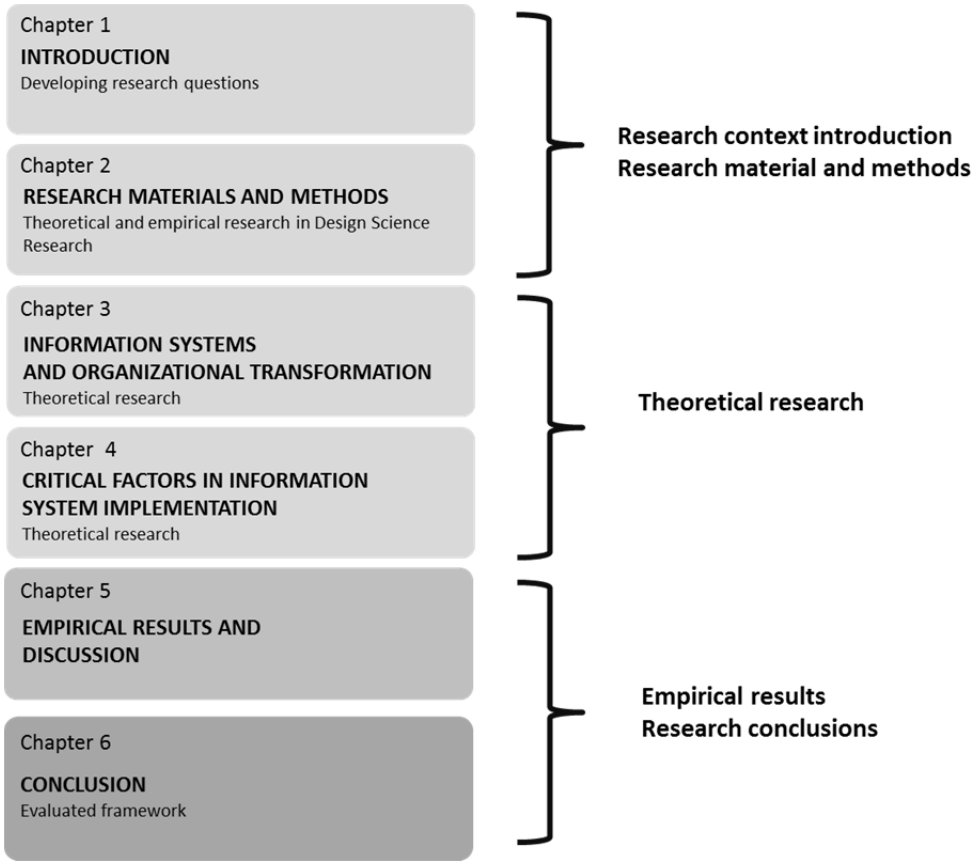

Figure 4. *Structure of thesis constructed in research time scale*

Theoretical research is presented in two chapters. Both two chapters are based solely on literature reviewing. In Chapter 3, the organizational transformation enabled and caused by information systems, is presented. The purpose there is to highlight main sources and drivers for IT and business renewal such as increased demand to improve decision making in the organizations. An example of a system as service software with project management capabilities and business intelligence capabilities is presented with the respect of implementation context. The core of the chapter is focused on a strategic point of view of information systems and change.

In Chapter 4, the important factors that have high priority in information system implementations are presented. These factors are gathered from the literature. In addition, this chapter emphasizes information system evaluation, since it is considered as an important factor in the implementation context. Both theoretical chapters include references to Chapter 5, regarding how theory is adopted into the design. In Chapter 5, the empirical results and discussion are presented. Finally, in Chapter 6, a summary and evaluation of the research findings are given. The chapter answers research questions, suggests future research possibilities and concludes the research.

2. RESEARCH MATERIALS AND METHODS

In Chapter 2.1, the research approach and methodology are presented. In Chapter 2.2, the main research methodology, design science research is presented in more depth, including other methods that are used in this research. In Chapter 2.3, the main data collection methods are introduced. In Chapter 2.4, data analysis is presented.

2.1 Research approach and methodology

The purpose of this research is to design an artefact which considers and enables the desired change and action in the organization. This requires a problem solving approach. Therefore, the research aims at finding concepts and relationships, attributes that enable the organization to implement the key objectives through the implementation framework. The design is done by using knowledge and requirements and it is evaluated by using methods of observation and description, in order to improve the artefact.

The research purposes necessitate using a scientific research method in the field of IS. A problem solving paradigm leads to the adoption of design science research (DSR). Design science research is motivated by the ambition to develop or improve the environment with innovative artefacts and the processes for building these artefacts (Simon 1996). The essence of design science was fairly implicated by Buckminster Fuller (1992): "*The function of what I call design science is to solve problems by introducing into the environment new artefacts, the availability of which will induce their spontaneous employment by humans and thus, coincidentally, cause humans to abandon their previous problem-producing behaviors and devices. For example, when humans have a vital need to cross the roaring rapids of a river, as a design scientist I would design them a bridge, causing them, I am sure, to abandon spontaneously and forever the risking of their lives by trying to swim to the other shore"*.

From the design science perspective, there are interventions and changes both in the 'social system' (work processes) and in the 'technical system' (tool) through the introduction of new IT artefacts (Goldkuhl 2012). The researcher's position is participative, collaborative and change-inducing in many occasions, and for example, requirements collection and evaluation require interaction between the researcher and participants. Therefore, the researcher adopts both objective and subjective points of view (Saunders et al. 2009, p. 119). Understanding the implementation context requires being empathetic for a phenomenon in social constructs in the organization.

The settlement, where the intervention is organizational change throughout an artefact, requires the researcher to adopt two research philosophies: pragmatism and interpretivism. Usually, qualitative research is associated with interpretivism but alternatives do exist and sometimes qualitative research in information systems can be performed following a paradigm of pragmatism. Pragmatism is concerned with action and change (Goldkuhl 2012), while hermeneutics is the theory and methodology of text interpretation; phenomena are abstract and conceptual until they are proven to be concrete, and seen it in relation to some context. This is also considered as an interpretative method because information is generated by rendering issues and interconnections in between its contexts. Empathy is an element of hermeneutics brought by the researcher. The researcher's imagination and capacity to understand or know the artefact generator may advocate understanding and interpretation of the produced artefact and event. (Anttila 1998) As the purpose is to contribute to local improvements through interventions and designs, the research philosophy used is pragmatism. In addition, the research needs interpretations of social constructs and aims for the conceptual evolution between the researcher and practitioners, the philosophy also reflects interpretivism (Goldkuhl, 2012) requiring the researcher to have an empathetic posture (Saunders, et al. 2009, p. 116). Figure 5 illustrates the research onion that describes the summarization of the methodology used.

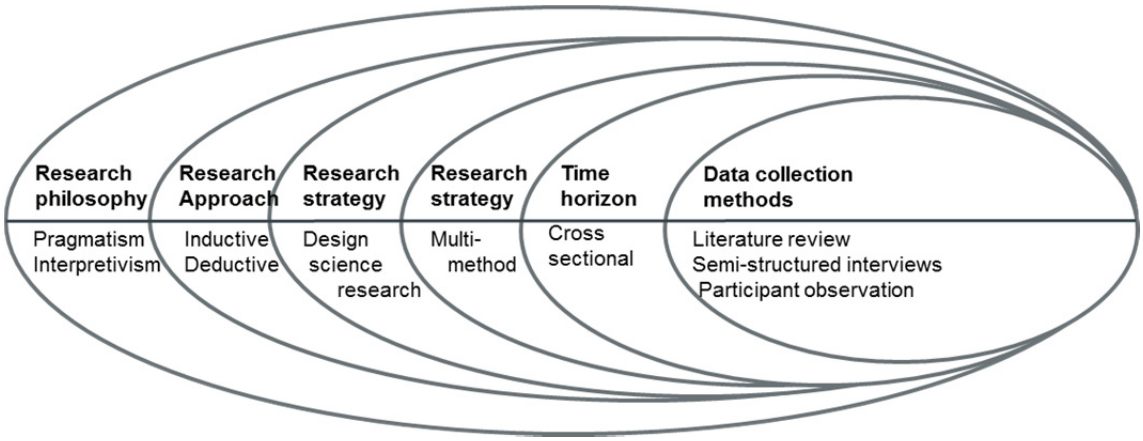

Figure 5. *Research methodology used in research (adapted from Saunders et al. 2009, p. 108).*

Since the attempt is to build a model based on the evidence in reality and to better understand the nature of the problem, the chosen approach is inductive; however, the research also combines elements of a deductive approach (Saunders et al. pp. 126; 490), since the theoretical frame supports the creation of implementation framework. The time horizon is cross-sectional. An inductive based approach is data-oriented and suitable for qualitative research. The approach considers evidence observed in reality, for the creation of a theoretical model and utilizing already existing theoretical frameworks. This evidence can be gathered, for example, with such data collection methods as queries, interviews, and document observation (Anttila 1998).

2.1.1 Design science research

According to Hevner et al. (2004), design science creates and evaluates IT artefacts for the purpose of solving organizational problems. These innovative artefacts are represented in structured form depending on the software, formal logic, and rigorous mathematics to informal natural language descriptions. Therefore, the design is both a process, as a set of activities, and a product, as an artefact (Walls et al. 1992). In addition, design is inherently an iterative and incremental activity, and the evaluation phase provides essential feedback to the construction phase (March and Smith 1995). Also Nunamaker et al. (1990) emphasized the integration of system development into the research process. He highlighted a multi-methodological approach that would include theory building, systems development, experimentation and observations.

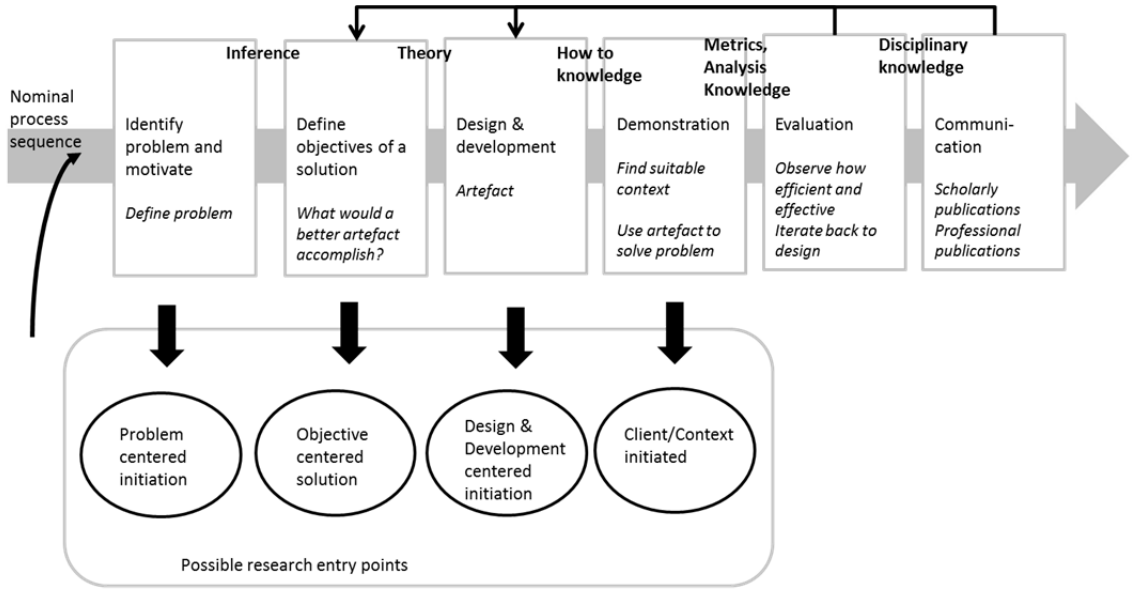

Figure 6. *Design science research framework (adapted from Peffers et al. 2007).*

As stated above in Figure 6, in design science research, a methodology contains three elements such as conceptual principles, practice and rules, and process for carrying out and presenting the research. Also an accepted and general framework is necessary for design science research in IS, in order to recognize and evaluate the results and value of design science as an IS research paradigm (Peffers et al. 2007).

In Table 1, Hevner et al. (2004) describe the seven guidelines for DSR in information systems to assist and understand the knowledge needed to build and apply the artefact. They emphasize that DSR is a problem solving process. Therefore, it requires the creation of an innovative, purposeful artifact for a specified domain. The result of design-science research in IS is purposeful IT artefact creation to address an important organizational problem **(Guideline 1)**. The description is significant, enabling its implementation and application in a purposed domain (Hevner et al. 2004). March and Smith (1995) argue that building is the process of constructing an artefact for a specific pur-

pose and the constructed artefact itself presents a challenge in explaining how and why it works.

Table 1. *Design science research steps (adapted from Hevner et al. 2004).*

Guideline	Description
Guideline 1: Design as an artefact	Producing a viable artefact in the form of a construct, a model, a method or, an instantiation.
Guideline 2: Problem relevance	The objective is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design evaluation	The utility, quality, and efficacy of a design artefact must be rigorously demonstrated through sophistically executed evaluation methods.
Guideline 4: Research contributions	Providing clear and verifiable contributions in the areas of the design artefact, design foundations, and/or design methodologies.
Guideline 5: Research rigor	Relying upon the application of rigorous methods in both the construction and evaluation of the design artefact.
Guideline 6: Design as a search process	Utilizing available means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of research	Presenting effectively both to technology-oriented and management-oriented audiences.

Since, the artefact is purposeful and designed to solve a problem, it must harvest utility for the problem (Guideline 2). Significant difficulties in design science result from the fact that artifact performance is related to the environment in which it operates (March and Smith 1995).

That raises the importance of evaluation (Guideline 3). Evaluation methods are critically important but they are also complicated by the fact that performance is related to intended use, and the intended use of an artifact can cover a range of tasks (March and Smith1995). The utility, quality and efficiency of a design must be rigorously demonstrated (Hevner et al. 2004). Also the evaluation criteria, the appropriate metrics themselves, must be determined for the artifact in a particular environment (March and Smith 1995). Often computational and mathematical methods are primarily used to evaluate the quality and effectiveness of artefacts; however, empirical techniques may also be employed (Hevner et al. 2004).

Metrics could include, for example functionality, completeness, consistency, accuracy, performance, reliability, usability, fit with the organization, and other relevant quality

attributes (Hevner et al. 2004). Prat et al. (2014) have collected and categorized IS artefact evaluation as hierarchical dimensions of goal (validity, effectiveness and generality), environment (consistency with people, organization and technology), structure (e.g. completeness, clarity, consistency and style), activity (e.g. completeness and accuracy) and evolution (e.g. learning capability). A design artifact is complete and effective when it satisfies the requirements and constraints of the problem it was meant to solve. Evaluation methods to apply can be categorized into observational, analytical, experimental, testing and descriptive methods, and usually, the methodologies available in the knowledge base are utilized (Hevner et al. 2004). Hence, in this research, the design of the implementation framework is evaluated through observational and descriptive methods with the hierarchical evaluation criteria in Figure 7.

Figure 7. *IS artefact evaluation hierarchy (adapted from Prat et al. 2014).*

Validity means the degree to which the artefact works correctly and achieves its goals, therefore, it encompasses reliability. *Effectiveness* measures whether the artefact produces its desired effect. *Generality* refers to the goal generality; the broader the goal, the more general the artefact is. *Utility* in the case of people and organization, measures the

quality of the artefact in practical use. *Ease of use* also relates to people. *Fit with organization* characterizes the alignment of the IS artefact with its organizational environment. *Consistency with technology* refers to the ability of the artefact to be a new layer that is built on new IT artefacts. *Clarity, completeness* and *level of detail* measure the internal structure of the artefact. *Learning capability* is the capacity of a system to learn from its experience and the reactions of the environment. (Prat et al. 2014) The justification process is iterative and constant. The research uses an observational method in the form of case study and descriptive method as an informed argument where the aim is to use information from the knowledge base, such as experience, to building convincing arguments of the artefact's feasibility.

Novelty is also important because the artefact attempts to innovatively solve the unsolved or known problem in a more efficient way. This aims at the distinction between DSR and practice of design **(Guideline 4)**. Design science research holds the potential for three types of research contributions based on the novelty, generality, and significance of the designed artifact. These three contributions are: the artefact itself, foundations and methodologies (Hevner et al. 2004). Design science offers prescriptions and creates artefacts that embody those prescriptions (Marc and Smith 1995).

The artefact itself must be rigorously defined, coherent, and internally consistent. Rigor is derived from the effective use of the knowledge base, theoretical foundations and research methodologies. **(Guideline 5)**. Often the artefact itself and the process around its creation, incorporates or enables a search process. Design task involves the creation, utilization, and assessment of heuristic search strategies. **(Guideline 6)**. DSR framework yields to effective communication of the research results to a technical managerial audience **(Guideline 7)**.

2.1.2 Multi-method applied to Design Science framework

The use of multiple methodologies allows triangulation and is gaining wider acceptance, leading to greater confidence in the findings (Palvia et al. 2003). 'Multi-method' refers to a combination of more than one data collection technique (Saunders et al. 2009, p. 152). This research is using multi-method qualitative methods in design science framework. Used methods are summarized in Table 2, by definition.

Table 2. *Summary of multi-methods applied (adapted from Palvia et al. 2003).*

Methods	**Definition**
Qualitative Research	Qualitative research methods are designed to help understand people and the social and cultural contexts within which they live. These methods include ethnography, action research, case research, interpretive studies, and examination of documents and texts.
Literature Analysis	Research that critiques, analyzes, and extends existing literature and attempts to build new groundwork.
Case Study	Study of a single phenomenon (e.g., an application, a technology, a decision) in an organization over a logical time frame.
Secondary Data	A study that utilizes existing organizational and business data, e.g., financial and accounting reports, archival data, published statistics, etc.
Frameworks and Conceptual Model	Research that intends to develop a framework or a conceptual model.
Interviews and participant observation	Research in which information is obtained by asking respondents questions directly. The questions may be loosely defined, and the responses may be open-ended. Participant observation involves: the systematic observation, recordings, and analysis of people's behavior (Saunders et al. 2009, p. 288).

The aim of **qualitative research** is to characterize or describe phenomena. Conducting a qualitative study aims to highlight the qualities and characteristics of the certain phenomena. The quantitative methods are predominately used as data collection and analysis procedure that uses or generates numerical data. Frequently, quantitative research is executed in macro level and qualitative research is used for a micro level to fill the gaps that are not notified during quantitative research. (Anttila 1998; Saunders et al. 2009) This research uses qualitative data collection methods and tries to describe the phenomena or the challenges in the context.

Literature analysis examines many past studies in a particular area and conducts a scientific analysis of the cumulative knowledge, in effect treating each study as one data point (Palvia et al. 2003). In this study, literature analysis is considered as literature review and used for the determination of objectives in the context and design of the artefact.

Case study is a research strategy which focuses on understanding the dynamics present within single settings and usually it is a combination of data collection methods such as archives, interviews, questionnaires, and observations (Eisenhardt 1989). According to Lee (1989), the case study research in MIS (Management information systems) can have as much rigor as quantitative research. Eisenhardt (1989) argues that organization-

al research should lead to the development of the theory. Case study theory building is a bottom-up approach, in such that the specifics of data produce the generalizations of theory. The key in building the theory is a substantial collection of literature that supports and conflicts the phenomena. The process itself is an iterative one. Therefore, it means a constant iteration backward and forward in the building process. For example, *"an investigator can move from cross-case comparison, back to redefinition of the research question, and out to the field to gather evidence on an additional case."* However, building the theory may lead to weaknesses. For example, the researcher may not be able to assess the most important relationships and those that are simply characteristic to a particular case, or the result may lead to a narrow and case-characteristic theory. Thus, the result lacks generalization. In this research, the goal is to define common characteristics which are valid in this research context, hence the generalization is not possible, but the research uses case study to elucidate artefact context and its evaluation. The artefact is studied in the business environment.

Secondary data sources include financial and accounting reports, annual reports, archival data, information in public domain, and commercial database services which are usually hard to reach outside of the organization. In recent years, company web sites became an attractive source of secondary data. (Palvia et al. 2003) This research uses secondary data to for problem identification in the organization context.

Frameworks and conceptual models are especially useful for a discipline that generally lacks and defies attempts to develop theory (Palvia et al. 2003). Conceptualizations are important in design science. They define the terms used when describing and thinking about tasks (Marc and Smith 1996). The framework should be shared by authors, reviewers, and editors to avoid the danger of being mistaken for poor quality empirical research or for practice (Peffers et al. 2007). The creation of the artefact uses frameworks and conceptual models from the literature but the research aims to have a clear concept and framework as a main contribution.

The last methods used in this research are **interviews** and **participant observation**. Palvia et al. (2003) consider interviews as a separate category, although they are usually a part of other methodologies, such as case studies and qualitative research. In this research, interviews are the main data collection method along with participant observation. Saunders et al. (2009, p. 318) argue that interviews may help gather valid, reliable and relevant data. Qualitative interviews are based on conversation, with the main idea being the researcher asking questions and listening, and respondents answering (Warren 2001, p. 83). It means that there is a prepared outline of topics, issues or themes, but also a possibility to vary questions in each interview (Eriksson and Kovalainen 2008, p. 80). Semi-structured interviews and participant observations were done together. All methods used in this study are listed in the Figure 8 along with the design science framework.

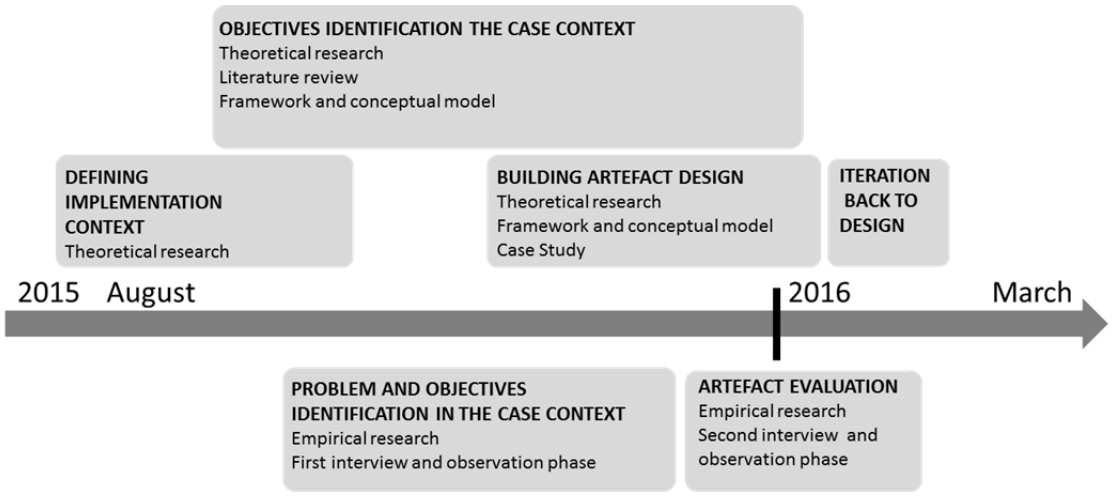

Figure 8. *Use of multi-methods in design science framework research*

In addition, this study has **action research elements** such as promoting change in the organization, the researcher's active involvement in the action for change and involvement of employees. All of these are important elements when change is implemented to an organization (Saunders et al. 2009, p. 147). From the action research point of view, this means that not only is a new artefact produced, more importantly, additional knowledge on artefact characteristics has emerged (Goldkuhl 2012). Suojanen (1998) also emphasizes that action research requires a constant personal level and working method development. This requires the person to reflect on the experiences and emotions, and evaluate them, thus making it a reflective process. The outcome is a knowledge base which may advocate new advanced methods and practices.

Järvinen (2007) counter-argues in his study that after parallelizing both approaches action research and design science seem to be similar research approaches. For example, action researchers' intent is to plan and to take action in order to change a part of reality, which is the aim of design research also. However, Hevner (2007) emphasizes that action research can be an approach for the evaluation of the output of design science research. That is, the artefact needs evaluation in the application domain. Consequently, the results of field testing give feedback on whether additional iterations of the relevance cycle are needed in this design science research project. Also Peffers et al. (2007) disclaim design research to be similar with action research: "*The design research comes from a history of design as a component of engineering and computer science research, while action research originates from the concept of the researcher as an 'active participant' in solving practical problems in the course of studying them in organizational contexts*."

2.2 Data collection

Data collection consists of both a theoretical and an empirical part. The theoretical part includes previous theories that are considered relevant in order to answer the research questions. The empirical part includes qualitative methods. The theoretical research includes scientific literature and journals. The majority of journals and literature concerns related information systems where the area is very dynamic and matures fast. Therefore, chosen articles and literature is mostly from year 2000 onwards. However, older material is also considered, to cover classic and traditional concepts and frameworks as a basis for the design. In addition, the literature field is lack of project portfolio management system related articles and therefore this thesis uses also ERP system related articles because of better availability. The requirements based on the literature review are highlighted in the theoretical part with RD, where RD refers to requirements design. The purpose of the requirements is to highlight theoretically relevant characteristics of an implementation and create attributes that can be fitted to implementation framework. All requirements were collected to Appendix A. Secondary data was used for defining the implementation context. Secondary data included organizational data such as annual reports, process models, handbooks, organizational documents from company's intranet and webpage. Consequently, secondary data uses internal and external data sources from years 2014-2016.

The primary data collection was based on the interviews and participant observation. The interviewees were chosen by the case organization. In the first interview phase from August to October in 2015 (problem identification in the context and objectives identification in the context), qualitative data was gathered from the case context in which it considered wide semi-structured interviews in the organization. Each of the interviews took from 45 minutes to 1.5 hours. Interviewees (N=19) were categorized as project operations, project managers, engineers, sales manager, resource manager, vice presidents of business line and IT manager level (Appendices B-C).

The second interview phase in January and February 2016 (artefact evaluation) consisted of semi-structured interviews and participation observation. In this phase, interviewees (N=9) were categorized as project operations, project managers, engineers, sales manager, resource manager, vice presidents of business line and IT manager. (Appendices C-D). In addition, two external interviews with secondary participants (Prat et al. 2014) (N=2) were conducted to get feedback from the framework design and verify that the framework ability is valid and generally effective in a similar project management context. The external interviews were held as a live-meeting over the internet (Appendix E). Each of the interviews took from 45 minutes to 1 hour.

Participant observation was carried out in internal interview groups. The purpose of the observation was to find out whether actions done during the research had an impact on the individuals. The focus of the observation was to collect data about how the inter-

viewees feel about IT system change and the researcher's role was that of a complete observer. Data collection was done through primary observation (Saunders et al. 2009, p. 296), where the focus was on the participants' feelings about change. The observations were divided into 'feeling categories': negative, sceptic, neutral and positive. The participants were categorized in the way they felt PPMs will affect their daily work after implementation. Similar participant observation was conducted during the second interview phase among the smaller group but with same participants.

2.3 Data analysis

Scientific literature and journals were used as source material during theoretical research. The data analysis for the literature review used categorization and summarization to combine and construct important topics in respect of Case company's situation.

Semi-structured interviews were analyzed in terms of data display. The data was interpreted and it was given meaning. Displaying data involves organizing and assembling data into visual form such as a matrix (Saunders et al. 2009, p. 505-503). All the interviews were categorized in matrix form and, where the display allows making comparisons between data, identifying plausibly evident relationships, key themes, patterns, and trends was made possible. It suits the inductive strategy to analyze qualitative data despite being compatible with deductive analysis (Saunders et al. 2009, p. 505).

The data analysis of the participant observation was based on identifying feelings that are associated with (Saunders et al. 2009, pp. 308) negative and positive reactions and behavior during interviews. Values in feeling categories were summarized and compared between first and second phase interviews since the participants were the same.

3. INFORMATION SYSTEMS AND ORGANIZATIONAL TRANSFORMATION

In Chapter 3.1, the information systems and their relation to decision making and the role of strategic requirements that guide organizations to adopt new information systems are revealed. The chapter introduces requirements for improving decision making in the organizations with business intelligence systems and the reason why the value of organizational knowledge has been considered important. Chapter 3.2 discusses the classification of organizational change, and the main drivers and sources of organizational change where the focus is more on changes caused by information systems, and their alignment between business processes. In Chapter 3.3, the benefits of business process re-engineering and management, along with detailed change management process, are discovered to highlight an example of change leading process management.

3.1 Information systems and improved decision making

Hyötyläinen and Kalliokoski (2001) state information system implementation start with strategic planning where the purpose is to discover how information technology can support companies to achieve strategical business objectives. One of the objectives for implementation is that correlation to better resource management, improved decision making and planning (Al-Mashari et al. 2003).

Information systems are determined as a system that consists of people, hardware, software and data transmission systems, and which are designed to improve, enable or ease specific, determined activities (Lyytinen and Newman 2008). Often, information systems' lifecycle is long lasting journey (Hyötyläinen and Kalliokoski 2001) and described through different methods and models, with maybe the most famous being an old and traditional waterfall model which starts from pre-exploration and ends up in maintenance (Pohjonen 2002, p. 26; 40). Development and renewal can be a result of customer demand, improved technological possibilities or other originated improvement requirements (Hyötyläinen and Kalliokoski 2001).

Data becomes business intelligence when it is in the hands of the decision makers who benefit for it and can use it (Thierauf 2001, p. 4) and companies consider knowledge as valuable asset which has a strategic role in the companies and its primary use is in decision making (von Krogh 2012). Therefore, knowledge management as a driver of an information system implementation is important: it is a broad and complex topic of socio-cultural, organizational, behavioral and technical dimensions (Easterby-Smith and

Lyles 2011, p. 106). The knowledge is generated from interpreted raw data; knowledge emerges through deeper engagement with an activity, social process and justifications of beliefs (von Krogh 2012). Data is seen as unstructured facts and figures that have the least impact on a typical manager, showing at the lowest level of hierarchy. The next level of data is information that is usefully structured for analytics and resolving critical problems. Recently, information is seen as the sixth resource in addition to people, machine, money, materials and management. The next level of information is knowledge, which is obtained from experts. Therefore, it requires integration of a range of information, in order to see patterns and trends that enable managers to make the transition to prediction. The last level is intelligence, which is a keen insight into understanding important relationships. Business intelligence basically examines the distilled essence of customer's and employees' personal experiences and needs, and also company's operations that are interrelated to external sources. (Thierauf 2001, pp. 7-10)

There are several types of information systems that are directly related to business intelligence systems such as knowledge management systems, decision support systems, online-analytical processing systems and executive information systems. The aim for all these systems is to help making comparisons, analyzing trends and patterns in business, and presenting historical and current information to decision makers (Thierauf 2001, p. 4). They let organization to take proactive stance rather than reactive approach to company's operations and today, the focus is on searching why and what can be done so that there is a clear understanding of the proper direction to take and prevent the occurrence of undesirable actions in the future. However, many companies still see IT as an overhead expense, not a valued asset (Thierauf 2001, p. 4; 8). Business intelligence system (BIS) is a place where data from many operational systems is combined together for the purpose of analysis. (Vitt et al. 2002, p. 34) A fast-changing business environment is the main driver for innovative data capturing and analyzing systems development (Thierauf 2001, p. 3) These software package applications usually include meaningful reporting capabilities to support decision making, and are of value in performing business analysis and are rightly part of an overall BI strategy, and data mining tools allow organizations to capture all the fundamental particles about customers, suppliers and internal transactions (Vitt et al. 2002, p. 34; Thierauf 2001, p. 3).

> **RD1:** Plan how the information system should support decision making
> **RD2:** Plan how the information system should support the reporting and analysis need

3.1.1 Value of organizational knowledge

Organizations value their knowledge in many ways and knowledge management is commonly understood as an implementation that alters processes of knowledge creation, sharing, capture and application in organizations (von Krogh 2012). Knowledge creation refers to the development of new organizational know-how and capability that

can be acquired from external sources or generated inside the organization (Nonaka 1994). Knowledge and its transfer within the organizations require a sharing process, involving trial and error, feedback and mutual adjustments (Easterby-Smith and Lyles 2011). Bloodgood and Salisbury (2001) suggest that information system implementation functions are knowledge codification and visualizing the networks. Codification perspective is, for example, data and information sharing via IT or storing in databases, decision support systems and other repositories. Visualization, thus, aims at a representation, that can be units, artefacts, individuals and places with all kinds of knowledge. Application refers to knowledge use. Thus, knowledge is needed and used in decision making, problem solving and coordination by individuals and groups in organizations. (Easterby-Smith and Lyles 2011, p. 108)

> **RD3:** Design and visualize methods of information knowledge creation, sharing and capture with IS

The operational perspective of knowledge management is to build protective capabilities in two ways: to limit the number of employees who can access certain data and information, and to ensure that single employees do not access strategically relevant data (Bloodgood and Salisbury 2001). However, knowledge management can easily miss the target by focusing on wrong data, information, people or the organization (von Krogh 2012).

> **RD4:** Plan the user access policy for different data and information sources

Information technology may affect companies' competitive advantage in the form of cost lowering, differentiation or changing competitive scope. Technology increases the companies' ability to coordinate their activities regionally, nationally and globally. In the long run, competitiveness derives from the ability to develop core competencies that spawn anticipated products and services at a lower cost and faster than the competitors. Prahalad and Hamel (1990) argue that the real source of advantage is found in the management's ability to consolidate corporate wide technologies and production skills into competencies that enhance the individual business to be agile. (Porter and Millar 1985; Porter 1985) In addition, communities can lead to knowledge sharing, thus they can be termed resources, which provides benefits such as reduced monitoring costs or lowered costs of searching (company can access to information queues) (Easterby-Smith and Lyles 2011, pp. 411-416). Assessing information intensity is relevant when trying to understand the strategic role of information technology in business environment. High information intensity may be in the value chain, in the product or in both. (Porter and Millar 1985)

> **RD5:** Plan information system to support the value adding to organization

It is noteworthy that knowledge in and of itself does not produce organizational value, however, its application for effective action does, and IT tools which facilitate knowledge application can lead to remarkable organizational value (Easterby-Smith and Lyles 2011, p. 108). For example, by managing BI effectively over time, a company can maximize its intellectual assets. More specifically these initiatives can be creative ways of improving the customer support process so that questions are answered more precisely and faster or there can be reductions in the costs of information gathering and decision support that do not add value to the business. In addition, there can be a need to reduce the so called intellectual hemorrhage: key personnel leave the organization but their knowledge and intelligence remain and can continue to add value to the organization. (Thierauf 2001, p. 185)

> **RD6:** Plan information system to support customer needs and value produced for the customer

3.1.2 Digitalization impact on value adding

We cannot escape digitalization. From the consultant perspective, according to McKinsey and Company, customers are the main drivers for digitalization while the companies are trying to adapt their processes and products according to rising demand. For example, intuitive interfaces, around-the-clock availability, real-time fulfilment, personalized treatment, global consistency, and zero errors are the demands customers have become increasingly accustomed to (Markovitch and Willmott 2014) in the digital induced world (Handler et al. 2015). Daily life perspective is driven by the increased smartphone and tablet use; as the work formerly included a lot of paperwork, it has now been substituted by smartphones and tablets (Robertson 2014). From a manufacturing perspective, consumer-driven manufacturing companies are increasingly operating in a technology-filled environment surrounded by social, mobile, cloud and information management where the digital business will become critical to long-term success Scheibenreif et al. (2015) from Gartner argue. Another perspective is that automation is not enough, and the mindset of standardization and automating processes should be headed to digitalize work by leveraging the IoT (Internet of Things) and smart machines to build intelligent business processes (Robertson 2014). In addition, replacing paper and manual processes with software allows businesses to automatically collect data that can be mined to better understand process performance, cost drivers, and causes of risk (Markovitch and Willmott 2014).

When determining digitalization, it is always about creating new value-adding possibilities. Gartner's (2015) definition of digitalization is that it "*is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business*". It is claimed that visibility is the key value that is delivered through digitalization. In the glossary, value-adding examples are real-time reporting possibilities through mobile devices, work visibility

through digitalized paperwork and automated workflow that generates resource availability and accountability. These all can be monitored through real-time dashboards and reports, when digital-process performance allows managers to address problems before they become critical (Robertson 2014).

> **RD7:** Plan information system to support enterprise digitalization requirements
> **RD8:** Plan and build the mobile access to information system

Engineering and production are core competencies for manufacturers in many industries, such as complex and highly engineered products, durable consumer goods, industrial machinery, and medical devices, the need for these capabilities to connect to the front end of the business is spawning refreshed attention on technology investments, and therefore, next-generation products using capability of IoT are forcing manufacturers to rethink their value adding products, business models and processes (Scheibenreif et al., 2015). According to Robertson (2014) from Gartner, companies should consider the new value desired and work backwards to determine what work is needed to create and deliver that new value. Employees should be involved in the transformation of the business.

3.1.3 Cloud software as a service

Currently there are numerous business intelligence software products which contain an integrated query, analytics and reporting solutions. These solutions enable the user to access data that users need and in the form they need it via client/server interfaces of web-browsers (Thierauf 2001, p. 102). Operational business data (transactional data) is collected to a data warehouse using the ETL process, where data is extracted, transformed and loaded. The ETL process and data warehouse are central components in improving data quality (Thierauf 2001, pp. 122-123; Vitt et al. 2002, pp. 50-52).

One example solution is Microsoft (MS) Project Server, a workflow management system that integrates business intelligence and business processes, supporting functions in a project based environment. It provides project management, work management and portfolio management capabilities for the companies. Therefore, it is also called ’project portfolio management system’. Figure 9 is an example of a MS Project schedule template.

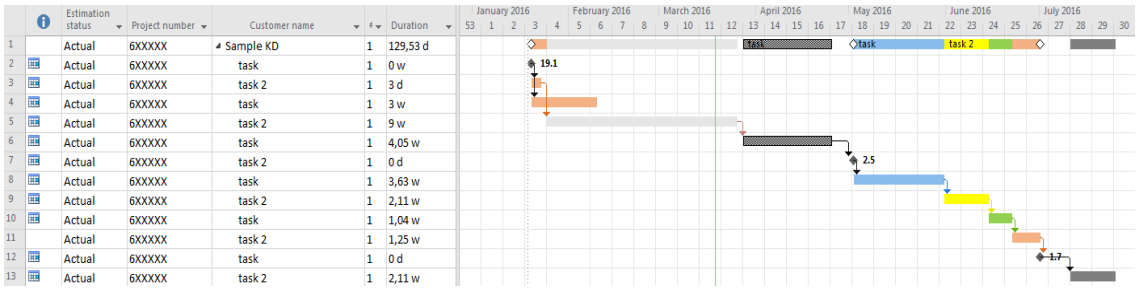

Figure 9. *MS Project schedule template*

The project information is stored in the Project Web App database that can be installed on the premises, on system provider cloud or third-party cloud. This information can be queried by any reporting tool that can connect to a Structured Query Language (SQL) Server database. Excel reports are data-connected spreadsheets that are used for visualizing the data retrieved from the Project Web App database. (Microsoft 2016)

Cloud computing has a number of positive aspects pushing for its rapid adoption, from both economic and technical points of view (Fatema et al. 2014). Cloud computing refers to internet based computers, resources and services that are available to service providers and software developers to provide assorted solutions (Jamsa 2013). Software as a service (SaaS) is one of the forms of cloud computing, where the usage is based on the need and user instance is browser or light customer software. Users apply the service independently and resources are centralized from a service provider's perspective. The cloud can be established on the service provider's premises or partner's premises. A real determination of SaaS is more or less academic debate (Järvi et al. 2011). Cloud computing implementation can be processed as follows:

- Software as a Service (SaaS), provides user instance or domain
- Platform as a Service (PaaS), platform where customers' computers and equipment can be connected
- Infrastructure as a Service (IaaS), considers whole infrastructure including computers, storage and connections, so called virtual knowledge center (Jamsa 2013).

Operation models are private cloud, community cloud or public cloud, but also hybrid models where two or more operational models are combined (Jamsa 2013). A private cloud is considered for security and optimization reasons (Dillon et al. 2010, p. 28). SaaS is a model which is not dependable on the place or time. Maintenance is provided by the system provider, since they have a control over the internet (Sääksjärvi et al. 2005). SaaS enables quick scaling, thus, users, can request and add licenses according to their needs. Service is visible while software monitors the transactions (Järvi et al. 2011). One software instance serves several users at the same time. Therefore, the service provider may have several customers on the same server. Depending on the size and of the customer, they may also share the same database resource (Jamsa 2011). The benefit

from the customer and user perspective is the payment policy based on the usage, consumers pay only for the services used, and it frees them from the management overhead of the underlying infrastructure. (Järvi et al. 2011; Aceto et al. 2013) However, several challenges for cloud services have been noticed, such as security, maintenance and performance related issues. These are discussed later on in this thesis.

RD9: Plan the type of cloud implementation and operation model
RD10: Plan the licenses usage when payment is based on the usage

3.2 Leveraging information systems for organizational transformations

Organizations are market-driven and constantly adapt to the changes demands of external environment (Chan and Reich 2007) and for example resource-based capabilities develop over time and constantly changing environments lead to dynamic organizational structures (Holbeche 2006, p. 3; Kirchmer, p. 13). Information system implementation is about many types of changes and innovations which help organizations and information systems to adapt each other. Therefore, IS implementation is also a social change that involves many organizational entities, and usually technical change is not enough to discover the implementation related attributes (Hyötyläinen and Kalliokoski (2001). Next, types of change are discovered in deeper level.

3.2.1 Sources, drivers and types of change

Kotter (1996, pp. 17-20) argues that main sources for changes are the economic and social forces which are driving the need for change in organizations. These sources are categorized into technological changes, international economic integration (e.g. more global capital flows), domestic market maturation within the more developed countries (e.g. slower domestic growth), and the collapse of worldwide communism (e.g. more countries are linked to capitalist system and more privatization). The company which is able to change is also able to adapt to the market.

Holbeche (2006, pp. 5-8) divides sources of change to competitive pressures and globalization. Organizations are shaped by their changing economic, political and social context. Organizational change is a term used to describe generally divergent processes that have different levels of impact on employees. Organizational change is divided into transactional, incremental, radical and transformational change. Transactional change is a term used to describe improvement in the existing organization, its operations and its outputs. Improvement, more or less, is required just to keep pace with the changing context. Interventions typically focus on formal structures, systems, work processes or work group relations. Incremental change can be major, highly significant change, but it is steady. For example, change may provoke employee resistance, and in many occa-

sions, sudden change may require rapid and fundamental shifts in behavior. Radical change occurs at pivotal moments for the organizations. For example, when organizations reach a crisis point, or when an organization goes on a growth curve, transforming itself through strategic acquisitions and mergers for example. Most organizations experience radical change at some point in their life cycle. Transformational change may be needed for survival. Change efforts geared to transformation are usually aimed at helping an organization regain strategic alignment with its environment.

Van De Ven and Poole (1995) have identified that the process of change in an organizational entity can be grouped into four categories in social, biological, and physical sciences: evolution, dialect, lifecycle and teleological. An evolutionary model of development consists of a repetitive sequence of variation, selection and retention events among entities in a designated population, such as an organization. In dialectical models of development, conflicts emerge between espousing opposing thesis and antithesis that collide to produce a synthesis, which in time becomes the thesis for the next cycle of a dialectical progression. Confrontation and conflict between opposing entities generate this dialectical cycle. A life-cycle model portrays the process of change in an entity as progressing through a necessary sequence of stages. An institutional, natural or logical program suggests the specific contents of these stages. A teleological model views development as a cycle of goal formulation, implementation, evaluation and modification of goals based on what was learned by the entity. This sequence emerges through the purposeful social construction. Each process is viewed as a different cycle of change, where the drivers for change are different, and they need a different unit of analysis and represent a different mode of change.

Lyytinen and Newman (2008) argue that a majority of change studies treat the change as a simple, linear progression where a new (technical) system is designed, adopted and modified in a controlled manner. They describe change in IS as follows: "*it covers the generation, implementation, and adoption of new elements in an organization's social and technical subsystems that store, transfer, manipulate, process, and utilize information*." According to them, IS change re-configures a work system by embedding new information technology components into it. Second, IS change can be viewed simultaneously as technical and social change; mainly incremental and cumulative, but it primarily, episodic so called punctuated IS change that involves both and links them. Leavitt defined change as interaction of technology, structures, people and tasks, in 1964s, as seen in Figure 10.

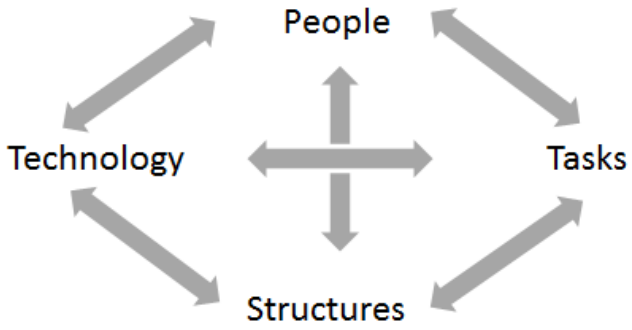

Figure 10. *Leavitt's diamond (adapted from Lyytinen and Newman 2008).*

The idea of dimensions is to see organization change as a multivariate system. Tasks describe the work system goals and purpose and the way in which the work gets done within the organization. Actors or people are an organization's members and its main stakeholders who carry out or influence the work. Structures cover systems of communication, systems of authority, and systems of workflow. It includes both the normative dimension, that is, values, norms and general role expectations, and the behavioral dimension, that is, the patterns of behavior as actors communicate, exercise authority or work. Technology denotes tools, problem-solving inventions like work measurement, computers and drill presses that compose a part of the work system. (Lyytinen and Newman 2008)

> **RD11:** Plan implementation to consider change as an interaction, of technology, structures, people and tasks

3.2.2 Strategic alignment

Al-Mashari et al. (2003) state the strong alignment between technical and organizational imperatives should be established in order to realize benefit of information system implementation. Chan and Reich (2007) argue IS change involves certain level of alignment between business processes, human and information management systems and organizational willingness to perform their work according to constraints created by the alignment. New technologies could be integrated into every component of their business, including tactical and strategic plans, management systems, culture, human resources, organizational structure, current technologies and business architecture (Al-Mashari et al. 2003).

Henderson and Venkatraman (1999) and Chan and Reich (2007) argue that business and IT alignment has been proved to have a positive impact on organizational productivity, performance and sustainable competitiveness. In the MIS literature, several dimensions of alignment are clearly apparent: strategic/intellectual, structural, social, and cultural.

Although significantly more attention is given to strategic IT alignment, both strategic alignment and structural alignment influence performance (Chan and Reich 2007). To create functional alignment, the level of alignment has to be clear; each organization level needs a different level of alignment. The most effective organizations are those that can create an innovative way of aligning the IT and daily business activities and therefore executives should consider alignment perspectives as alternative conceptual lenses and make continuous adaptions. The high IT maturity supports corporate strategy with appropriate IT solutions that can be established with correct IT investments.

RD12: Plan the alignment type
RD13: Design strategic alignment according to organization need
RD14: Plan adaptations to the alignment according to organization requirements
RD15: Plan alignment classification to business objectives, IT objectives, IS requirements and organizational requirements

Henderson and Venkatraman (1999) debate that companies' inability to realize the value of IT investments is partly because of the lack of alignment between the business and IT strategies of organizations. Their model of strategic alignment is designed to include both external and internal domains, with an integrally dynamic fit (Figure 11). Challenges of alignment building can vary depending on the organization size, capabilities to understand knowledge needed for alignment and turbulent environment of the operating context, thus, alignment should be a joint responsibility between IT and business executives (Chan and Reich 2007).

RD16: Expose strategic alignment design with many organizational perspectives

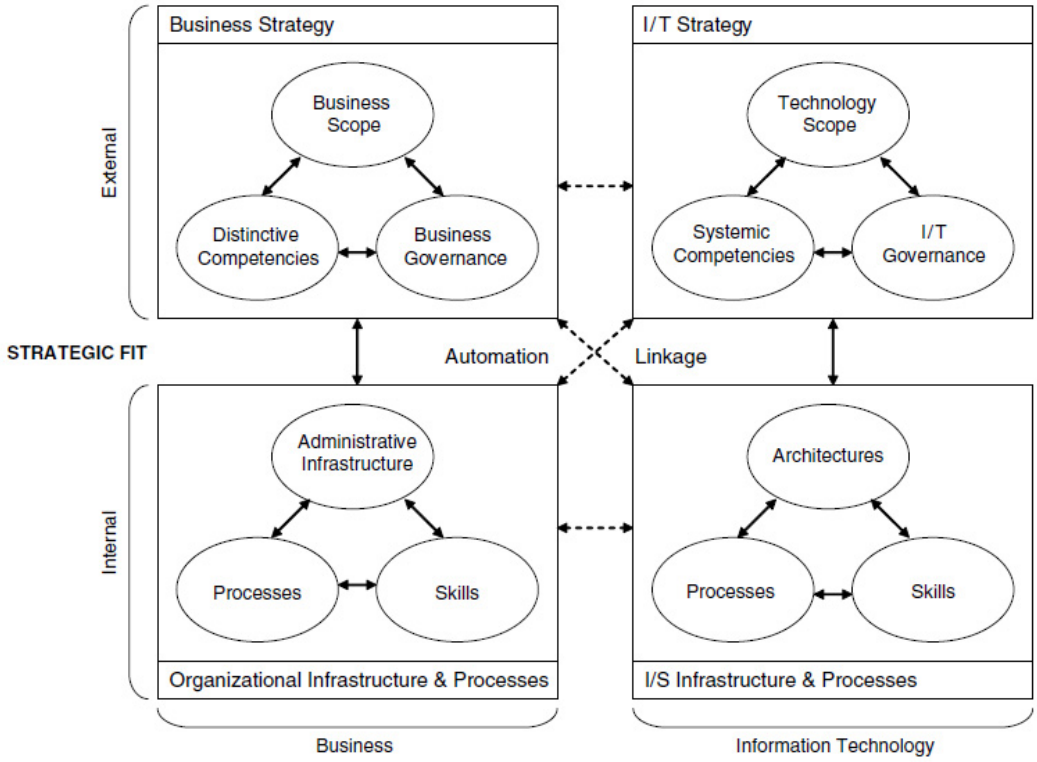

Figure 11. *Strategic alignment (Henderson and Venkatraman 1999).*

Alignment is not an event but a process of constant adaptation and change. In other words, advantage is gained through the capability of an organization to abuse IT functionality on a continuous basis. Not only does this require a fundamental change in the managerial perspective about the role of IT organizational transformation but also an understanding of the critical components of IT strategy and its supportive role for shaping business strategy decisions. (Henderson and Venkatraman 1999)

A concept of strategic alignment is based on building blocks of strategic fit and functional integration. The strategy addresses both external and internal domains, where external is in the business arena with strategy attributes that differentiate the company from its competitors, while the internal domain is concerned with choices pertaining the logic of administrative structure, and specific rationale for design and redesign business processes, as well as acquisition and development of necessary human resource skills. (Henderson and Venkatraman 1999; Chan and Reich 2007)

Business strategy is the core driver of organizational design and IS infrastructure design choices. The second perspective is technology transformation. The chosen strategy should be implemented through an appropriate IT strategy, and the articulation requires information system architecture and processes. The role of the executive management is to provide technological vision of the best solution that supports the chosen business strategy. Thus, the IT strategy is an enabler. A competitive perspective allows the adoption of a business strategy via IT capabilities. The perspective seeks to identify the best

set of strategic options for business strategy and the corresponding set of organizational infrastructure and processes. (Henderson and Venkatraman 1999)

A service level perspective is important in establishing a world-class IS service organization. Therefore, it requires an understanding of IT strategy relation and correspondence of IS infrastructure and process design. Thus, the strategic fit combines IS customer needs and IT capacity. An analytical perspective requires systematical methods, such as end-user surveying, to ensure that products and services that currently exist in the IS organization meet customer needs. (Henderson and Venkatraman 1999)

RD17: Plan IT products and service to meet the client needs

3.3 The role of business process re-engineering and management

Hyötyläinen and Kalliokoski (2001) state companies should alert the different types of process and process requirements during the requirements specification phase. For example business processes, organizational learning processes and customer processes can be the ones which are impacted during information implementation. Al-Mashari et al. (2003) state the package software solutions seek to integrate business processes and organizations and one of the major benefits for information system implementation such as ERP, is role of re-engineering that allows companies to improve existing business processes.

Business process re-engineering (BPR) is a customer-centric approach to improve and redesign organizational processes. It aims to increase performance dramatically resulting in the elimination of numerous non-value-adding activities that are the source of costs, errors and delays (Hammer 2007). Major process improvements are usually carried through re-engineering projects (Laamanen and Tinnilä 2009, p. 24). Re-engineering requires looking at fundamental processes of the business from a cross-functional perspective. One way to ensure that re-engineering has a cross-functional perspective is to assemble a team that represents the functional units involved in the process being reengineered and all the units that depend on it. Creating new rules tailored to modern environment ultimately requires a new conceptualization of business processes (Hammer 1990). After implementing the new redesigned model in the organization, this organization must be managed and controlled. Processes, tasks, resources and goals for operation of implemented process are framed by continuous process management. The company should permanently adapt to changing conditions in the turbulent market environment, and only by making the process management continual, the strategic creativity is guaranteed. (Becker et al. 2003, p. 237)

RD18: Plan all processes that need re-engineering

A concept of business process is defined as a completely closed, timely and logical sequence of work activities, which are required to work on a process-orientated business environment (vom Brocke and Rosemann 2010, p. 4-6). Business processes are end-to-end work that creates customer value by transforming the inputs to quality outputs. Essential features of business processes are interfaces to business partners, such as customers and suppliers. In addition, all processes have a system perspective, and processes have to be understood as part of the whole system (Laamanen and Tinnilä 2009, p. 28). Porter (1985) has proposed the model of a value chain where he separated corporate activities to primary activities and supporting activities. The primary activities are regarded as value-creating activities with a direct relation to manufactured product and contribution to economic outcome of the company (Porter and Miller 1985). These primary activities can be for example sales, marketing, logistics and customer service. The supporting activities do not have direct impact on manufactured products or services but are necessary in order to execute the core process, for example human resource and accounting are regarded as supporting processes. Large international organizations typically have from five to ten value chains. In essence, value chains are the ultimate processes defined by the companies. (Becker et al. 2003, pp 4-5)

RD19: Plan and model value-adding tasks and activities

Nevertheless, the primary processes are not effective themselves and they need supporting process around to accomplish their purpose (Laamanen and Tinnilä 2009). The line between primary process and supporting process is usually fickle and depends more or less on the type of the business as well as the size and structure of the organization. According to Laamanen (2001), the right approach is to define a key process inside primary and supporting activities. Figure 12 presents the fundamental life-cycle approach to business process management. The essential points are in design, implementation, execution, and control and monitor.

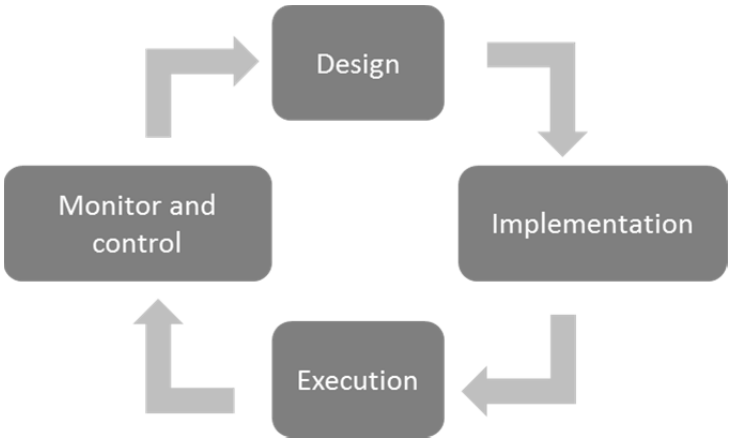

Figure 12. *The Life-cycle of business process management (adapted from Krichmer 2010).*

Fundamental approach to business processes is that they always arise from customer needs. The processes and resources are designed to support the demand of the customer. Outputs are the answers to customer needs. (Laamanen 2001, pp 21-23) The life-cycle starts when the main business processes of a company are identified. Next, innovations and their general process impacts are defined, delivering the basis for the process structure and the related process goals. The underlying application system architecture is planned accordingly, supporting the required agility (Krichmer 2010). Implementation includes the software configuration or development, and change management, consisting of information, communication and training. Execution is done through people (human) and IT. The people based execution should be supported by continuous learning and talented management initiatives. Monitoring and controlling are needed to ensure that the process is achieving its targets (Krichmer 2010).

3.3.1 Business process walkthrough to describe a workflow

Process walkthrough enables people in the process to realize those functions and tasks which are relevant for value-adding, and for example, software development and selection of an ERP system both need reference process models to help the evaluation (Becker et al. 2003). A workflow is determined as the part of the process that includes a timely and logical sequence of activities (Laamanen 2001). Information, data and resources that are involved in the execution of this task are also recorded. The main objective is in automation; the transitions between the individual activities are controlled by workflow management system in the automated process execution, and usually this is linked into the transaction of an ERP system (zur Mühlen 1999). The process walkthrough generates the process description, and the description is a way of spreading information to necessary parties. By increasing the knowledge of the process and its relation to organizations is the way to understand, analyze and develop the business processes, and process description is an efficient approach to point out critical stages. (Becker et al. 2003; Laamanen 2001, p. 50) In order to understand business processes, the high level and clear description is enough to create understanding. To improve and develop parts of the process, a more detailed description of the object is valid and needed (Laamanen 2001, p. 79).

RD20: Describe and visualize the workflow of selected processes

The process model and description should include critical steps of the process and relations between tasks. It also guides the understanding of the ensemble and, its own role enables collaboration between humans in the process (Laamanen 2001, pp. 79-88). Workflow activities specify the resources that can be taken over the execution. Those resources can be for example employees, machines or software resources (zur Mühlen 1999). The model of flowcharts should be simple and unnecessary symbols avoided because usually they do not serve a purpose. Correct and clear techniques enable better understanding of the outlined object (Laamanen 2001, pp. 82-88). The distinction be-

tween the business process model and workflow management is that modelling focuses on organizational design and workflows concentrate on the IT support, thus available process models have to be adapted to the workflow management purposes. (zur Mühlen 1999). However, not every business is suitable for support by the workflow management system, and challenges and possibilities have to be recognized. The major benefits are in coordination when tasks are in the electronic support if process execution and manual work is reduced. Related transportation times are minimized and equal process objects are processed in the same way. This contributes to process mastering and process quality improvement. (Becker et al. 2003, pp. 263-274)

Laamanen (2001, p. 88) argues that four types of evaluation are recommended for the organization. First, process executives have a responsibility to evaluate that the model, description and structure of the process are technically relevant. Second, management executives should make sure that the process description follows the workflow. Third, key performers should evaluate whether critical tasks are in line with the process and are described in a proper way. Fourth, process performers should understand their part and role in the process. After the analysis is done for the examined process, the improvements should be realized with a minimum short term effort. (Becker et al. 2003, p. 133).

RD21: Evaluate and iterate designed model constantly with organization

3.3.2 Change as an important process

In response to these competitive pressures, organizations have reached for the glossary of change management (Holbeche 2006, p. 4). According to Kim and Kankanhalli (2009), user resistance to information systems implementation has been identified as a salient reason for the failure of new systems. Laamanen (2001, pp. 258-272) argues when basic plans of change have been done and new models are pushed through, a certain chaotic phase exists; letting go of old and implementing the new, even though the new models are not fully internalized. His approach to organizational change is structured as the planning of the steps of change, as illustrated in Figure 13: *recognizing, vision, energizing, testing, implementing and imprinting.* (Laamanen 2001, pp. 260-272)

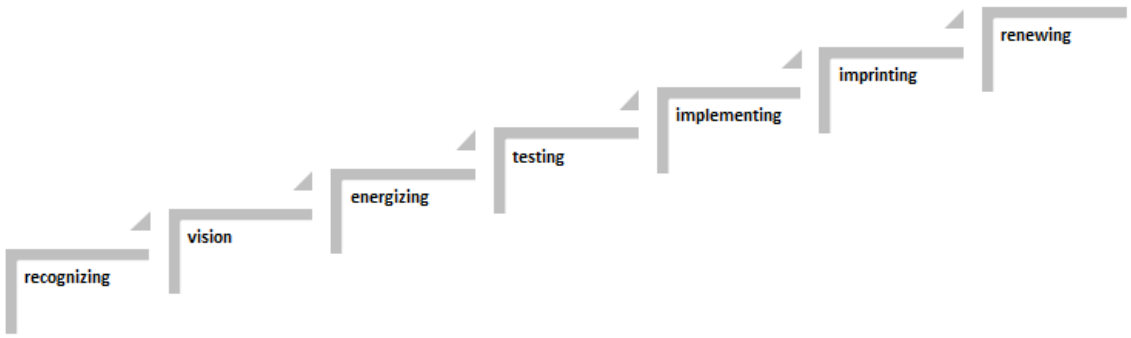

Figure 13. *Change as a process steps (adapted from Laamanen 2001, pp. 260-272).*

Recognizing means key people (top-management) in the organization have a mutual agreement with the idea of change. The benefits, challenges and causality of change should be described in this phase. The vision, improving challenge and deduction of the problem should be payed attention to in the first phase. After recognizing the people, who participate in implementing the new model, are responsible for creating the general and common vision of change model and new state. The critical success factors should be taken notice of in this phase. Essential for this dimension is to analyze the risks of the change, perceived by people who contribute to the change, especially in terms of psychological stages such as resistance and political in-fighting. Change resistance in IS implementations can be caused by, for example, intra-organizational power distribution with new system, where the fear of power loss causes resistance towards IS (Kim and Kankanhalli 2009). Robey et al. (2002) argue that the primary obstacle during the ERP implementation projects was the company's knowledge of existing business processes and systems. When being empathetic with these factors, it is easier to convince them that change is needed in the organization. Also planning the roles and choosing the right people are done in the vision phase. The result of envisioning is an operating model where responsibilities, time tables, tasks and goals are described, along with relevant measures. This phase forces the leaders to start with the big picture in mind. The change plan should show clearly how some parts of the vision are to be achieved. At the end, change has status, and a vision of a new operating model is created and communicated. (Laamanen 2001, pp. 260-272; Holbeche 2006, p. 299)

> **RD22:** Plan and prepare to change resistance from different organizational perspectives
> **RD23:** Plan and share clear vision of the change in early phase

The meaning of energizing is that the people who the change concerns contribute to the idea of change. Therefore, it is critical to understand factors such as 'status quo bias theory' which explains how people prefer maintaining their current status or situation, in terms of rational decision making cognitive misperception and physiological commitment (Kim and Kankanhalli 2009): the aim is to understand the essentials and possibilities of change. However, individuals constantly assess costs and benefits of change

before making a switch to a new alternative, or loss aversion (cognitive misperception) can lead to bias, since smaller losses can be perceived bigger than they really are. The last psychological commitments, such as feel of control, guide individuals to determine their own situation. Thus, a carefully designed change plan should guide the actions and behavior of those involved in its execution and enable the progress to be monitored (Holbeche 2006, p. 299). At the energizing phase, people decide whether to direct their energy to new options, or stay with the old option. The result of this phase is increased knowledge among people who are involved in the change somehow, as well as their understanding of the upcoming. It is important to create a list of concepts, as well as the communication plan and material. After the new operation model is communicated, testing follows. Testing is the phase where key people plan, execute and get feedback on the changes in practice. This can also be called the pilot phase where the ideas are actualized. It is essential in this phase to contemplate the new operational model into practice. The challenges are the old ways to think and perform: routines, self-indulgence and habits of time use. Therefore, to ensure the success of organizational change in the long term, new working methods have to be reinforced. Leaders should have developed mechanisms that reinforce and institutionalize change. (Holbeche 2006, p. 307; Laamanen 2000, pp. 260-272)

RD24: Involve people in development and execution
RD25: Test new designed methods and processes

Implementing, in this circumstance, means that the people who are involved in the change, are trained according to the new model and information systems are changed to support the new operations model. The base for applying the new model widely is created in this phase. The challenge in the implementing phase is changing the routines and breakdowns, and errors usually lose the commitment to adopting new methods (Kim and Kankaanhalli 2009). Also new is not new anymore, meaning that beginners enthusiasm disappears even though the actual change has not yet happened in the organization. Therefore, value promotion, providing detailed information to people on how their work changes, and proof of the performance of the new system, are essential (Kim and Kankaanhalli 2009). The results after implementation are requested knowledge to perform according to new model, new tools and information systems and a rewarding system in which performers know. The requirements for the process goals and how they are rewarded are communicated to people. (Laamanen 2000, pp. 268-270)

RD26: Promote value and detailed information of how work changes

The desired results that follow the change should be rewarded. Performance measuring is essential in the imprinting phase, so that the return to old manners is prevented (Holbeche 2006, p. 391). The purpose of this phase is to contribute to the positive attitude of change. Continual feedback is needed for developing new goals. The risk in this phase is to cease measuring the change too early. The reality is that the actual imprinting is put

into test in the first crisis, and especially when challenges are faced, the old models and ways to work are a lucrative option. The results are reports of the progress and development, corrective actions to negative feedback, breaking the connection to the old way of working, and rewards. (Laamanen 2000, pp. 268-270)

RD27: Plan how feedback is collected in continuously

Renewing is the last lesson to learn. Leading the change is measured and evaluated, and the goal is to learn in the change projects. Kim and Kankanalli (2009) suggest a measurement instrument for user resistance, perceived value, switching benefits, switching cost, colleagues, self-efficiency of change and organizational support. These attributes could be measured in individuals. Afterwards, the gained knowledge of how to conduct changes can be applied in the future, so the next project and initiatives are conducted more efficiently. The key in this phase is to learn and apply the gained knowledge and apply it to new situations. The challenge is to keep renewing constantly instead of staying in a rut. The routines and self-indulgence will take place after new actions and models are internalized and learnt, even though the surrounding environment will change and new opportunities will rise. The results of the renewing are changes and improvements to the execution and operational model, evaluation reports and realizing the need of the new improvement. (Laamanen 2000, pp. 270-272)

RD28: Plan the process renewal

4. CRITICAL FACTORS IN CLOUD SYSTEM IMPLEMENTATION

In Chapter 4.1, the lifecycle of the cloud system implementation is introduced, and also the critical factors during implementation. In Chapter 4.2, the implementation practices and competences that are seen highly relevant are introduced to give an insight in the critical factors in cloud system implementation. The core of the chapter is to highlight the enablers of social change and emphasize the project management methods that are suitable to manage complexity and uncertainty. In Chapter 4.3, the importance of IS evaluation is highlighted. The sole basis of the chapter is in benefits and success realization during IS implementation and project management.

4.1 Critical factors in cloud system implementation lifecycle

As Hyötyläinen and Kalliokoski state (2001) the information system implementation of information system includes technical and organizational approach. Cloud services and software systems are designed to be implemented quickly. However, the implementation requires careful planning from different perspectives. For instance, the organizations where the implementation is done may be complex in many different ways. The structure of the organizations may be complex and geographically dispersed, and therefore, the implementation challenges the organizations to involve difficult, possibly unique, technical and managerial choices and challenges (Markus et al. 2000).

From a technical point of view, cloud system implementation requires pretesting and knowledge of the cloud technology in the first early phase of its lifecycle (Figure 14). Testing should involve scenarios of business models that could done through cloud systems. The second phase of the implementation cycle consists of capabilities, cloud strategies and roadmap planning. Cloud and IT capabilities of the organization highly impact the cloud implementation. The experience of cloud and service outsourcing, and service based architecture, has an influence on the company's capabilities to adopt cloud services. The strategy should answer the questions 'how can the cloud support unsolved problems?'. The purpose of the mobilization and transition plan is to enable the organization use cloud implementation in accordance to the cloud strategy with the right resources and named responsibilities. The cloud strategy and roadmap phase also includes the necessary training in technical, functional, architectural and communicational aspects of the cloud service. (Marks and Lozano 2010, pp. 115-123)

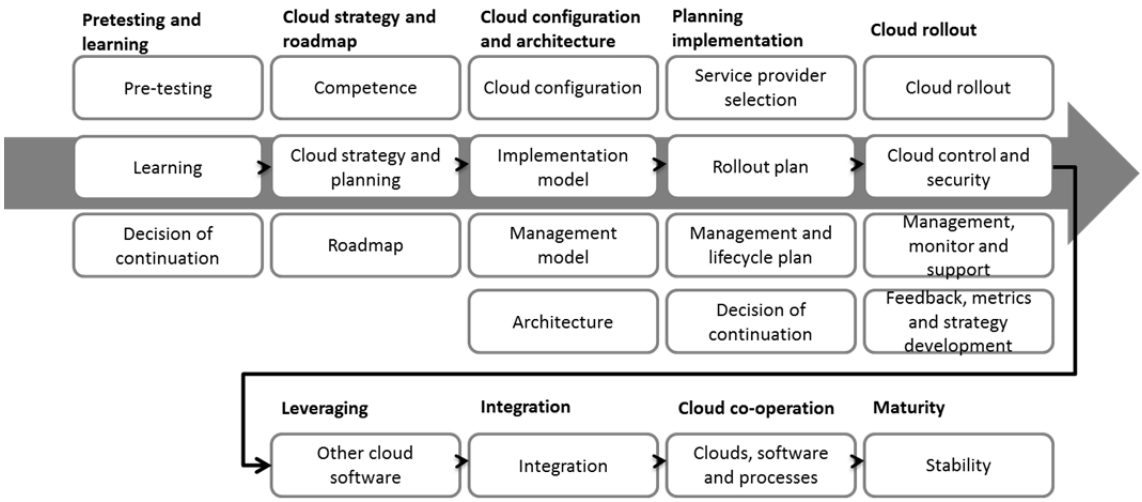

Figure 14. *Cloud system implementation model (adapted from Marks and Lozano 2010, p. 196).*

Cloud modeling and architecture adoption in the lifecycle model includes cloud modeling and architecture steps, in order to execute the cloud strategy. This adoption lifecycle stage leverages the cloud computing reference model and the management modeling and architecture framework, in order to develop a strategically aligned cloud reference model. The implementation planning phase includes service provider evaluation, implementation planning, management and life cycle planning. In this phase, the implementation plan describes models that suit organizational needs and designed cloud strategy. Cloud service providers should be evaluated and analyzed carefully to minimize the possibility of vendor-lock-in. The provisioning plan describes resources needed from the organization, how data and software and business processes are migrated to the cloud and back, if the organization is satisfied to use the cloud or does not need the service anymore. (Marks and Lozano 2010, pp. 130-133; Järvi et al. 2011)

RD29: Plan cloud system lifecycle and implementation model
RD30: Plan preliminary cloud system leveraging possibilities

Cloud implementation follows the documents of the cloud model, architecture and implementation plan of the previous phases. Cloud control and information security, performance and service quality, service level agreement (SLA) and cloud migration management have high importance during the implementation. In addition, this phase includes data migration, transformation to the cloud and back from it, and management of different applications that have access to the cloud. Feedback should constantly be collected and the process should be seen as an ongoing development process, with right metrics that have been set in accordance of cloud strategy. Metrics should also measure the implementation phase. (Marks and Lozano 2010, pp. 134-140)

4.1.1 Maintenance and service level agreement

Since the responsibility of cloud maintenance is provided by the service provider, the customer and user organizations should secure the level of received service. The organizations with or without cloud services require a maintenance strategy to ensure the manageable maintenance and future development. The maintenance strategy should cover current the situation and possible problems regarding the maintenance. Strategy creation starts when the project team is gathered. The project team should map out the opinions and points of view of all users, IT professionals and other stakeholders. It is relevant to explore the critical issues that negatively affect the current maintenance. Existing maintenance models and instructions are needed, in order to find out whether they need updates or development. (Koistinen 2002, pp. 72-74)

Next the objectives and the role of the maintenance are described and also how they support the company's IT strategy. To realize the objectives, the relevant metrics are needed. Monitoring metrics need their own process which is properly documented and aligned with daily work. The main purpose is to have constant follow-up with corrective actions. This also requires correct and named resources. Also, the supporting tools and software that are used for monitoring are documented. (Koistinen 2002, pp. 74-76) The clear instructions for maintenance include how it is executed. The document form can be, for example, a maintenance handbook or manual. The project team ensures that IS strategy is implemented, and the people involved in strategy execution have the right knowledge, instructions and training available. Also a training plan should be created. Maintenance is an ongoing process and development is a critical part of it. (Koistinen 2002, p. 76-77)

RD31: Plan cloud system maintenance and requirements by organization

The service level agreement is a contract signed between the service provider and customer, to respect the service offer and quality of service. SLA is important, since the customer does not have control over the IT resources but still they should be able to control the service quality, availability, performance, reliability and the resources regarding them (Dillon et al. 2010, p.. 31). The providers are expected to meet the quality and key performance indicators for services in order to enforce their agreed SLA terms (Fatema et al. 2014).

According to Kandukuri et al. (2009, pp. 517-518), a typical SLA consists of security, withdrawl of agreement, problem management, service level monitoring and measurement, accident recovery and continuance management. The objectives of the service level are listed in the contract for a basis for measurement. Other purposes of SLA agreement are the identification and determination of customer needs, reducing complexity and increasing understanding, reducing conflicts, encouraging conversation when conflicts exist and reducing unrealistic expectations.

Cloud performance can be measured from many perspectives. Nevertheless, cloud computing is a relatively new paradigm and no common standards have been widely adopted by deployed systems (Aceto et al. 2013). According to Fatema et al. (2014), the main performance metric should cover at least agility, low cost, device and location independence, multi-tenancy, high reliability, high scalability, security and sustainability. For example, usability is related to fitting the purpose and it is an important factor when evaluating usability, since the intended goal of a monitoring tool determines the usability judgement. Affordability considers both the cost of the monitoring agent and the back-end server component. One of the reasons behind the popularity of cloud adaptation is the reduction of cost. Comprehensiveness is a metric that supports different types of resources (both physical and virtual), several kinds of monitoring data and multiple tenants. Cloud multi-tenancy is a metric that measures whether the cloud offers a multi-tenant environment where multiple tenants share the same physical resources and application instances. Availability measures whether the cloud provides services according to the system design whenever users request them (Aceto et al. 2013). Archivability means the ability to retrieve historical data that is useful for analyzing and identifying the root cause of a problem in the long term to enhance customer satisfaction (Fatema et al. 2014).

> **RD32:** Plan the right metrics to cloud performance and use the metrics in service level agreement

4.1.2 Cloud security

Security is considered as one of the most significant obstacles to the growth of cloud computing, especially considering that some businesses may be highly critical and consumers and governments may have strict principles regarding where data is stored. (Aceto et al. 2014) Heiser and Nicolett (2008) list security attributes that should be considered:

- Privileged user access: clarification how service provider secures and controls customer data. Also supply-specific information on the hiring and oversight of privileged administrators, and the controls over their access.
- Viability: clarification of situation when service provider long-term viability is threatened. How the organization would get data back and would it be in a format that organization could import into a replacement application.
- Compliance: clarification if service provider is able to submit to external audits and security certifications, providing their customers with information on the specific.
- Data location: clarification where the data is storage. If needed, clarification whether service provider can give a contractual commitment to obey the law on your behalf.

- Data segregation: clarification how data is segregated by the service provider and proof of the encryption is done properly. Evidence that the encryption implementation was designed and tested by experienced specialists. Clarification who performed the protocol analysis and code reviews.
- Data recovery: clarification how service, data or service provider are recovered from the total disaster, and how service provider can replicate data and in which time manner.

In addition, Heiser and Nicolett (2008) state that companies should clarify the security and reliability related services in order to reduce risks. Kandukuri et al. (2009, p. 519) and Aceto et al. (2014) highlight that all listed attributes should also be considered in the service level agreement.

RD33: Plan and ensure system and user security of cloud

4.1.3 Cracking knowledge barriers and blocks by implementation practices

Despite cloud systems being easy to implement, implementation practices have organizational effects of system adoption. These practices highly depend on the organization objectives, scopes and capabilities. According to Robey et al. (2002), while companies configured their ERP systems, it involved populating at least hundreds, and usually thousands, of tables with values that reflected the business rules. When the system combines several data repositories, it is likely to generate complexity. The complexity of ERP, the assimilation of new work processes and organizational changes posed more complex challenges with ongoing implications creating significant knowledge barriers that were acknowledged by the respondents. Therefore, rollout practices should be aligned with company's strategies (Markus et al. 2000) and they are critical to companies for many reasons. First, the company can lower the organizational resistance by undertaking fewer changes at one time (Robey et al. 2002).

Big-bang deployment refers to an implementation where a new system ramp-up is done at one time and usually requires companies to shut down operations worldwide (Markus et al. 2000). Robey et al. (2002) describe it as '*concerted change'* when many things change at once. In this approach, members of an organization must not only learn to use new systems but they must also learn new ways of doing their jobs.

Phased implementation divides the implementation into different strategic phases (Markus et al. 2000). Phased implementation can be organized in many ways. For example, global companies can first implement common operating methods and processes, and then implement the new system, or first implement the new system and later new processes (Markus et al. 2000; Robey et al. 2002). This type of change can be called '*piecemeal*' because fewer changes are undertaken at one time. It may also be

considered as an example of loose coupling between technical and organizational change. Companies that adopted the piecemeal approach seemed to have an easier time overcoming knowledge barriers than those that adopted a concerted approach (Robey et al. 2002).

> **RD34**: Plan the type of implementation practice in accordance to the company's objectives and capabilities

According to Holbeche (2006, p. 209), organizations may also be habituated to blocks that can prevent change. Perceptual blocks can be caused by a too narrow definition of the problem. Cultural blocks refer to the individual's motivation towards change, such as tradition being preferred over change and beliefs that reason, logic and practicality are positive, and that feeling, intuition and qualitative judgements are negative. Environmental blocks can be distractions, such as telephones or activities that keep people so busy they have no time to be fully attended. Last block is emotional, such as the fear of making a mistake, or of taking a risk. Therefore, without having a culture of experimentation, organizations can fail strategically (Holbeche 2006, p. 217). Also a knowledge block may exist, since knowledge transfer is a complex process where new knowledge is built through a learning process, with double-loop cycles that are prompted by reflections that evaluate past decisions and mistakes (Marabelli and Newell 2009).

Marabelli and Newell (2009) argue that customization and configuration during ERP projects are linked to a tradeoff between user-oriented and business-oriented implementations. User-oriented implementation includes support for users and managers, as well as technical staff to request the customization and configuration according to their needs, while the business-oriented focuses on the satisfaction of business requirements and improvements of effectiveness in terms of configuration on customization. These perspectives should be balanced, and the worst case scenario would be that nobody uses the system.

> **RD35:** Plan user-oriented and business-oriented customization and configuration to be in balance

4.2 Critical taxonomy and success factors of implementation

Critical factors effecting on IT adoption and its implementation have been studied since the 1980's, when IT literature was dominated by optimistic tone (Powell and Dent-Micallef 1997). Currently, the literature on successful tool implementations emphasizes short time value realizing, effective minimization of the change pain and maximization of the time to value, through leadership and organization change management (Handler et al. 2015). As stated by Hyötyläinen and Kalliokoski (2001) organizational involvement is an important factor to ease the implementation.

Al-Mashari et al. (2003) have underlined a critical framework for ERP implementation projects in Figure 15. The purpose of the novel taxonomy approach is to realize and maximize benefits. Clear scoping is critical, and the company should have a clear understanding of the desired end state (Handler et al. 2015). The scope defines the extent and type of benefits that can be derived with standardized software configurations which can be configured according to different needs of business units. Scope also specifies the degree to which the ERP system will change managerial autonomy, task coordination and process integration. Clear visions are translated to critical factors of success that will be communicated to different levels in the organization (Markus et al. 2000).

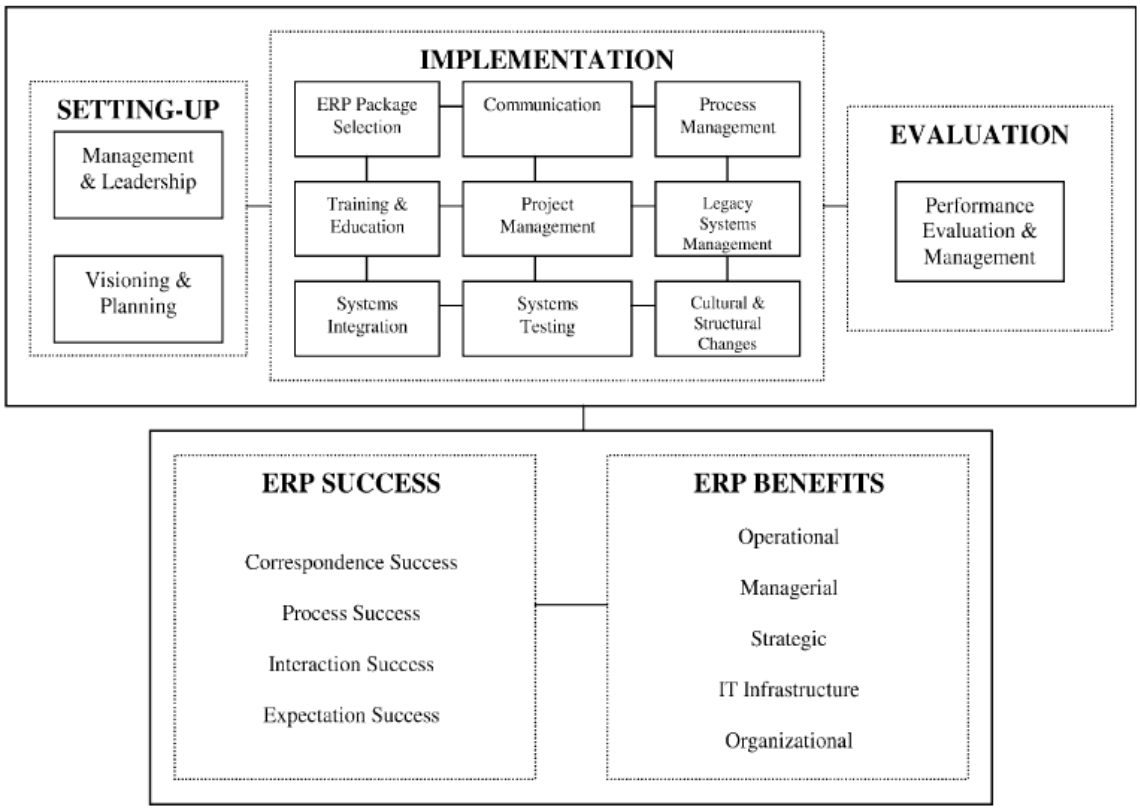

Figure 15. *Taxonomy of critical factors in ERP implementation (Al-Mashari et al. 2003).*

The implementation is divided into nine categories followed by the evaluation. Success is measured in different terms which are realized through benefits. In addition, these factors are listed in a collection of literature review, as illustrated in Table 2, which implicates the factors and practices during IT implementation projects, especially ERP implementation projects that are considered complex ones. Communication and project management capabilities are discussed separately in Chapter 4.2.1 and Chapter 4.2.2

Table 2. *List of factors and practices from literature review*

Factors and practices	Literature
Small and motivated internal core team with experience	Robey et al. (2002); Bingi et al. (1999); Handler et al. (2015)
Integration and operational discipline	Bingi et al. (1999); Al-Mashari et al. (2003), Themistocleous and Irani (2001); Themistocleous et al
Training and end user support	Robey et al. (2002); Bingi et al. (1999); Handler et al. (2015)
Top management support	Pollard and Carter-Steel (2009); Bingi et al-(1999); Handler et al. (2015), Subramaninan et al. (2007);
Qualified consultant	Robey et al. (2002); Bingi et al. (1999)
Performance management and goal setting	Holbeche, (2005); Lyytinen and Hirschheim 1987; Handler et al. (2015)
Communication and change promotion	Holbeche, (2005); Laamanen (2001); Al-Mashari et al. (2003)
Project management capabilities	Handler et al. (2015); Yeo (2002); Snider et al. (2009); Al-Mashari et al. (2003)

The implementation involves many stakeholders. According to Pohjonen (2002, pp. 46-47), information system development and implementation projects involve people from the customer and provider site, such as system developers (programmers, consultants and designers) users and management. According to Robey et al. (2002), a small internal core team during the implementation with respected business and technology managers is essential, since they provide the needed business and technical expertise and can make decisions fast. In most firms, a core team assumed responsibility for configuring the system. It is essential that the project team has the adequate knowledge of hardware, operating systems, data base handler and a project application language (MacFarlan 1981). In dialectic terms, the core teams operated as forces promoting new knowledge against the knowledge barriers of existing organizational memory. Companies found various ways to ensure that core teams overcame the complexity and novelty of configuring software. (Bingi et al. 1999)

In addition, interest and motivation are key enablers of change. Motivation is an indispensable factor in the work context. Maslow and Herzberg have highlighted how individuals are motivated by a hierarchy of needs. Individuals are controlled by physiological needs (pay and conditions; care of the physical environment, health and safety). They also have a need of belonging/affiliation, such as working in teams, pride in organization), or need of freedom and control/power (involvement). Also, needs for growth and development/achievement (chance for learning, responsibility and career development) may control individuals. (Ozguner and Ozguner 2014; Holbeche 2006, p.

380) Therefore, the implementation project team should be a combination of the right talented and motivated individuals (Handler et al. 2015).

RD36: Plan small implementation core team with the right knowledge

The goal of information system integration is to link two or more components of the information system together, so that the separate components of the information system can operate as one system (Bingi et al. 1999). In addition, the integrated system should support the organization's business processes. Organizations need to understand the nature of integration and how it affects the entire business, in order to avoid financial issues that might result due to lack of expertise (Themistocleous and Irani 2001). With tight integration, the ripple effect of mistakes can, by passing them from one part of the business unit onto the other departments, magnify the original mistakes as they flow through the value chain of the company. However, integration is often seen as a difficult problem, the outcome of which could be a disaster, or at the very least be a challenging problem which the organization needs to overcome. For example, research made by Themistocleous et al. (2001) raises the issues regarding the technical challenges and problems of the IS implementation project. The imperfect integration causes problems for the employees in performing daily tasks and complicates systems' interoperability, but can also be very expensive to renew. Therefore, the companies must be highly aware of potential risks of errors and take the appropriate steps to solve the integration problems. For instance, companies need a plan on how to handle error situations and how to communicate with all parties affected by errors (Al-Mashari et al. 2002). Certain discipline should be established by training how information flows and how errors affect the activities in the value chain. Formality and explicit rules, which contain the needed knowledge to accomplish tasks, should be planned to ensure organizational learning. (Bingi et al. 1999; Lindkvist 2004)

RD37: Plan information system's integration and the support carefully

According to Robey et al. (2002), when companies invested wisely in training and adopted an incremental approach to organizational change, they reported that they had satisfactorily disseminated knowledge about the effective use of the system across the organization. According to Bingi et al. (1999), people are a hidden cost of implementation projects. During ERP projects, employees require rigorous training, so companies should provide possibilities to enhance the skills on continuous basis, so that the needs of the business and employees are met. Handler et al. (2015) state that companies should ensure that contribution is a good match to the maturity of the audience and to the organizational culture. The audience should be kept primed and excited about training. Developing and maintaining end user support is essential and it should notify organization change and cultural fit.

RD38: Plan training in the way that people are exited and can enhance skills on continuous basis

The implementation projects can encounter major challenges because of the absence of top management support. Top management commitment is necessary to guarantee funding for resources like training, hardware and software, but it is also essential to endorse policy and enforce compliance to the standard processes across the entire organization (Pollard and Carter-Steel 2009). Top management needs to constantly monitor the implementation project progress, resolve conflicts, develop the shared vision and build diverse cross-organization groups and provide direction to ensure smooth change and system roll-out (Bingi et al. 1999). This requires spending the necessary time upfront to secure a strong and visible executive sponsorship and engagement (Handler et al. 2015).

RD39: Plan how the top management is communicated by project progress

In the study by Robey et al. (2002), transferring knowledge from the consultants to the company was seen as beneficial. Where companies supported the core implementation team and managed their relationships with consultants well, they reported that they had configured a system which they were able to implement across the organization. Therefore, qualified consultants with multiple skills, for example, those concerning a specific industry, and also technical and interpersonal skills, is an important factor but may also be infrequent, since the need depends on the companies' objectives (Bingi et al. 1999).

RD40: Plan how to transfer knowledge from consultant, and give feedback

Powell and Dent-Micallef argued (1997) that of all resources, human resources are perhaps the most neglected and difficult to master. Information management should be human-centered, as managers still get the information from people using the information systems. People are a critical success factor in many ways, and therefore, the ways of motivation should be established. Employees should be offered opportunities to 'stretch' – in terms of the level of challenge and development. Ideally, goals should enable people to have access to something new, to greater variety and responsibility, if appropriate. Goal-setting should emphasize both business activities and development targets (Holbeche, 2006, p. 391). Companies should have a solid understanding of the desired state in the early phase, including requirements, goals, processes and reports (Handler et al. 2015).

RD41: Plan how to motivate people with incentives based on the performance

4.2.1 Internal change promotion and communication

Holbeche (2006, p. 237) advocates that change promotion requires tolerance and an ability to live with uncertainty and complexity without undue stress, and an ability to assist in the management of conflict and conflict resolution, from change leaders. Change leaders should have a long-term perspective in mind, in order to help the organization achieve the desired goals, and also be able to divide long-term goals up into middle-term goals. An attitude and ability to promote a spirit of energy and a climate of positive change is vital. Leaders should be comfortable with nature of change: how and why people change, how and why they avoid change, and how larger systems change or avoid changing. In addition, change leaders should have the ability to influence others in terms of organization politics, for example, a willingness to use their own power bases, with discretion, and build support and productive relationships.

Project management literature frequently emphasizes the importance of good communication during the lifecycle of the project (Turner and Müller 2004). Communication has a key role in change management (Holbeche 2006, p. 217; Laamanen 2001, p. 262), such as in information system implementation (Lyytinen and Newman 2008), and in the way how the organization learns from individuals and how it communicates its mental model to individuals (Easterby-Smith and Lyles 2011, p. 584). Many studies and IT literature argue that people have the greatest power in IS implementation (Powell and Dent-Micallef 1997). The resistance of change is more or less raised when people feel their environment is more likely to change or has changed, and it is important that resistance is anticipated (Gillot 2006-2008, p. 69). The lack of formal communication may result in individuals having a too simplistic understanding or being highly skeptical (Orlikowski and Gash 1994), since they assume planned change is not affordable for them. The result is a lack of motivation (Holbeche 2006, p. 383). If people do not understand something, the constriction is difficult (Orlikowski and Gash 1994).

RD42: Plan how to communicate mental models

According to Crane and Livesey (2003), early communication theory described a simple and linear model where the focus was on the information itself, rather than a social process with negotiation and consensus, but currently the focus is more on audience feedback which can be used by message adaptation and refining. Authors highlight that communication can be defined as a process, content, motivation and outcome. The process is divided into one-way (symmetrical) or two-way (asymmetrical) forms, which depend on the communicator's motives: manipulating or persuading, educating or facilitating understanding. Content can be tailored rendering to the stakeholders needs or standardized to a uniform message. Communication of a uniform message can be relevant, especially when the company is attempting to lead the change or protect the company's image, for example. Effective communication can help change the contribution

in two ways: to increase understanding of the needed change, and let individuals contribute to the change. This is usually managed through a communication strategy. However, usually companies use one-way and top-down communication techniques, informing employees without necessarily enabling real dialogue (Holbeche 2006, p. 21).

RD43: Plan asymmetrical communication with feedback possibilities
RD44: Plan how to measure effectiveness of communication in the organization

To change status quo, Holbeche (2006, p. 385), and Turner and Müller (2004) emphasize practical methods that should be utilized in the organizations, such as knowledge of progress and achievements, changes and open issues and next steps. Developing shared vision of a better future helps individuals to move to the desired stage. The communication of change should be proactive, and as something is decided the information should be distributed directly. Open communication focuses on a two-way approach, where questions and comments are encouraged and the listener should sense the emotional and content nuances. This technique may hinder cross-cultural problems, such as misunderstandings, language problems and communication style differences (Easterby-Smith and Lyles 2011). Asymmetrical dialogue produces change, as much as it is constitutive change in approach to stakeholder relationship management (Crane and Livesey 2003). The last important thing is to focus communications on what the audience cares most about, for instance team members are generally much more interested in what is planned for the short term, while top-management is interested overall implementation (Bingi et al 1999).

RD45: Plan how to consider cultural aspects of communication

Marabelli and Newell (2009) reported that, during the ERP implementation, marketing or promotion campaign is important in order to increase user adoption, so that individuals see it benefitting them in may perspectives. Therefore, tactics of integrated marketing imply an integrated and strategic method, in order to connect and enable the dialogue with target audience and stakeholders such as customers, top management or authorities. Hence, it means the careful planning and management of the coordinated activities using multiple channels and disciplines for the tools of communication (internet, intranet, email, and advertising) (Kliatchko 2005). The domain where the messages are delivered is highly dependable on the organization: operation across different locations may require vivid and symbolic methods. For instance, strategic messages can be delivered with techniques of visualizing the text outlook and storytelling, advocating nuclear message promotion and marketing. Practical methods such as personal project reviews (focus groups, meetings, face-to-face), project analysis (information on quality metrics and project trends, sourced from project media), written status reports brief verbal updates, electronic media (email, electronic newsletters, intranet) surveys (feedback col-

lection) and steering group meetings are different types of communication methods. (Holbeche 2006, p. 325, 333, 335-338; Turner and Müller 2004)

RD46: Plan how to campaign change internally
RD47: Plan communication channels where message is delivered
RD48: Use visual and storytelling approaches for communication

4.2.2 Project management capabilities

Information system implementation should be treated as a project (Handler et al. 2015). Good project management is a one of the critical attributes and companies that have greater consistency prior to the implementation appeared to achieve more successful implementations. These capabilities involved documentation and leadership to plan and control project tasks, responsibilities, and deadlines, as well as milestones and contingency. (Snider et al. 2009; Handler et al. 2015) Therefore, the project management capabilities are discussed more in details.

RD49: Design information system implementation as a form of project

A project is a temporary exertion and creates a unique product, service, or result. Although, repetitive elements may exist in project deliverables and activities, the repletion does not change the fundamental idea of the unique nature of project work. Project management is a process which involves initiating, planning, executing, monitoring and controlling and closing (PMI 2013, pp. 3-5). It is a complex decision making process involving the inflexible pressures of time and cost (Laslo 2009), and uncertainty requires medium levels of structure (Huemann et al. 2004). Based on the project goals, dates and costs must be planned and defined as standard values, milestones. Project based organizations are highly dependent on their individuals and their capabilities to self-organized project work (Lindkvist 2004).

RD50: Design the implementation project to include phases of initiating, planning, executing, monitoring and controlling and closing

Project starts with initiating, where the project schedule is created. It must include the desired end date of the project. Programs and schedules are defined by the project manager, based on the expected values of activity duration but often planning and scheduling problems are subject to change, which usually has an impact on resources (Laslo 2009). The benefits and efficiency of projects are achieved when clearly defined, relatively short-lived and limited objectives are set. The fundamental life cycle of a project is presented in Figure 17.

Figure 16. *Project life-cycle (PMI 2013, p. 50).*

Planning a project is essential in reaching the project objectives. The most important thing when planning the project is the integrated consideration of dates and resources to meet realistic standards for the milestones, so that the end of the project can be assigned. Resources and costs can vary and moreover, speeding the completion of the project may cause added costs. (Becker et al. 2003, pp. 13-14) Weak definitions of the requirements and the scope of the implementation project can cause larger problems later on in the project (Yeo 2002). For example, project managers should have capabilities for strategic and tactical activities, such as project missioning and top management support, while tactical activities can be technical tasks, communication and consultancy in the organization, personnel recruitment, monitoring progress and feedback collection (Al-Mashari et al. 2003).

RD51: Plan project resources to integrated to schedules

The complex nature of project management may require the use of repeated feedback loops for additional analysis. The plan should explore all the aspects of the scope, time, cost, quality, communications, resources, risks, procurements and stakeholder engagement. As a perspective of software project, risk management is considered as a key variable. (PMI 2013, p. 55-56; MacFaran 1981; Subramanian et al. 2007)

RD52: Plan project scope, time, cost, quality, communications, resources, risks, procurements and stakeholder engagement

> Executing involves coordinating resources and people, managing stakeholder expectations and also integrating and performing the activities of the project. During execution, results may require a planning update and reassembling, such as collecting change requests and documenting them in the project change log and implementing approved changes into the project's scope, plans and environment. (PMI 2013, p. 56)

RD53: Design how to implement changes during the project

Monitoring and controlling refers to comparing actual project performance with the plan and ensuring actions are taken, if necessary. It also requires the identification of new risks (threats and opportunities) and monitoring existing risks to ensure the appropriate risk response plans are being executed. Regarding the issues, it is revenant to ensure appropriate actions are taken (escalate issues that cannot be solved). (PMI 2013, p. 57)

Project closing refers to the finalization of activities, completing project phases and the project itself. It may require activities, such as obtaining the acceptance of the customer or sponsor to satisfy the project completion criteria. Also conducting post-project reviews, collecting project records, gathering lessons learned and archiving project information for future use in the organization project records, are usually included. (PMI 2013, p. 57-58)

RD54: Plan the project closing, gather lessons leant

Different projects require different managerial approaches (MacFarlan 1981), for instance software development projects differ from traditional waterfall and project management approaches with a defined process model. Software projects are considered complex ones, where projects that are worth funding are the ones that have not been done before. This has a significant implication on the process to follow. (Guckenheimer et al. 2012, p. 2-3) Some of the requirement complexity can be attributed to the technology that has grown in both scale and scope in the last decade (Moe et al. 2012).

The paradigm of project complexity can be divided into management situations, the four categories of simple, complicated, complex, and chaos. This categorization is originally introduced by Stacey and adopted by Schwaber, and illustrated in Figure 16 (Guckenheimer et al. 2012). This complexity is the reason why today software development is often referred to as solving 'terrific problems' (Moe et al. 2012).

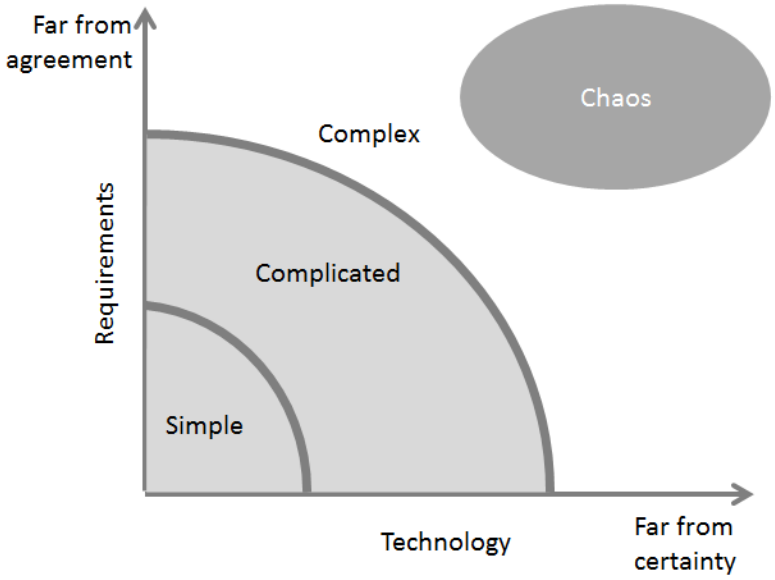

Figure 17. *Project noise level by Ralph D. Stacey Schwaber K. (adapted from Guckenheimer et al. 2012, p. 3).*

The simple and complicated areas describe tasks that are well-defined, requirements are agreed, technology is well understood, and the risk might be low. When the require-

ments are not necessarily well agreed or the technology is not well known, the project falls in the complex region, or even chaos. That is exactly where many software projects do get funded, since there is the greatest point of competitive differentiation (Porter and Millar 1985).

The uncertainty challenges the project planning, and defined process models can be quite incompatible to projects with uncertainty. In these cases, rather than laying out elaborate plans that will change, it is often better to create fluid options, try a little, inspect the results, and adapt then take the next steps based on the experience. (Guckenheimer et al. 2012, pp. 3-5) Although shared mental models may develop over time, they can also be instantiated effectively through workshops to strengthen the shared mental models in order to understand and to agree upon what project teams were actually going to deliver (Moe et al. 2012).

RD55: Plan how to compete with uncertainty during the project

4.3 Information system evaluation

Information system project outcomes usually involve the measuring of both the product, and the process. The process measures can be based on the objectives and schedules. The quality of the software is related to such attributes as reliability, usability, maintainability, enhance ability, usability, portability and reusability. (Subramanina et al. 2007) Information system evaluation is an important but a complex organizational process, even though new approaches and techniques have appeared in the literature (Serafeimidis and Smithson 2000; Smithson and Hirschheim 1998). According to Smithson and Hirschheim (1998), the evaluation of IS has been lacking formal procedures despite organizations having gone through dramatic IS-associated changes over recent years. In addition, IT expenditure forms a significant proportion of an organizations' turnover and investment budgets, consequently evaluation is relevant.

Traditionally IS evaluation was seen subservient to IS development and took places in IS development lifecycles, after the implementation. But linear approaches focus on the use of resources and the achievement of predetermined (technical) objectives, adopting a short-term view and assuming a stable context. (Serafeimidis and Smithson 2000) The purpose of the information system evaluation is to provide a basic feedback function for managers and a component of organizational learning, and it is considered essential for problem diagnosis and the reduction of uncertainty (Smithson and Hirschheim 1998). In addition, the evaluation itself may cause organizational change, as the resulting recommendations may imply further changes in the allocation of resources, the structure of the organization, the roles and tasks of various stakeholder groups and, consequently, the overall balance of power within the organization (Serafeimidis and Smithson 2000). This can be seen benefitting or complicating the organizational change. However, "*not all technological change is strategically beneficial*" (Porter 1985).

Acknowledging the perspective of the stakeholder in the evaluation may be critical in hindering strong contrasting views, since individuals are only likely to accept a solution if they have developed a common set of shared meanings (Boonstra 2006). According to Irani (2002), much of the savings resulting from IS are considered suitable for insertion within traditional accountancy frameworks, it is the intangible and non-financial benefits, together with indirect project costs that complicate the justification process.

However, there are difficulties that lie in many layers: the information system has an impact on the social organizational and people, and it is not only a technology activity. What is the level of evaluation is performed, for example? Identifiable levels could be, for instance, macro, sector, firm, application and stakeholder. Another problem is that the information system is argued to improve decision making, which is almost impossible to measure. In addition, when speaking about the concept of value, it may have multidimensional facets (Irani 2002). Nonetheless, the IS systems are social systems (von Krogh 2012) that evolve over time, thus the time of conducting an evaluation is difficult decide.

> **RD56:** Consider that IS evaluation is multilayered, so criteria should cover many layers with adequate exclusion

4.3.1 Success realization

According to DeLone and McLean (1992), there is no clear consensus on how to measure the success of information systems which can be a result of many steps in the information dissemination. Therefore, there can be several variables that can be used in measuring success, even though Smithson and Hirschheim (1998) argue that that is a problematic setting, since the conflicting perceptions of different stakeholder groups.

> **RD57:** Plan several variables to measure information system success

The framework developed by Smithson and Hirschheim (1998) is based on different zones: efficiency, effectiveness and understanding. The first zone, efficiency, is characterized by objective assumptions regarding the nature of evaluation. The key impression in this zone is to evaluate performance or quality compared to fairly detail low-level specifications or benchmarks, resulting that the measuring can be conducted by using hardware or software monitors or simulation techniques. The second zone is effectiveness, which is characterized by doing the right things. In this zone, evaluation is less clear-cut and it emphasizes that evaluation focus should be more on the impact on business and should consider business goals and critical success factors rather than pure costs. The danger in finance-based techniques is that they favor a short-term view which is incompatible with investments which are expected to be a part of a long-lasting infrastructure. In this zone, risks are also relevant since, there is much risk and uncertainty in IS development and the system may not meet the requirements.

The third zone focuses on the organizational context, named understanding. In this zone, evaluation is problematic and it seeks to understand more analysis about personal constructions, cognitive psychology and attempts to explain how people use binary constructs to evaluate artefacts and situations. To reveal the various sides of IT evaluation, Table 3 presents different categorizations of how IT success could be measured according to different authors.

Table 3. *Different perspectives of how to evaluate IT systems*

Attribute	Purpose	Author
Correspondence success	Where there is a match between IT systems and the specific planned objectives.	Lyytinen and Hirschheim (1987)
Process success	When IT project is complete within time and budget.	
Interaction success	When users' attitudes towards IT are positive.	
Expectation success	Where IT systems match users' expectations.	
System quality	Measures the information process itself	DeLone and McLean (1992)
Information quality	Measures information outputs	
User satisfaction	Recipient response to use of the output of an information system	
Individual impact	The effect of information behavior of the recipient	
Information use	Recipient consumption of an Information System	
Organizational impact	The effect if information on organizational performance	
Concept justification	"Justification of an IT/IS investment to its strategic stakeholders will have a strong alignment with the corporate strategy of the organization, and include competitive risks associated with not investing."	Irani (2002)
Financial justification	"Financial justification's primary concern is with the individual pieces of technology that need to be bought, linked, and integrated."	
Lifecycle evaluation	"A comprehensive post-implementation review process would appear to be value adding, and support organizational learning and a 'deeper' understanding of the IT infrastructure."	

In an early study from the 1980's, Lyytinen and Hirschheim (1987) have divided success into a less complex structure: correspondence success (objectives), process success

(IT project performance), interaction success (user-centric), and expectation success (user-centric). It is common for these success theories to combine organizational, individual and performance related areas. Followed by DeLone and McLean (1992), six different dimensions or success categories were discovered to accomplish the evaluation of IS, presented in the Table 3. These dimensions focus on the information system and information quality aspects, such as how the decision maker perceived the value of information received from the information system. The second categorization is user-centric: how individuals feel about IS, or how much they use information system, or how does IS affect individual effectiveness (clearly hard to define). Irani (2002) highlighted that there is a relationship between the concept justification of an information system to operational stakeholders, and their increased level of commitment towards project success. Life-cycle evaluation refers to post-implementation review such as benefits and costs that are well placed as appropriate benchmarks during the justification process.

4.3.2 Benefits realization

A study by Irani (2002) argues that there is evidence in support of the proposition that IT/IS benefits can be classified as strategic, tactical and operational benefits, with financially, non-financially and intangibly natures. Ashurst et al. (2008) emphasize that benefits should be the central focus point when implementing IS: focusing on benefits rather than technology. It is an interesting topic, since rather than ending up with IS implementation failure, companies should be ending up with the benefits of IS implementations. Their study suggests a benefits realization framework that considers a systematic way of benefits planning, benefits delivery, benefits review, benefits exploitation.

> **RD58:** Plan benefits to categorization of strategic, tactical and operational benefits, with financially, non-financially and intangibly natures

Benefits planning refers to a need of articulate benefits during a project's planning phase. These benefits should be more business-driven and less system-functionality-related, in order to have success in their delivery. The linking of benefits delivery to the changes may have positive impact on the stakeholders' behavior. Benefits delivery refers to the practices and routines of benefits delivery. This also enables knowledge transferring to the project organization, in order to support benefits delivery: regularly scheduled meetings, informal brief sessions to contribute to the information exchange between individuals and projects. Benefits review refers to the reflection of how the performance of projects could be improved. Benefits exploitation and realization is a shared responsibility which should be an ongoing commitment and which needs ongoing management. (Ashurst et al. 2008)

> **RD59:** Plan benefits realization to be a systematic process

5. EMPIRICAL RESULTS AND DISCUSSION

Chapter 5 is generated from the design science research framework by Hevner et al. (2004) and Peffers et al. (2007). In Chapter 5.1, problem identification is illustrated briefly, and an overview, depicting design science research in developing the artefact, and the Case company resourcing process challenges is given. In Chapter 5.2, the preferred objectives of an implementation are reported based on the literature and interviews. In Chapter 5.3, the results of implementation framework design and resourcing process are presented. In Chapter 5.4, evaluation criteria are reported.

5.1 Problem identification in the case context

The aim of Case company was to improve the visibility of internal project management in a global project management environment. To achieve this objective, Case company was about to implement new PPM software, Microsoft Project Server, which is integrated in the enterprise resource planning system and financed as a system as service from a service provider cloud. The objective of this study was to create an implementation framework (an IS-related artefact) which is used for the planning of the implementation. The framework should also enable the organization to perform incremental change where improvements consider people, tasks and technology. Thus, problem identification in the case context illustrates research and context related problems.

Continuous and similar issues rose during the interviews (N=20) in the first interview phase when company's project organization were interviewed in fall 2015. As most of the interviewees argued, the mega project organization did not have a common and agreed-upon tool to manage their projects, nor did they have commonly agreed resource management policies during the project lifecycle. The issue was underlined by VP of Business line (I8): "We have resources here and there, but we do not have clear policies and real visibility to our resource pool, because the pool does not exist. We should have only one software tool to manage these resources aligned with projects to gain full portfolio view of all our projects".

When asked about tools for project management and resourcing, it came out that projects were mainly managed with project directors' and managers own Excel and MS Project, while lacking common discipline and connection to each. However, not everyone considered it as a problem. Few interviewees felt their project management tools were adequate. "I do not see any benefits for MS Project adaption regarding our work. The tool will probably benefit more megaproject engineers" (I19: Engineer's team lead). "From sales point of view, I do not see MS Project to benefit us, since we use

other software to manage our projects" (I20: Sales Manager). In addition, the VP of Business line (I17.) highlighted that they already have an existing tool to book resources.

The other issue rose regarding the project lifecycle documentation; there were several documents to support the projects and their resourcing but which were not necessarily visible and connected. The issue was raised by project managers, project directors and resource managers. The information was in silos with limited accessibility and each of the project managers and resource manager had their own methods for resourcing, despite the statement that, in the project-based organizations, the comfortable certainty of climbing the ladder up the functional silo does not exist (Huemann et al. 2007). The relevance of the resourcing problematics is illustrated in the process description in Figure 18.

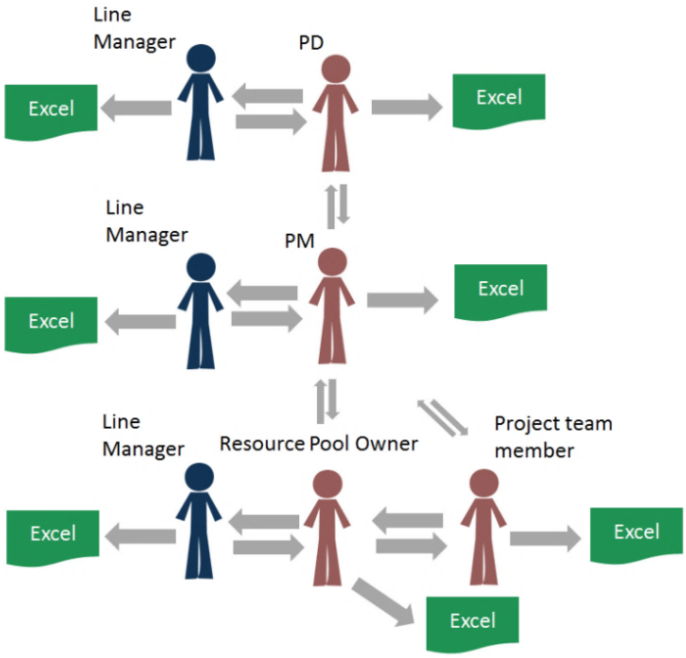

Figure 18. *Current project resource management in project delivery organization*

As Figure 18 tries to illustrate the challenges in the project delivery organization and in resource management: information flow between individuals is hierarchical and requires many contact points, even though some files were commonly accessible. This scenery was considered to complicate the project management in a global environment where organization should have common resource pool to access. 11 of 20 interviewees felt that the overall project resource management was a vast problem and many resource owners had their own ways and methods for resourcing. "Would be easier if schedules and resourcing go together, since now we have situation where schedules are changed but resources do not follow the changes, there is a clear gap in that"(I11: Resource Manager). While project directors' almost a common opinion was that they have to fight over the resources and everyone tries to book the same ones. Whereas project

managers said: “Our current system does not show where the people physically are - it is just a booking system, so not filling its full purpose” (I4: Project Manager). However, some interviewees felt that resourcing was not a problem due to the dynamic resource management or the existing resource management system in the line organization. The majority of the interviewees, 17/20, mentioned the visibility in project management was poor and therefore tool relevancy in the organization is accepted, as majority of the project managers emphasized this fact during the interviews.

5.2 Objectives identification in the case context

The objectives identification in the case context is based on the results of the introduction interviews (N=20) (Appendix F) and requests of the RD12-RD16 (Appendix A). As a result, objectives and requirements were collected during the interviews, and then categorized within the framework from strategic and functional perspectives. The alignment model was planned (RD12) and in this case adopted from Henderson and Venkatraman (1999), and then fitted according to organizational requirements (RD13-RD14). These objectives were classified (RD15) as business objectives, IT objectives, IS requirements and organizational requirements, aligned to each other. Figure 19 illustrates the strategic alignment of different objectives.

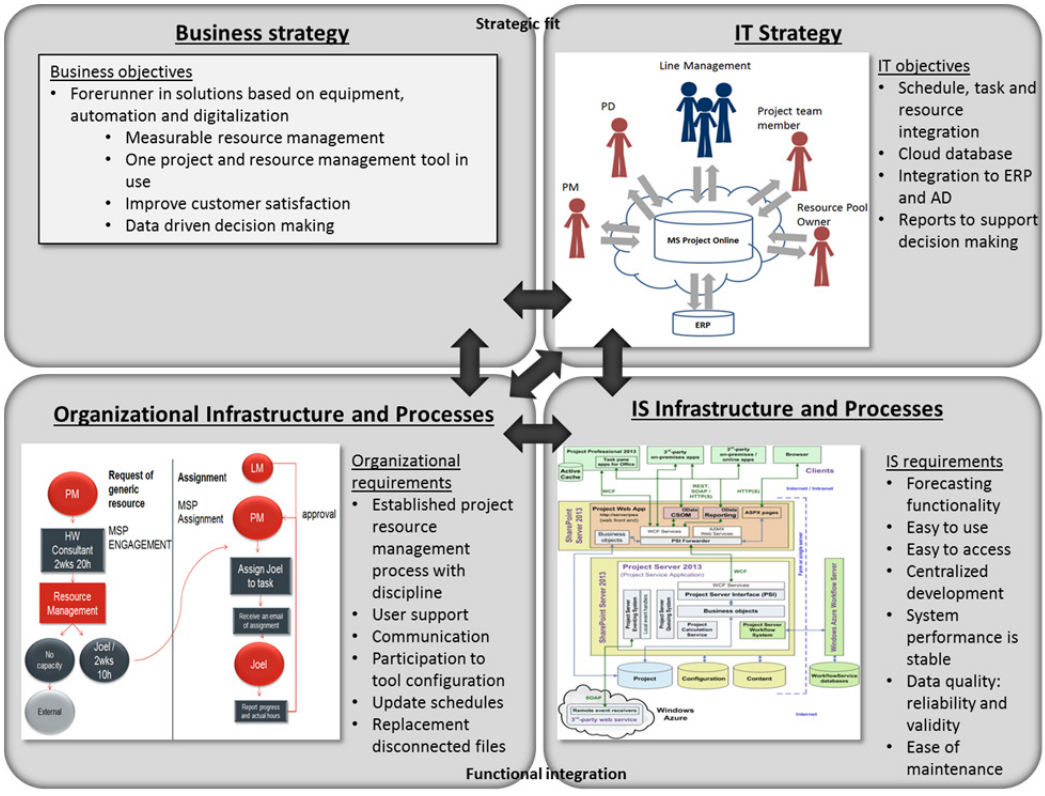

Figure 19. *Strategic perspective for objectives identification (adapted from Henderson and Venkatraman 1999).*

Regarding the objectives identification, the purpose was to gain different organizational perspectives for the implementation and the alignment creation (RD16). The management was more focused on the strategic objectives and while project managers concentrated on operational, project scope, budget, schedule and user satisfaction, related objectives, they could see strategic interests, as well. As a result of objectives collection (see Appendix F), the main business objectives reflected the business strategy; measurable resource management, one project and resource management tool in use, improve customer satisfaction and data-driven decision making were core business objectives. Especially VPs of business lines were emphasizing the strategical business objectives. HR Director (I4) strictly required that only one tool should be in use which quantifies the resource capacity and demand. VP of Business lines were emphasizing the internal visibility and decision making that should be based on the real-time data. "In the delivery process should not be any black boxes" (I18: VP of Business line). In addition, as pointed by of VP of Business line (I8): "customer is the main driver and they set lowest requirement to the visibility, therefore we need fill they requirements and provide decent reports to them." Therefore, the customer reports generate satisfaction which is an important business objective to Case company.

IT objectives were categorized as schedule, task and resource integration, cloud database, integration to ERP and active directory, and reports to support decision making. These objectives were mainly arisen during the interviews with VP of IT Services (I14). However, active directory integration and ERP integration were decided before the research started. A cloud system implementation was a strategical objective because of the cost and maintenance. In addition, the cloud-based server offered reporting capabilities that were considered decent.

IS requirements were categorized as forecasting functionality, easy to use, easy to access, centralized development, stable system performance, data quality: reliability and validity and ease of maintenance. The performance metrics were considered highly important, since Microsoft Project Server was integrated to ERP and the cloud was not owned by the company. These requirements raised mainly form project managers, project operations and project directors. However, MS Project Server is standard software package with limited customization and configuration possibilities. Even so, the internal IS requirements were adjusted accordance of the MS Project Server limitations. User-centric requirements such as, easy to use and easy to access and ease of maintenace were resulting to acquisition of PPM-tool that is familiar to organization. The centralized development was one of the critical objectives from managerial perspective, because it gives harmonized methods to system control, thus saving resources. Additionally, resource managers (I4; 16), project directors (I10; I2) and VP of Business line (I8) emphasized resource forecasting ability as an important objective.

Organizational requirements were collected and categorized to meet the IS and business objectives. These were established as the project resource management process with

discipline, user support (which considered training), communication, participation to tool configuration schedule update, replacement of disconnected files. These requirements arose during the interviews with project managers and resource managers. Nearly all the interviewees requested to clear and established project resource management process. The second important objective was user support with training possibilities. The communication was highlighted nearly by all the participants who took a part to interviews. The communication about the project progress, kick-of meeting, intranet releases and emails were seen relevant. As vice president of the project management business line said: "You cannot over communicate in this project".

The participant observation (N=19) (see Appendix F) revealed that the overall feeling towards the upcoming change was almost a tie between sceptic (5/20) and positive (6/20), most users (8/20) felt neutral. A reason for this could be that the participants described that Microsoft Project Server would probably to complicate their work; on the other hand, they were expecting to have a solution that would create more visibility. Neutrality towards the implementation implicates that users are not necessarily directly benefitting from the solution but saw some benefits for the other user groups. The research objective was to find a way that the objectives and desired state would be reached in the company with plan that is introduced in the next chapter.

5.3 Building artefact design

A designed artefact, an implementation framework (Figure 20), was built by using request RD1-RD11 and RD17-RD59 (Appendix A) with literature and existing frameworks and conceptualizations as a primary information source. The implementation framework is fitted to project model (RD49) as emphasized in the literature that good project management is an essential to success in information system implementation. The framework is divided into the rollout process and communication process where attributes are adopted from project management principles (RD50-RD52). Since, the MS Project Server was a new system and organization the implementation framework was designed to consider uncertainty aspects of the implementation (RD55) by adopting iterative methods to develop the plan, therefore the model is a dynamic.

The rollout process consists of six (6) major phases: pre-implementation (pre, initiation), configuration (execution), process and solution implementation (deployment), support and implementation verification (iterate), close (close), and evaluation (post) (RD50). All phases include project milestones. These critical milestones were: G2 which indicated that the general implementation project plan was approved, G2.1 which indicated that the solution was ready for the implementation, G2.2 which indicated a go-live date for the certain project plan type, G3 which indicated the sign-off after support and implementation verification. The last critical milestones were project G4 which indicated project closure, and G4.1 which indicated project evaluation conclusion. The

grey color indicates cloud-related activities or tasks. The red color indicates tasks and activities that are not related to the cloud.

The communication process (highlighted in the blue color) consisted of four major (4) categories: workshops, change advancement, cracking knowledge barriers and stakeholder communication. These were ongoing actions that were not divided by milestones.

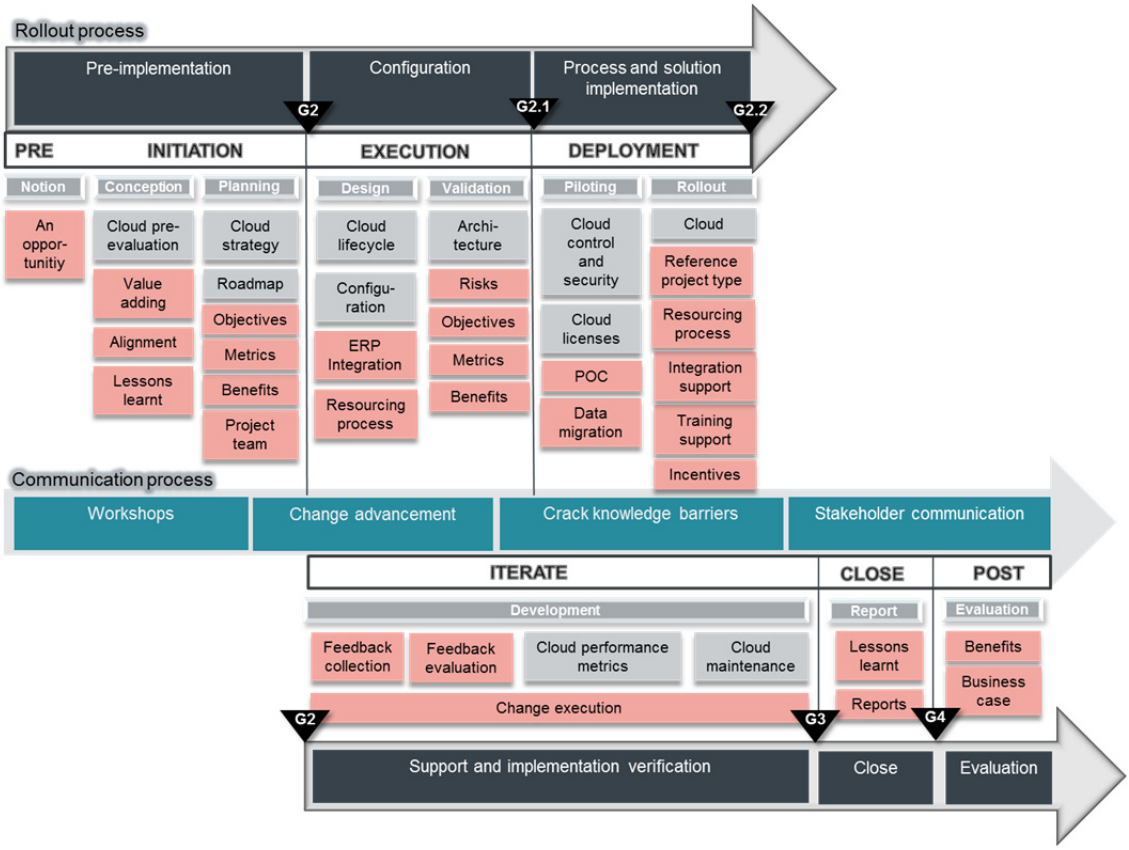

Figure 20. *Designed implementation framework for MS Project Server implementation*

This framework was reconciled in the schedule in Microsoft Project where their progress was reported. The framework was fitted against Case company's project type and reconciled to a schedule, year 2016 (Appendix H). In Figure 24, Phase 2 and Phase 3 highlight the ERP integration rollout. All activities are planned to be value-adding tasks and activities as supported by the theory of process walkthrough and workflow modeling (RD19) and cloud implementation model (RD29), however, minor subtasks are not visualized in the framework but described in MS Project schedule, as Figure 25 illustrates an example (Appendix I). Next, the implementation process and communication process are described in detail.

5.3.1 Rollout process

Pre-implementation considered 11 attributes that were determined. This is an initiation phase that mainly concerns how a notion, conception and planning are done in order to support strategical and operational objectives. Notion of an opportunity means recognizing the possibilities to change existing system. In the case of Case company's situation, the need was to support the decision making (RD1) and project management visibility as a part of digitalization requirements (RD7) resulting the need of harmonizing the project internal and customer reporting (RD2, RD6). Therefore, the pre-implementation considered how these demands could be fulfilled with new type of information system and produce overall value to organization (RD5). Conception of cloud system pre-evaluation means that alternative information systems, vendors and consultants are searched, and requirements and proposals sent. The cloud strategy building should start in accordance to objectives (Marks and Lozano 2010, pp. 115-123).

The conception of value adding means the value of information system should be discovered. The organizational knowledge can be applied effectively with IT tools which facilitate knowledge application, thus can lead to remarkable organizational value as stated by (Easterby-Smith and Lyles (2011, p. 108) and Thierauf (2001, 185). As stated by Robertson (2014) visibility is the key value that is delivered through digitalization and the examples can be are real-time reporting possibilities through mobile devices, work visibility through digitalized paperwork and automated workflow that generates resource availability and accountability, as these requirements are in the key position in Case company. Overall, the assessment of technology role is important (Porter and Millar 1985) and the conception of an alignment means the determination the alignment type to gives more focused and strategic use of IT (Chan and Reich 2007). In the Case company's situation the chosen type was to adapt strategic alignment adopted form Henderson and Venkatraman (1999) that supported the idea of dynamic model where change is as an interaction of technology, structures, people and tasks (RD11). The last attribute is a conception of lessons learnt meaning that if there are any types of post-implementation evaluations or gathered lessons learnt, these should be reviewed (PMI 2013, p. 57-58).

Planning the cloud strategy is aiming to answer the question "how can the cloud support unsolved problems?" (Marks and Lozano 2010, pp. 115). The organizational capabilities to adopt cloud services should be planned and described in this phase. In addition, organization should determine the cloud implementation and operation model (RD9) such as, system as service from private or public cloud. The security of cloud should be also examined in this phase (RD33). Together with cloud strategy, the IS roadmap should be planned. The roadmap will guide to answer which type of implementation practices should be notified (RD34) such as concerted change or phased implementation by Markus et al. (2000) and Robey et al. (2002). In the Case company's situation, the plan suggested to have a phased rollout, where few of changes are implemented at the

same time constantly iterating. The cloud strategy and roadmap phase also includes the necessary training in technical, functional, architectural and communicational aspects of the cloud service (Marks and Lozano 2010, pp. 115-123).

Planning the objectives does not only suggest determining them, but also designing and visualizing them. When the Case company's objective is to gain transparency, visualizing the methods of information distribution (RD3) may help people to understand to shared mental models and perhaps understand why the change is relevant (Easterby-Smith and Lyles 2011, p. 584). Therefore the visioning of the needed change should be done as early as possible in the respect to avoid the organizational change resistance (RD22-RD23) but also to understand how the information system supports the organizational objectives (RD5).

Planning the metrics, benefits and project team in an early phase are important. Cloud performance metrics can be used to service level agreement (RD32). In the Case company's situation, the metrics were planned in the configuration phase when the system capabilities were better known. Instead, the benefits and project team were determined in the initiation phase. The implementation core team was planned to be small (RD36) and team members had the different types of background in the organization as the idea was supported by Robey et al. (2002) to diminish knowledge barriers.

Configuration considers how are the designed methods and strategy, created in pre-implementation, executed through configuration. The nine (9) attributes were chosen to this category and they were dived to design and validation. Design of cloud lifecycle includes how transformation to and from cloud is done and future preliminary possibilities mapped. Design of a cloud configuration is done according to user-centric and business-centric approaches (RD35) by the consultant. The configuration phase was the point where Case company's core team was able to transfer the knowledge from consultant. In addition, the configuration should support ERP integration purposes. These ERP requirements should be determined and designed in accordance of configuration (RD37). As incorrect implementation can result serious problems for the employees in performing daily tasks and complicates systems' interoperability, but can also be very expensive to renew (Themistocleous et al. 2001). Therefore testing the configuration and PPM software are highly obligatory, even though the most PPM software tools are licensed as commercial software (Handler et al. 2015). A design of resourcing methods was requested by the Case company, since their plan was to manage resourcing with the MS Project server. This attribute follows process modeling and process walkthrough techniques.

The resourcing process model was the process that needed re-engineering (RD18). Workflow of resourcing process was visualized (RD20) and constantly evaluated by different stakeholders (RD21). Resource management methods were relevant in order to establish the methodology on how the processes and new project portfolio management

software are serving the business objectives and organizational transformation. The process description gave the disciplinary boundaries, task-related roles and responsibilities to each project organization member, as well as, informative description on how the way of working was planned to be changed (Laamanen 2001, p 50; zur Mühlen 1999). The core was to visualize technical and social change caused by IS. Figure 21 presents the designed resourcing methods in generic level.

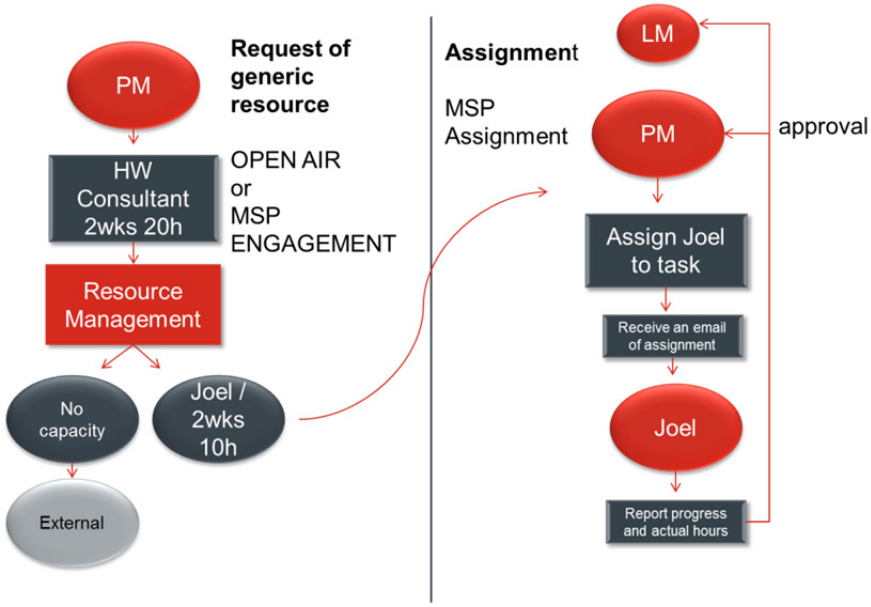

Figure 21. *Designed methods to use MS Project for resourcing*

Workflow was used for highlighting the current system and new system differences. The MS Project Server provides more capabilities for resourcing than the existing system which was used in some functions in Case company. As Figure 21 shows, the MS Project Server covers the same methods as the current system and it enables detailed resource planning. The same resourcing process is illustrated in Figure 26 (Appendix J) in more detailed level as a standard process description model. Figure 26 underlines how the different roles act with different MS Project systems. The purpose is to highlight how resourcing is performed by using MS Project Server and software instances.

The validation of architecture and the software testing plan were recognized as important factors during the configuration phase in the Case company. In addition, the designed process models were tested in the respect of configuration (RD25). These two factors were also project phase milestones. After they were conducted, the project phase was able to continue to implementation phase. The validation of risks, objectives, metrics and benefits are suggested to validate in this project phase. The reason is to re-validate with stakeholders to make corrections to plans created in the pre-implementation phase. As Ashurst et al. (2008) and Marabelli and Newell (2009) discovered user knowledge transfer is a complex process which can require great amount of time. Therefore, re-validation is beneficial since knowledge might have been increased in in configuration phase, or the benefits validation enables users to increase

their knowledge On the other hand, it is a check-point to evaluate whether any benefits have been achieved. In this phase, there is always the possibility not to implement the solution (Marks and Lozano 2010, pp. 130-133)

Process and solution implementation phase consisted of how should the designed process and solution be implemented in the organization. This phase follows all the previously designed plans strategies. In this phase 10 attributes were discovered. The core of this phase is to actualize the plans and involve people to perform change according to plans. Therefore, this phase requires remarkable amount of communication and marketing and understanding of people in the organization during the change. A Hyötyläinen and Kalliokoski (2001) emphasize, the purpose is also involve entire organization to implementation (RD24).

Piloting the cloud control and security refers the system access of different organizational perspectives. The users should be categorized to Project Managers, Portfolio Managers, Team members and Resource Managers with correct visibility and functionalities, with right licenses (RD4; RD10). In this phase, the mobile access can be built (RD8). The license control is also relevant in order to avoid unnecessary costs. Piloting is relevant in a global environment, since the internet connection may vary depending on whether the user is in China or on a customer site, or in a hotel with limited internet access, as the issue rose during the first interview phase. Furthermore, organizing a proof of concept (POC) where the system and resourcing methods are piloted before the go-live to ensure people understand the impact on the new system. Data migration to new system was done by the project managers.

The cloud rollout required also a technical clarification with IT organization. These technical requirements are not discussed but their relevance is important to understand. The rollout of cloud considers everything that was designed in the configuration phase, including reference project types which are going to be implemented. The Case company had an active directory integration which was also implemented at the same time.

Rollout of resourcing process is an execution supported by continuous learning and talented management initiatives as supported by Krichmer (2010). Rollout of the integration and integration support require organization to have right resources to cope with integration related problems. As emphasized by Al-Mashari et al. (2002) and Binig et al. (1999) the support should be established to handle error situations and how to communicate with all parties affected by errors. Additionally, discipline should be established by training how information flows and how errors affect the activities in the value chain. Furthermore, rollout of training support is perhaps the most relevant enabler of organizational change. The purpose if the training rollout is to provide people ability to enhance their skills on continuous basis (RD38) and keep people motivated by the correct incentives (RD41) and encourage them to development.

Support and implementation verification is an iterative part of framework and already starts in the configuration phase. This phase includes five (5) attributes that encourages to process and system development. The development of feedback collection (RD27) and evaluation is supported by the many authors to develop and renew the organizational processes (RD28) and information systems to meet the client and user needs (RD17). In addition supported by Marks and Lozano (2010 pp. 134-140) the cloud system leveraging possibilities and maintenance need are coming from the users. The development of feedback process supports the users and other stakeholders to give feedback via correct channels. The feedback is gathered and evaluated, actions should be implemented. The feedback process (documentation, channels, evaluation team, actions) should be documented and communicated to relevant stakeholders. The feedback given should always result in evaluated actions (RD53). In addition, cloud performance should be evaluated continuously because of the integration.

Close is a phase where the project is closed after the completion criterion is obtained as indicated by PMI (2013, p. 57-58). The phase includes two attributes. Reporting the lessons learnt and other reports are considered as an important closure of this phase (RD54). The project records are collected, and in this case, the closing phase includes lessons learnt, such as problems, root cause analysis, quality improvements, and learning outcomes. All of these are documented and final reports of project success (schedule, scope, cost and deployment rate) are reported. This phase is close to project verification and an evaluation starts. All the results are communicated to relevant stakeholders and lessons learnt can be used for next implementation phase. As pointed in the implementation schedule (see Appendix H), first closing phase is planned to August 2016 for the reference project Plan type X.

Evaluation of information systems is a necessary evil that needs to be conducted somehow, in order to measure the IT investment and get project sponsors (Smithson and Hirschheim 1998). Despite, evaluation is done after project is closed, IS success should be measured continuously entire life cycle as suggested by Irani (2002). Figure 22 is designed by the strategic evaluation metrics that are generated from objectives in Figure 19.

The evaluation phases consists two (2) attributes. The evaluation of benefits and business case are project contains both information system and project related evaluation attributes. The benefits realization should be focus point if the implementation, as stated by Ashurst et al. (2008). The categorization could be to strategic, tactical and operational benefits, with financially, non-financially and intangibly natures (RD58). As emphasized by the literature the evaluation should cover many layers, since IS evaluation is quite often multi-layered (RD56) and would be necessary to contain several evaluation variable to cover the adequate evaluation (RD57). However, some restrictions had to be made, and the decision was to implement a few metrics first, and later plan additional

metrics when more users are engaged to use the MS Project Server (E8: VP IT Services). Evaluation was seen an important in the Case company, in order to evaluate to-be-reached objectives with the new information system and project portfolio management software. As supported by the Serafeimidis and Smithson (2000), the evaluation should contribute changes in the organization, for example, if the performance of the cloud is constantly poor or system is not used that should result to actions.

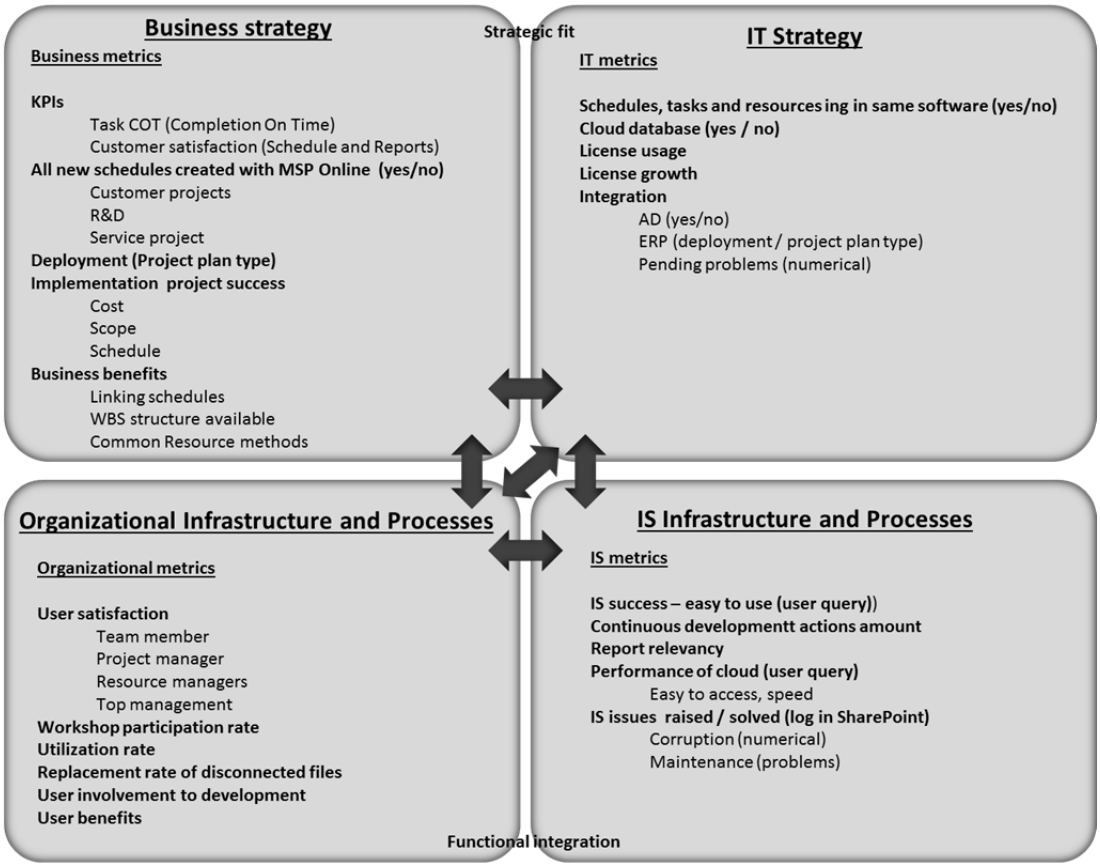

Figure 22. *Designed strategical evaluation metrics generated from objectives*

Business metrics are key performance indicators (KPI) linked to the company's strategy, such as task completion on time and customer satisfaction. The importance of KPIs was arisen during external interviews. Also, quantitative metrics were discovered to measure that all new schedules are created with MS Project Server. Deployment by plan type means giving the number of project types that is already implemented. Implementation project success focuses on the budget, scope and schedule of the project as supported by Lyytinen and Hirschheim (1987), however, the evaluation is already concluded in the closing phase. Business benefits were the up-to-date data available with links, and the WBS structure was available for each project type, and the organization will have common global resource methods documented.

The IT metrics were discovered to go hand in hand with the objectives as highlighted by Koistinen (2002, pp. 74–76). Schedules, tasks and resourcing were set in the same software metric, as Case company had an alternative system where they were not included in the same system. The cloud database is either achieved or not achieved. License usage and license growth were considered as important metrics, since the payment was based on the cloud system use (RD10). Therefore, monitoring that users are actually using the licenses and system is an important financial metric. In addition, it enables controlling that new methods are actually understood and utilized in the organization. The integration needed metrics that support integration, for instance, if there are pending problems constantly in the integration surfaces. Also, integration measures whether or not the planned project types are integrated.

The IS metrics included success metrics of the user perspective, the purpose of which was to conduct user queries and receive feedback on system usage. As Lyytinen and Hirschheim (1987) highlighted, user success could be measured for example, how system matches user expectations and how users feel towards IT. Other planned metrics were the number of continuous development actions, report relevancy, performance of the cloud, and number of IS issues. In addition, IS performance metrics can be used for a service level agreement.

Organizational metrics describe the users' confluence with the cloud system. The metrics focus on user satisfaction more by different project stakeholders. These metrics are similar to IS success metrics but data collection was planned to do as qualitative interviews. Additionally, these interviews enable project to measure communication effectiveness in the organization. In addition, the objective was that people are involved in the configuration, so, workshop participation was measured. The utilization is similar to license usage and reports are delivered to the line managers, thus they are able to control that their organization is really using and updating schedules as agreed. The replacement rate of disconnected Excels covers how many disconnected files are replaced. User involvement in the development is measured by the number of development actions users are giving and contributing.

The benefits realization should be systematic process (RD59). In this framework, user benefits are qualitative ones, such as the ease of updating the schedule and the ease of making customer reports. The evaluation also considers business case building where success factors and benefits and drawbacks are evaluated. The business case was seen as an essential post-implementation review as Irani (2002) suggest, lifecycle evaluation should also support an organizational learning and generate deeper understanding of the IS project. The evaluation and closing phase go parallel; therefore a clear milestone for evaluation is when all benefits and drawbacks are communicated.

5.3.2 Communication process

Project communication was considered as a critical knowledge transferring process and a stakeholder influence factor. The communicating through the organizational change is supported by the various authors in the literature. The plan how the mental models are communicated (RD42) organization-wide in different channels is relevant to determine in early phase of an implementation project (RD47). In addition, it is always relevant to consider cultural aspects (RD45), for instance, how should messages be delivered as supported by Holbeche (2006, p. 209). In addition, it is significant to communicate of culture of experimentation as emphasized by Holbeche (2006, p. 217). In this rollout framework, there are four (4) major attributes which were used to communication: workshops, change advancement, knowledge barrier cracking and stakeholder communication. The framework also suggests to measure the communication effectiveness (RD44).

Workshops were organized by the consultant. The main purpose of the workshops was configuring Microsoft Project Server according to the company's needs. Workshops also enabled knowledge transfer between the implementation team and employees, and also critical stakeholder participation to system configuration, as it is considered as an important factor of IT system acceptance (Orlikowski and Gash 1994; Boonstra 2005; Laamanen 2001; 260-272). In addition, workshops allowed Case company to critical knowledge transferring during the implementation process; to strengthen the shared mental models in order to understand and to agree upon what project teams were actually going to deliver supported by Moe et al. (2012).

Change advancement considered various techniques how should the change be communicated and promoted internally (RD46). For example, promoting and visualizing, how individuals work will change (RD26) enables people to see their relation to change. In addition, by using visual and storytelling approaches in communication was used for resourcing method descriptions and project progress reporting to the stakeholders. Furthermore, change advancement highlighted the technology capabilities to support the digitalization requirements, since MS Project was a relatively new tool in the organization and its full capabilities were unfamiliar.

Knowledge barrier cracking supports ways how the organization can enhance organizational learning. For instance, a continuous benefits delivery is a possibility to project team and organization to receive better understanding of the change, as supported by Ashurst et al. (2008). The attribute included hands-on sessions where the core was in configuration review, testing and regular meetings for feedback collection, change execution and benefit re-evaluations. This also involved sharing tips and tricks about the best practices and configuration improvements. In addition, this requires external communication with consultant and constant knowledge transferring (RD40).

Stakeholder communication was done through different channels to enable one-way (symmetrical) and two-way (asymmetrical) communication (RD43) as suggested by to Crane and Livesey (2003). Communication with the management (RD39) was handled by Management Letter that was planned to be innovative way to approach management with visual outlook (RD48). The other management communication event was Steering Group review where the purpose was the progress of the implementation project. The project team received memos and participated in evaluation interviews. In addition, they received conclusions regarding open questions about the project. Line managers were communicated of changes and the whole organization was contacted by a formal intra-net newsletter.

5.4 Artefact evaluation

Since the short space of time, the entire artefact was not tested in practice as the first project types have evaluation phase in the end of year 2016 (see Appendix H), which resulted in conducting evaluation interviews. A case study method was used for understanding the dynamics present within single settings. As a result, the context-related problem, objectives and the artefact were subjected to internal and external interviews, as a part of evaluation during the second interview phase.

The implementation framework was given the evaluation dimensions adopted from Prat et al. (2014). The dimensions were of goal, environment, structure and evolution, and the evaluation attributes were

- **Goal:** General, Validity, Effectiveness
- **Environment:**
  Consistency with people - Utility - Ease of use
  Consistency with organization - Utility
  Consistency with technology
- **Structure:** Clarity, Completeness, Level of detail
- **Evolution:** Learning ability.

The second interview phase consisted of two interview groups: internal and external. The evaluation aimed at the iteration of the implementation framework and which also provided a possibility to observe the internal participants' attitudes toward change, since knowledge of the implemented system was increased. In addition, the stakeholders' political aspect of evaluation can be very important in particular cases (Serafeimidis and Smithson 2000), therefore validation was seen as relevant communication to different stakeholders.

External interviews were conducted with Partner companies C1 and C2, which had undergone similar changes in the similar project management context. The both organization had one (1) participant who took part to the interviews. Their role was essential

because their knowledge and experience of solutions and change management in the IS implementation was based on many years. External interviews were reconsidered as an important factor of the artefact evaluation. First, they brought rigor to the research. Second, they improved the artefact design based on the experiences of the implementation. Both organizations widely adopted MS Project Server use.

5.4.1 Internal validation interviews in Case company

Internal validation interviews considered nine (9) internal employees, of whom seven (6) were directly related to project management and one (1) a vice president of IT services and one (1) senior manager of operational excellence and one (1) vice president of the business line (see Appendix G).

The internal validation interviews concentrated on improvements: how successful was the implementation framework so far, and which type of action attributes should be taken care of in the artefact design and what types of benefits the interviews considered to gain with MS Project Server. The first interviewee (E1: Resource Manager) emphasized the concrete methods to training and testing. His comments regarding the communication were: “It has been satisfying”. Regarding the benefits, considered overall visibility should be improved as a result of the implementation. The second interviewee (E2: Resource Manager) also requested to have concrete approaches to implementation. He also highlighted how incentives plays significant role to motivate people to adopt the new tool. When evaluating the benefits, he emphasized the long term planning and real-time data are one of the major benefits for him. The third interviewee (E3: Resource Manager) also emphasized the concrete touch to implementation. He mentioned the go-live to given best evaluation results. Regarding the benefits, he considered reporting will be eased.

The fourth interviewee (E4: Master Planning, Project Operations) was also satisfied to communication; however, communication could have been distributed in wider perspective. In addition, he emphasized the training could be done through videos. Regarding the benefits, he underlined overall management. The fifth interviewee (E5: Project Manager) emphasized communication of rollout schedules that should be highlighted in the framework. As he said: “It is difficult to see how the implementation and change is affecting since there is no clear schedule published officially.” Also hands-on sessions where the facilitator is someone else are better than learning by alone. He thought there are no direct benefits for him.

The sixth interviewee (E6: Project Director) also underlined pragmatic approaches. In general, he said his work will be eased after MS Project will be in use. The seventh interviewee (E7: VP of Business line) evaluated the communication has been adequate to him. He was satisfied of the Management Letter. The benefits were not directly concerning him, but as he considered, the centralized coordination of development for pro-

ject templates was one of the important benefits. In addition the resource pool creation and reduce of ad-hoc work will be the business and organizational benefits. The eighth interviewee suggested having less metrics to be implemented at once. The most important metric will measure the cloud system adaption.

As a result, positive feedback was given to communication and information was delivered to necessary parties. The business line manager still requested to have an organizational wide communication, such as an intranet release. However, a clear implementation schedule was not published and as a result interviewees were waiting for official communication about rollout schedules. Negative feedback was given to workshops where the Microsoft Project Server was configured. Two of the project managers found the workshops ineffective and time consuming. They expected that the outcome of each workshop would have been more concrete. According to them, they hoped that the sessions were more interactive with clear results, and clearly not all of the topics considered them. In addition, the resource management process was judged to be with unclear responsibilities. The clarification of actual resourcing process was requested. As the first interviewee said: “I still do not know how does the resource process works in our organization, and how to place people to this model”.

Training ideas emphasized hands-on sessions where users were would learn how to use Microsoft Project Server. Also a training camp and focus group training were requested for. When the training is scheduled and someone is guiding the session, it forces me to learn. Otherwise, I probably will not practice by myself, was one of the comments given during the interviews. In addition, training videos were requested, since they are not depending on the users’ time or place.

When the interviewees were asked about the overall feeling, the answers were mainly positive. That also indicates that the implementation framework has succeeded between milestones G2-G2.1 in the area of validity, effectiveness and consistency with the organization. Moreover, the results of the observation also support that the attitude towards change was seen more positive after people had a more concrete understanding of the concept of Microsoft Project Server. Based on the overall feedback of the interviews, the feeling seemed to be positive. The ninth interviewee (E9: Senior Manager) was overall satisfied. As he said of that the organization’s employees are waiting for the new project portfolio management tool: “If somehow this new tool is not implemented they would be annoyed. The reaction would have been different a few months ago”, so in this case the attitude and mind-set has changed from the beginning

5.4.2 External interviews Partner company C1 and C2

External interviews were considered as a critical factor of the evaluation of the implementation framework. The first interview (Partner company C1: Development Manager) (see Appendix G) with the partner company’ representative highlighted that they have

had a different approach to the implementation and structurally they have had different categories of schedules, workload and reporting where the implementation phased, unlike Case company, where the plan was to develop everything at once per template. Benefits were discovered in an early phase, and were not collected as a part of a constant process, but were based on the user experiences. However, since the current situation was not described accurately at the beginning, distinction between the beginning and the end was difficult to point out, according to an interviewee. The focus was mainly on qualitative benefits that were able to be set numerically, for example, ”All new projects are managed with MS Project” or ”All schedules are created with MS Project”, with the answer being yes/no.

The first interview highlighted the importance of training and practical factors that were missing in the framework. For example, training possibilities were utilized creatively. Such training included, for example, short video sessions of simple topics which received positive feedback internally. Also, accessibility to these videos was organized centrally through the intranet. Regarding the success factors of the implementation project, the first interviewee raised importance to combine a good internal implementation team that is willing to contribute the change and is competent to solve problems. The interviewee emphasized that it cannot be the responsibility of only a few people who solve the problems. This was not reconsidered in the framework separately. The interviewee also highlighted that change resistance also depends on the users’ capacity to adopt new things. Also, the key message was that the tool should replace something existing, in order to convince that it is truly needed.

The second interview (Partner company C2: Senior Specialist) with partner company’ representative underlined that the partner company’s implementation also differed from the designed implementation plan. According the interviewee, implementation was phased in accordance of the country deployment. Certain project types were introduced in different countries in different times, therefore one of the measures was deployment. In the company, MS Project Server was considered as a replacement investment where the old version was not delivering business benefits and the performance was inadequate, the objectives were according to that need. Therefore, the company’s objectives were set up differently in the first and second phases. In the first implementation, metrics were set up to control and monitor effective use. This was mainly to guarantee the adoption of new tool and methods.

The second interviewee agreed that there are difficulties in IS benefits realization. Difficulties lie in the structural level of the objectives and benefits: how to consider personal level for example. The interviewee highlighted that first you have to have an objective and business benefits discovered, supported by top management. The best situation is when the business need is aligned with KPIs. That ensures that the top management is involved and escalation to managerial level is possible. Secondly, it is relevant to understand the project investment in accordance with schedules (scope and budget). Thirdly,

it is important to ensure the technical performance and reliability in the context. Therefore, the server has to be defined in accordance to the needs of the business; the connection has to work, wherever you are, if the business is requesting it.

As a conclusion, the second interviewee emphasized that it is important to satisfy both the management and the users. To provide adequate training and support for the users, and manage the objectives that the project steering group has set are reached. Regarding practices and improvements to the framework, schedule updaters responsible for ensuring that schedules are always up-to-date were not assigned. Other improvements considered the process and template alignment: templates created should be in a harmony with processes. That is a real benefit that you are able to deliver to the customer in your visible delivery process (schedules and progress, maybe key resources), even though they do not request it. It clearly displays certain professionalism and quality to customer. This was not reviewed in the implementation framework design. The interviewee recognized that their internal visibility was less considered than the external (customer), unlike Case company which also focused on the internal, since their manufacturing partners were situated in a different country.

Both interviewees emphasized the reliability of the cloud. According to their experience, operations in China resulted to light structured project files due to low bandwidth speed. Similar issues should be considered in hotels abroad, for example. These facts were not considered in the framework methodically.

5.5 Combining the empirical results

The Case company had two types of problems: problems regarding global resourcing and project management practices. A solution from the company's side was to improve them (context-related problem). As a result, they were implementing a new PPM software tool, Microsoft Project Server, causing the need of the implementation framework (research related problem) and triggering an incremental change. To reach the context-related objectives, the implementation plan should discover issues and objectives in the context: strategical, technical, organizational attributes were examined.

The objectives and content related issues of the implementation framework were collected during the fall 2015, and the implementation framework (artefact) building went parallel with qualitative interviews and configuration workshops. Methods for the new resourcing possibilities were iterated constantly in the context. The framework and implementation schedule were introduced during the validation interviews in January and February 2016 after the majority of the Microsoft Project Server configuration was done and users had an understanding of the tool possibilities. Validation used the case study method to construct the problem, objectives and solutions in the case context. Validation interviews resulted in corrections and improvements to the framework. These corrections were:

- **User support:**
  - POC/ training camp
  - Video training
- **Project evaluation:**
  - KPI
  - User and customer satisfaction
  - System performance
  - License usage
- **Testing:**
  - Reliability and functional testing at country level
- **Communication:**
  - Implementation schedule communication
- **Project resourcing methods:**
  - Clarifications to process descriptions

All these improvements were iterated to the framework (Figure 20). Since the correction was needed, evaluation was beneficial and gave rigor to the research, hence most likely increasing the framework's ability to achieve its goal (validity, effectiveness), consistency with organization, and clarifying and completing structure. As a result, implementation framework evaluation attributes were weighed by internal and external interviews. Most interviewees emphasized that the implementation needs pragmatic approaches to achieve its effectiveness and validity. As one of the project managers said "there are most probably difference between the plan and the reality". Therefore, validation at this point was trying to give directional information about the framework's ability to be "utilizable" and fill its purpose. The validation was done accordingly:

- **Goal: validity and generality**
  - Validity and generality evaluated in internal and similar external context
  - Ability to reach the objectives evaluated partially during project
- **Environment: consistency with people, organization and technology**
  - Utility and ease of use evaluated by users and stakeholders, and feedback was considered
- **Structure:**
  - Clarity, completeness and level of detail evaluated by users and stakeholders
- **Evolution**
  - Learning capability was no evaluated

The result of the interviews of how the framework's evaluation attributes should be weighed in the case organization's context is presented in Figure 23. The colors indicated whether the framework has achieved some of the dimensions and criteria. The green indicated *achieved*, yellow indicated *not completely achieved* and red indicated *not*

achieved. It is relevant to notice that evaluation is a constant process and criteria outputs can vary over time.

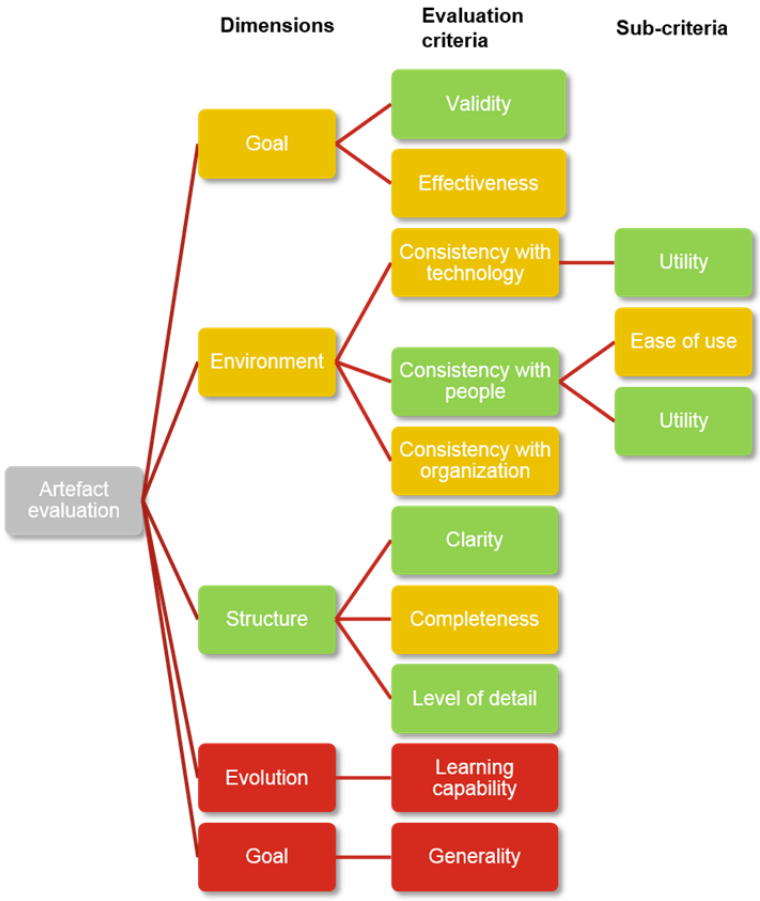

Figure 23. *Evaluation attributes in hierarchy level in Case company*

The hierarchy level was given order by Senior manager (E9) (see Appendix G) during the validation interviews in the respect of the current situation and Case company's environment, as supported by (March and Smith 1995). Therefore, the relevancy is based on his experience. The most important evaluation dimension was goal where effectiveness and validity were given importance. This dimension is also supported by Hevner et al. (2004) and Peffers et al. (2007). Based on the experience of the senior manager, the validity was considered achieved, while effectiveness was not completely achieved, but the communication process was evidence that the direction was right. Still, the evaluation covered a small group of stakeholders, so this has to be viewed critically. The second important evaluation dimension was environment, also supported by (March and Smith 1995) where performance is related to the environment in which framework operates. Consistency with technology was given importance, since one of the main objectives of the company was to have only one resource management tool in use, instead of many. However, this cannot be evaluated yet. The second important criterion was consistency with people which was considered to be achieved.

The third important evaluation criteria were consistency with organization, as the framework's purpose was to build alignment with the organization, IT and processes. Structure was weighed as the fourth most important criterion. There, completeness was not completely achieved, since the experimentation of the framework is was ongoing. Evolution and, especially, learning ability, was seen as the least important criterion, together with generality because it was not yet relevant, when the evaluation took place. As he expressed his thoughts: "I do not remember whether we have had any type of plan that would be as accurate as this plan, although its structure has been changing." Generality was considered the least important and the least irrelevant of all the criteria, however, the framework uses generally notified best practices and critical factors adopted from different literature and external interviews. Nevertheless, the framework's core idea was not to be generally adoptable.

Framework utilization required and will require constant validation by experienced users and stakeholders. Also, external validation gave rigor and relevancy to the implementation framework. To finalize the implementation project, outcomes need measurement. If the objectives of the implementation are fully successful, the artefact is fulfilling its purpose (Hevner et al. 2004). At the moment, the framework is still incomplete because complete evaluation is not conducted. This requires complete case study results after Microsoft Project Server implementation is completed.

In the situation where an individual attempts to across the river, *"I would design them a bridge"* (Buckminster Fuller 1992). A correctly designed bridge enables an individual and organizations to move from their current situation to the desired location. Bridge building requires knowledge and scientific theories. The greatest reference for a bridge is its sustainability, an evidence of concept. Nevertheless, software development and implementation in a global scale is done in an environment where multiple users and other stakeholders are setting certain requirements from different perspectives which may be far from the agreement. In addition, complexity is generated from constantly evolving demands on how can the system support different internal and external stakeholders, such as a customer. On the other hand, technology sets specific requirements especially when cross-technology integrations exist. In the area of complexity, the methods should be empirical and iterative to build an artefact to fill its purpose. Notable is that scientific literature argues that the plan should have an ability to evolution and the ability to adaptation, especially when the complexity exists, therefore the development is rather a dynamic process than stable condition (Guckenheimer et al. 2012, pp. 3-5; Nunamaker et al. 1990; March and Smith 1995; Becker et al. 2003, p. 133; PMI 2013, p. 55-56).

6. CONCLUSIONS

In this study, the main research question was "What should be included in the implementation framework in order to reach the objectives of an implementation?" To address the main research question, supporting sub-questions were identified. To address the first and second sub-questions, the research defined problems and objectives in the context of implementation to characterize and construct context-related issues. To address the third and fourth sub-questions, a multi-level view of IS implementation was combined to theme of the thesis, that consisted six major topics such as data-driven decision making, organizational change and IT alignment, cloud system implementation, critical factors affecting IS implementation and evaluation. To address the fifth and sixth sub-questions, the research used IS artefact related hierarchical evaluation criteria. Next, key results and assessments are presented.

6.1 Key results

Based on theoretical literature, empirical interviews and observation, this study was able to answer the main research question and design the implementation framework for the cloud-based information system in the Case company's context. This thesis studied information system implementation through six major topics that were partly used to design the framework, which was considered as a pragmatic guide the organization from the current situation towards the desired solution: solve the context-related problems and enable a favorable incremental change by acknowledging the lifecycle of MS Project Server implementation. The lifecycle included strategic planning (improve the decision making, increase the visibility and value-adding over the project management as part of digitalization plan), requirements specification (strategic alignment classification to business objectives, IT objectives, IS requirements and organizational requirements, and design of resource management process), implementation (practices and critical factors such as an integration and project communication) and continuous improvement (information system evaluation).

The first key result was the designed implementation framework that considered a scheduled plan on how the Case company's different project types are implemented to project organization in order to success the goal of the thesis to enable the organizational change with new designed resourcing process and new MS Project Server. The empirical part collected attributes and the ideas which tried to answer the main research question. Altogether, 39 attributes were suggested and fitted to process of rollout and communication. The central focus of the framework is on IS-related incremental change

that considers social systems, as organization and work processes underlining resource management process, constant benefit realization and IS development and the evaluation.

The second key result was the evaluation criteria used to evaluate the artefact. The purpose of the criteria was to evaluate the artefact design feasibility, the ability to reach its objectives, since the short space of time to cover a whole implementation project. This resulted to experience-based validation interviews internally and externally. As a result, there were many attributes which were not evaluated yet. Therefore, the evaluation of framework showed that the proof of its capability to guide the organization to the desired location is still incomplete. The evaluation criteria covered the following attributes in hierarchical levels:

1) Goal:
    a) Validity
    b) Effectiveness
2) Environment:
    a) Consistency with technology
    b) Consistency with people
        i) Ease of use
        ii) Utility
    c) Consistency with organization
3) Structure:
    a) Clarity
    b) Completeness
    c) Level of detail
4) Evolution:
    a) Learning ability
5) Goal:
    a) Generality

The evolution considered being the second least important attribute but its relevance should be higher since the framework is under development and designed to contain iterative work. As supported by Guckenheimer et al. (2012, pp. 3-5) during the complex projects, rather than stick to the elaborate plans that will change, it is often better to create options with iterative methods: try a little, inspect the results, and adapt then take the next steps based on the experience. Therefore, the framework's ability to evolve and adapt should be higher in the hierarchy. As a result, the research is still lacking evidence to fulfil its purpose and requires full a case study after the implementation project is finished.

6.2 Recommendation for actions

The research suggests that the organization continues with empirical methods and experimentation by utilizing the developed framework in the Case company's global project management context. After later iteration, evaluations and development of framework and resourcing processes, if discovered, the framework's ability to be feasible is testified and result should be published. After validation and change are executed, the design rationale should be considered, so that documentation is available to see what was the reason the change the plan and why was it needed, and also, ensure organizational learning (Lee 1997). In addition, the Case company should determine the activities, tasks and attributes that were not defined during this research such as financial and technical attributes, feedback process determination, incentives plan and general resource management handbook. In addition, there were several training and instructions needs that should have been met to ensure the quick adoption of MS Project Server, which were not discovered in details. The recommended actions also include using motivational techniques to enhance change in the organization, thus avoiding change resistance, as people are the most important factor during the change.

6.3 Assessment of research

This thesis aimed at find concepts and relationships, attributes that enable the organization to implement the key objectives through the implementation framework. The collected attributes were fitted to framework and scheduled, which was an objective of this research. However, the framework is not ready to answer whether Case company can achieve its objectives, thus a question is raised: "*Which relevant part is not discovered?"* As Hevners' et al. (2004) Guideline 7 suggests, the results are communicated to audience in order to get research rigor and improve the framework when time passes.

This thesis also attempted to provide a one perspective to a cloud-based information system implementation. The topic of the research is modern as statistics show; still many of the IT acquisition projects are not successfully managed. There may be many reasons, not only a failed budget, schedule or scope. This research scenery requested a pragmatic and interpretive approach where the researcher's position was participative and interventional. Therefore, the researcher adopted both objective and subjective points of view. This scenery requested a great amount or intra-organizational work to familiarize actual problems and objectives.

As stated by Goldkuhl (2012) the information systems considers interventions and changes both in the social system, as work processes and in the technical system. However, the information system implementation is a wide topic, and there were restrictions to cover the full-view of the IS implementation. This resulted that the focus was more on incremental and organizational change where the drives were in strategy. Therefore, there was less discussion of a technical change, only central pointes were conversed.

Finally, the evaluation criteria are presented as an objective of this thesis. It was considered as an important factor of objectivity and research rigor. However, this evaluation was not accomplished completely due to the research time manner. Only external evaluation interviews were able to give diminutive research rigor. Therefore, the case study of this research was possible to be conducted only in part and experimentation should be continued. In addition, the results of evaluation are only directional, thus it would be relevant to examine the evaluation criteria and its order again in future.

6.4 Assessment of the utilized methods

This study attempted to use a problem-solving method, design science research, to construct an information system related artefact in a particular case. By using design science research as a main methodology, the study was able to define problems and objectives, and construct an artefact to solve the problem in Case company's context. In addition, as Nunamaker et al. (1990) underlined, multi-method approaches were applied in the design science framework: development and experimentation and observation. A case study method was included in the research for artefact evaluation purposes. Therefore, this research has accomplished the objectives to develop and construct the IT artefact, which is problem-related and tries to solve an existing problem, and it is evaluated by validation criteria. The process of design science was easy to adopt, conversely, the case study method was included for evaluation and introduced during evaluation interviews, which had to be assessed critically. For example, in internal interviews context-related problems and objectives are familiar, but when introduced to external interviewees, there might be misunderstandings, wrong interpretations and assumptions when context is not familiar and interviews are short.

Along with design science research, action research was applied as a minority method, because of the researcher's involvement, the interest and purpose was to enhance change in the organization and able the organization to transform according to the objectives. Therefore, the researcher promoted change during interviews and participant observation, which has had an impact on the results and must be viewed critically.

Main data collection methods were semi-structured interviews, participant observation and literature analysis. Since the company's objective was to get MS Project Server adopted, introduction and evaluation interviews focused very much on user benefit-centric questions. However, little was discussed about technical aspects of tool usage which might have resulted in different results. Reliability concerns whether similar research would reveal similar information (Saunders et al. 2009, p. 326). It is important to notice biases, especially since primary data is collected through qualitative interviews. Interviews are biased in many ways: the time interviews are done, how interviewer imposes answers according to his/her own beliefs and the length of data collection session, can seriously affect results. Also, the lack of credibility can affect the value of information the researches may be given. However, this was tried to be avoided by building

familiarity early on with the case organization. In addition, statistical generalization is not possible with such small focus groups. (Saunders et al. 2009, p. 326-332; Shenton 2004) Nonetheless, observing is biased as well. The effect that an individual feels that he/she is being observed changes his/her behavior, therefore time error is relevant. Also data recorded highly depends on the researcher's role as an observer (Saunders et al. 2009, pp. 296-297; 309). This research could be conducted with a similar setting. However, participant observation and change promoting depend on the researcher's subjectivity.

The literature analysis covered mostly scientific journals and literature. However, the subject of information technology expires quickly when new technology is developed and new research results are discovered. Therefore, this thesis attempted to use a wide range of different types of literature and value was given to currently relevant articles. However, the literature on the strategic alignment has developed over time and conceptualizations have been enlarged over time and researches recognize many points of alignment between business and IT as stated by Chan and Reich (2007). Therefore, it is relevant to argue that alignment built in this thesis is sophistically adopted, moderated and probably will continuously be developed.

6.5 Recommended future researches

As the results of evaluation showed, the framework generalization was not considered important. However, it would be an interesting topic to study how could the designed implementation framework be adopted in a different organizational context with a different project management context. In addition, would be interesting to research more, how could the customer satisfaction be improved by adopting the MS Project Server and what would be the impact on the implementation framework?

This thesis had to exclude several important topics regarding the information system implementation. Therefore would be interesting to conduct a research that discovers financial and technical aspect of IS implementation, information system acquisition and stakeholder management as part of total implementation project management. Another interesting area would be to cover the topics of information system and business alignments, IS evaluation metrics and business intelligence as a part of decision making in depth. Previous topics are covered here but their full understanding requires more researching. Thus, it would be interesting to conduct a study on building a better strategic alignment in the case organization. Also, the topic of IS evaluation would need its own study to cover the multilayered structure of evaluation. In addition, information assessment from different perspectives would be relevant to discover before reporting is harmonized in the Case company. This would result in harmonized reports to different stakeholders according to the information need, thus enabling better use of the business intelligence functions of MS Project Server.

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APPENDIX A: LIST OF REQUIREMENTS IN FRAMEWORK DESIGN

RD1: Plan how the information system should support decision making
RD2: Plan how the information system should support the reporting and analysis need
RD3: Design and visualize methods of information knowledge creation, sharing and capture with IS
RD4: Plan the user access policy for different data and information sources
RD5: Plan information system to support the value adding to organization
RD6: Plan information system to support customer needs and value produced for the customer
RD7: Plan information system to support enterprise digitalization requirements
RD8: Plan and build the mobile access to information system
RD9: Plan the type of cloud implementation and operation model
RD10: Plan the licenses usage when payment is based on the usage
RD11: Plan implementation to consider change as an interaction, of technology, structures, people and tasks
RD12: Plan the alignment type
RD13: Design strategic alignment according to organization need
RD14: Plan adaptations to the alignment according to organization requirements
RD15: Plan alignment classification to business objectives, IT objectives, IS requirements and organizational requirements
RD16: Expose strategic alignment design with many organizational perspectives
RD17: Plan IT products and service to meet the client needs
RD18: Plan all processes that need re-engineering
RD19: Plan and model value-adding tasks and activities
RD20: Describe and visualize the workflow of selected processes
RD21: Evaluate and iterate designed model constantly with organization
RD22: Plan and prepare to change resistance from different organizational perspectives
RD23: Plan and share clear vision of the change in early phase
RD24: Involve people in development and execution
RD25: Test new designed methods and processes
RD26: Promote value and detailed information of how work changes
RD27: Plan how feedback is collected continuosly
RD28: Plan the process renewal
RD29: Plan cloud system lifecycle and implementation model
RD30: Plan cloud system leveraging possibilities
RD31: Plan cloud system maintenance and requirements by organization
RD32: Plan the right metrics to cloud performance and use the metrics in service level agreement
RD33: Plan and ensure system and user security of cloud

RD34: Plan the type of implementation practice in accordance to the company's objectives and capabilities
RD35: Plan user-oriented and business-oriented customization and configuration to be in balance
RD36: Plan small implementation core team with the right knowledge
RD37: Plan information system's integration and the support carefully
RD38: Plan training in the way that people are exited and can enhance skills on continuous basis
RD39: Plan how the top management is communicated by project progress
RD40: Plan how to transfer knowledge from consultant, and give feedback
RD41: Plan how to motivate people with incentives based on the performance
RD42: Plan how to communicate mental models
RD43: Plan asymmetrical communication with feedback possibilities
RD44: Plan how to measure effectiveness of communication in the organization
RD45: Plan how to consider cultural aspects of communication
RD46: Plan how to campaign change internally
RD47: Plan communication channels where message is delivered
RD48: Use visual and storytelling approaches for communication
RD49: Design information system implementation as a form of project
RD50: Design the implementation project to include phases of initiating, planning, executing, monitoring and controlling and closing
RD51: Plan project resources to integrated to schedules
RD52: Plan project scope, time, cost, quality, communications, resources, risks, procurements and stakeholder engagement
RD53: Design how to implement changes during the project
RD54: Plan the project closing, gather lessons leant
RD55: Plan how to compete with uncertainty during the project
RD56: Consider that IS evaluation is multilayered, so criteria should cover many layers with adequate exclusion
RD57: Plan several variables to measure information system success
RD58: Plan benefits to categorization of strategic, tactical and operational benefits, with financially, non-financially and intangibly natures
RD59: Plan benefits realization to be a systematic process

APPENDIX B: INTRODUCTION INTERVIEW QUESTIONS TO PROJECT MANAGEMENT

Background questions and workflow determination in project deliveries:

1. Your position at Case company?
2. What are the main activities related to this position?
3. Roles and responsibilities.
4. Tools used at work.
5. How are the resources managed at the moment?
    a. Scope
    b. Schedule
    c. Cost?
6. What about key resources?
7. Anything to add?

Process evaluation:

1. How do you see the customer's or sales office's opinion in delivery process?
2. How is the project resources reserved at the moment?
    a. Are there any process differences?
    b. Problems in process interface?
3. Challenges in resource management?
    a. resource management challenges
    b. issue management
    c. reporting?
4. What is working well in this process?
5. What data you are following in the process?

Attitudes:

1. Do you see that new Project Management tool will solve problems?
2. Do you see that new Project Management is going to be useful and help your daily tasks?
3. What is your main concern regarding the new Project Management?
4. Requirements for the tool use?
5. Anything to add?

Process development:

1. If you could develop some point, what it would be?

Open discussion

APPENDIX C: INTRODUCTION INTERVIEW QUESTIONS TO RESOURCE MANAGEMENT

Background questions and workflow determination in project deliveries:

1. Your position at Case company?
2. What are the main corner stones of resource management in general?
3. How does product line resourcing differing from each other?
4. How are resources managed at the moment?
5. Could you describe the resource management metrics?
6. What are the most important metrics?
    a. Data sources for metrics?
7. Is there other metrics that should be created? (For example EO, CO metrics?)

Process evaluation:

1. Most significant challenges in project resource management?
2. What is working well in this process?

Implementation:

1. Expectations regarding the Project management software?
2. What metrics you need to have in the Project management software?
3. Experience of other software implementations?
4. Requirements for use?
5. Anything to add?

Process development:

1. If you could develop some point, what it would be?
2. Concluding

Open discussion

APPENDIX D: EVALUATION INTERVIEW QUESTIONS TO PROJECT MANAGEMENT

Show implementation framework draft

Evaluation:

1. Main requirements
    a. List of requirements
    b. Success evaluation (list of success metrics)
        i. Interaction success, when users' attitudes towards IT are positive.
        ii. Expectation success, where IT systems match users' expectations.
2. Communication during project
    a. Formal (electronic, reviews, memos)
    b. Informal (face-to-face)
    c. Progress reporting
    d. Knowledge barrier cracking
    e. Other
3. Training during the project
    a. How has different stakeholders notified?

Benefits re-evaluation:

1. Planned and expected benefits?
2. Gained benefits?
3. Anything to add?

Development need and feedback:

1. Expectations regarding the implementation?
    a. User support
    b. Communication
    c. Metrics
    d. Other requirements
2. Anything to add?

Open discussion

APPENDIX E: EVALUATION INTERVIEW QUESTIONS TO EXTERNAL GROUP

Show implementation framework draft

Evaluation:

1. How would you separate IS implementation from traditional project management?
2. A which part differ the most?
    a. Is it in framework?
3. What would you consider relevant part in the framework regarding IS implementation?
4. Which part you specially focused during the implementation?
5. Did you face any user resistance?
    a. How did you managed to reduce it
6. What metrics you set for your projects?
7. Anything to add?

Possible benefits if recognizable:

1. How framework is fitting to current situation in your organization?
2. Which part is relevant?
3. Which part is implementable?
4. Anything to add?

Open discussion

APPENDIX F: CATEGORIZED DATA OF INTRODUCTION INTERVIEWS

Table 4. *Categorized data of introduction interviews*

Interviewees	Business objective and benefits planning	Implementation requirements	Observation attribute: attitude toward change
I1 - Master Planning, Project Operations	Visibility, overall understanding of project life-cycle and causality, minimum contribution to maximizing the benefits.	New PPM-tool should not require too much time, not too complicated.	Sceptic
I2 - Project Director	Visibility, real-time schedules, managing project change better, less ad -hoc- work, we get common resource pool, advanced resourcing. Critical milestones included to schedules.	Not too much data in templates, resource engagements booked for long-term. Key resources are needed in advance. Not too complicated system.	Positive
I3 - Project Director	Able to recognize over booking, less ad-hoc work, visibility, calculation of EV, critical milestones included.	Make change possible by reducing other options.	Positive
I4 - HR Director	Visibility, right resource on the right place on the right time, global tool, all in the same resource pool.	We do it together, information of progress, good change process.	Positive
I5 - Project Manager	Visibility, templates are harmonized.	Licenses should be optimized.	Neutral
I6 - Site Manager	Visibility of visas.		Neutral
I7 - VP Business line	-	Should be in line with existing tool, communication.	Sceptic
I8 - VP Business line.	Visibility, customer perspective, global tool, resource pool, forecasting and shadow load indication ability.	Communication, promotion.	Neutral
I9 - Project Director	Visibility in lower level of project hierarchy, terminology, defined WBS, clear responsibilities, one resource pool.	Piloting, demos, progress-reporting of implementation project steps, training, not too much data in templates. Information of rollout plan, communication of potentials.	Neutral

I10 - Project Director	Visibility, no proper forecasting, no so called soft-booking and hard-booking.	Agreement how to use the tool, constant iteration.	Positive
I11 - Resource Manager	Visibility, reduction of manual work, managing changes better.	Training.	Positive
I12 - Project Operations Manager	Visibility of all projects.	Not too detail level at the beginning, training, communication, understanding the purpose of the tool, portfolio view.	Sceptic
I13 - VP IT Services	Visibility	Good project management, with metrics, clear goals and objectives communicated, simple PPM tool.	-
I14 - Project Manager	Visibility, where people physically are. Better usability than previous system, tool should be aware of costing.	Reconsidering that resources moves from site to site, ease of confirming actuals, tool must be easy to use, so many users' needs to be involved.	Sceptic
I15 - Project Manager	Visibility to see where people are physically, ease of use, critical milestones included.	Training, communication.	Neutral
I16- Resource Manager	Visibility, resource workload monitoring, improved forecasting, progress.	Roles and responsibilites, communication of benefits.	Positive
I17 - Resource Manager	Visibility of resource workload and capacity management, over-booked resources and schedules are all together. Tendering phase: rare level bookings.	Communication, early engagement, resources for training,	Neutral
I18- VP Business line	Visibility project lifecycle, resource optimization.	-	Neutral
I19 - Engineer's team lead	Not recognizable benefits.	Easy to use	Sceptic
I20 - Sales Manager	Not recognizable benefits.	-	Neutral

APPENDIX G: CATEGORIZED DATA OF EVALUATION INTERVIEWS

Table 5. *Data analysis of evaluation interviews for external interviews*

Interviewees	Framework analysis	Possible benefits for the company
Partner company C1 - Development Manager	Video-training, enthusiastic project team, implementation by different areas (progress, reports)	Implementation project did not have similar deep-level implementation plan
Partner company C2 - Senior specialist	Top-management support, link to KPIs, deliver customer value, implementation by countries	Integral project management with linkage to gain overall visibility

Table 6. *Data analysis of evaluation interviews for internal group.*

Interviewees	Evaluation of framework	Benefits re-evaluation	Observation attribute: attitude toward change
E1 - Resource Manager	More concrete is still needed; we need testing session, or POC to gain understanding in reality. Workshops were not efficient.	Improved visibility, improved forecasting, improved reporting, harmonized and consistent reporting, project WBS structure is descried.	Positive
E2 - Manager Service Area	More concrete is still needed: training of people user groups, change communication; effect of change, intensives.	Improved visibility, improved forecasting, better project quality in long term, improved resource management, real-time capacity, comparable data , real-time data.	Positive
E3 - Resource Manager	Concrete still needed, go live is the best evaluation.	Improved visibility, eased work, improved reporting, changes are managed better.	Positive
E4 - Master Planning, Project Operations	Communication: official information of launch is needed, why we need to use this, validation of outside of team. Training: video session that everyone can watch, more practice is needed. Methods: Building a mind-set.	Improved time management, problem-solving based, customer reports are ready, other improvement possibilities; such as root-cause analyses variance errors.	Positive
E5- Project Manager	Implementation schedules were unclear, so no concrete understanding how tool will effect and in which time scale. Workshops were not efficient. Training: documents with print screens, the	Not real extra benefits, since schedule management is will be similar as it is now. Maybe if there is integration with ERP and billing milestones are exchanged. The benefits are similar as now, maybe if I can see commissioning resources, it will help.	Neutral

	soon as possible you adapt methods to routine (weekly work is routine). Hands-on sessions have been ok. Intensives: must is best intensive.		
E6 - Project Director	Need for concrete approaches. Training: hand-on sessions have been ok. Intensives: must is best intensive.	Will ease of work.	Positive
E7 - VP Business line.	Official communication, bullet-ins has been good.	One database, centralized coordination and development of templates, resource pool creation, reduction of ad-hoc.	Positive
E8 - VP IT Services	Concentrate on few metrics and then add more.	-	-
E9 - Senior Manager	Evaluation attributes hierarchy.	-	-

APPENDIX H: IMPLEMENTATION SCHEUDLE

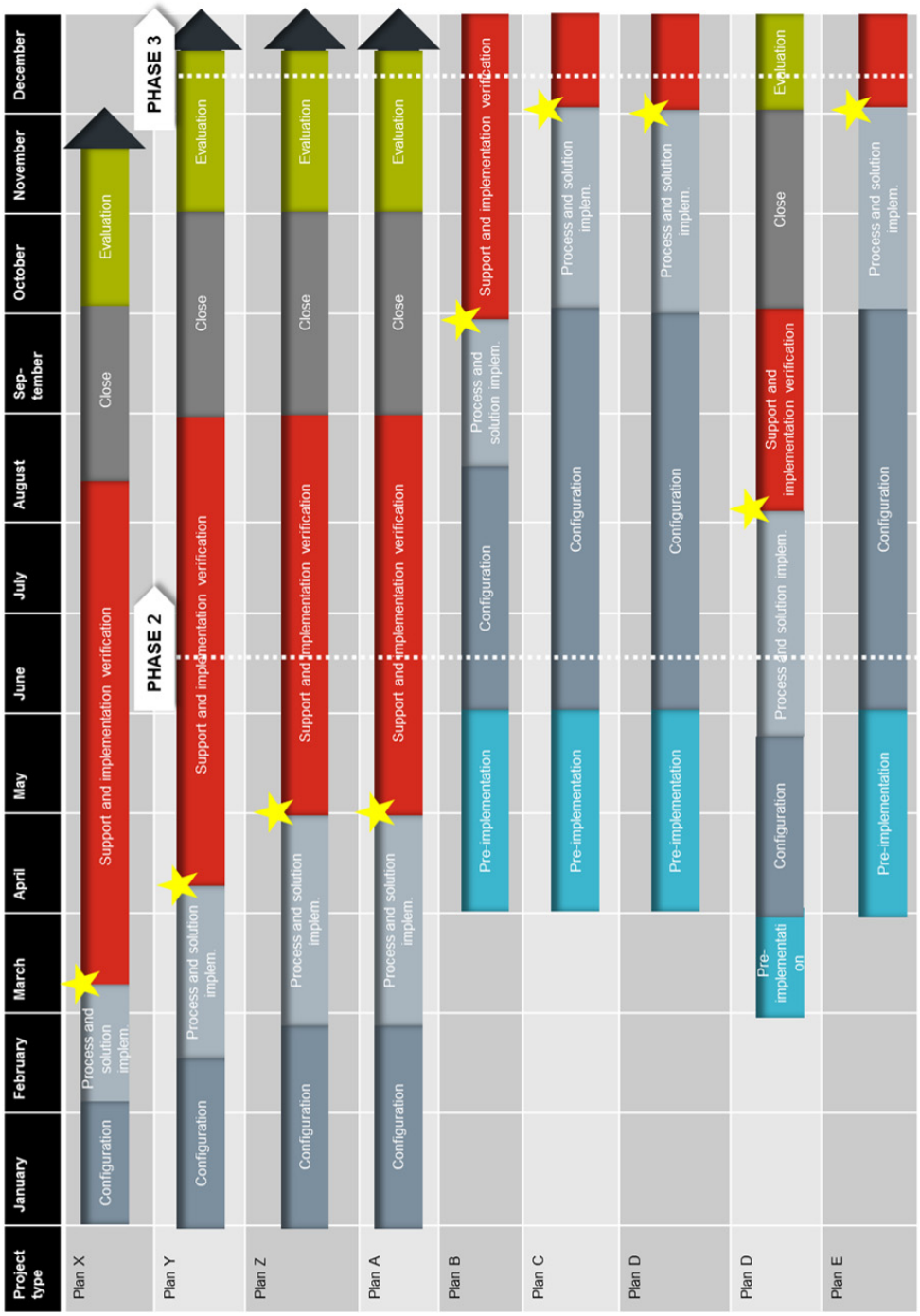

Figure 24. *Rollout schedule per project type*

APPENDIX I: FRAMEWORK IN MS PROJECT

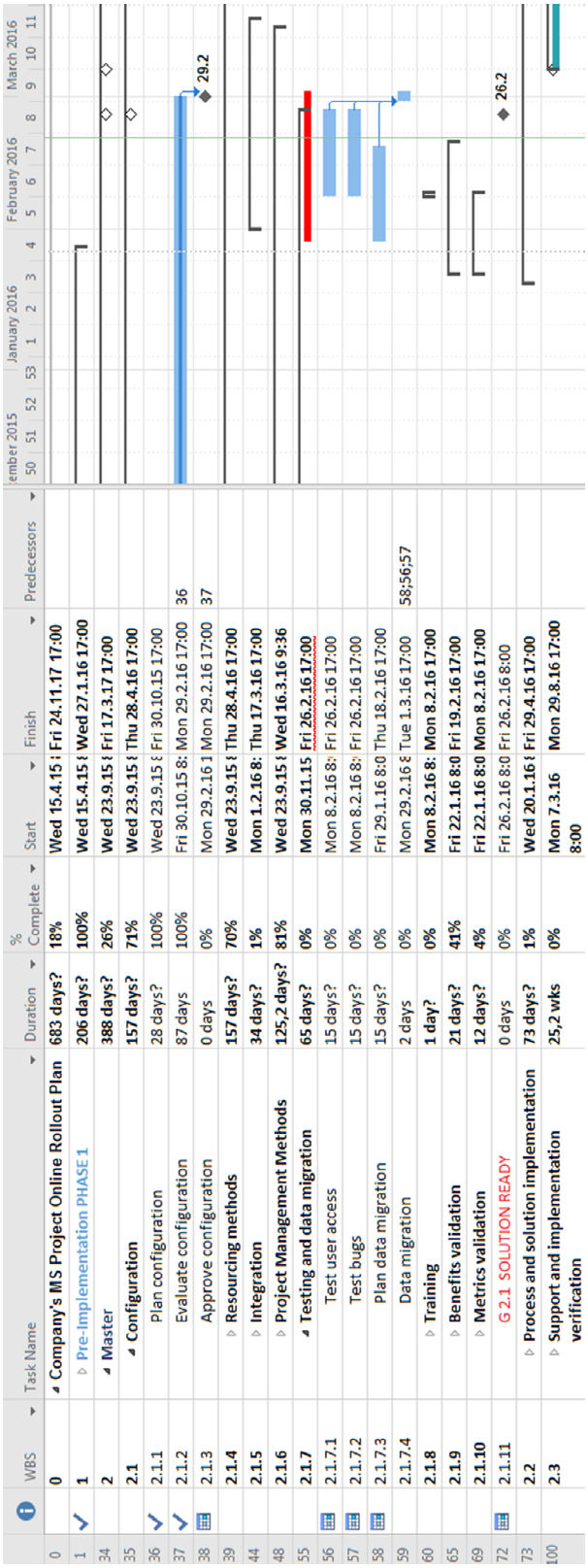

Figure 25. *Implementation schedule in MS Project for one project type*

APPENDIX J: RESOURCING PROCESS

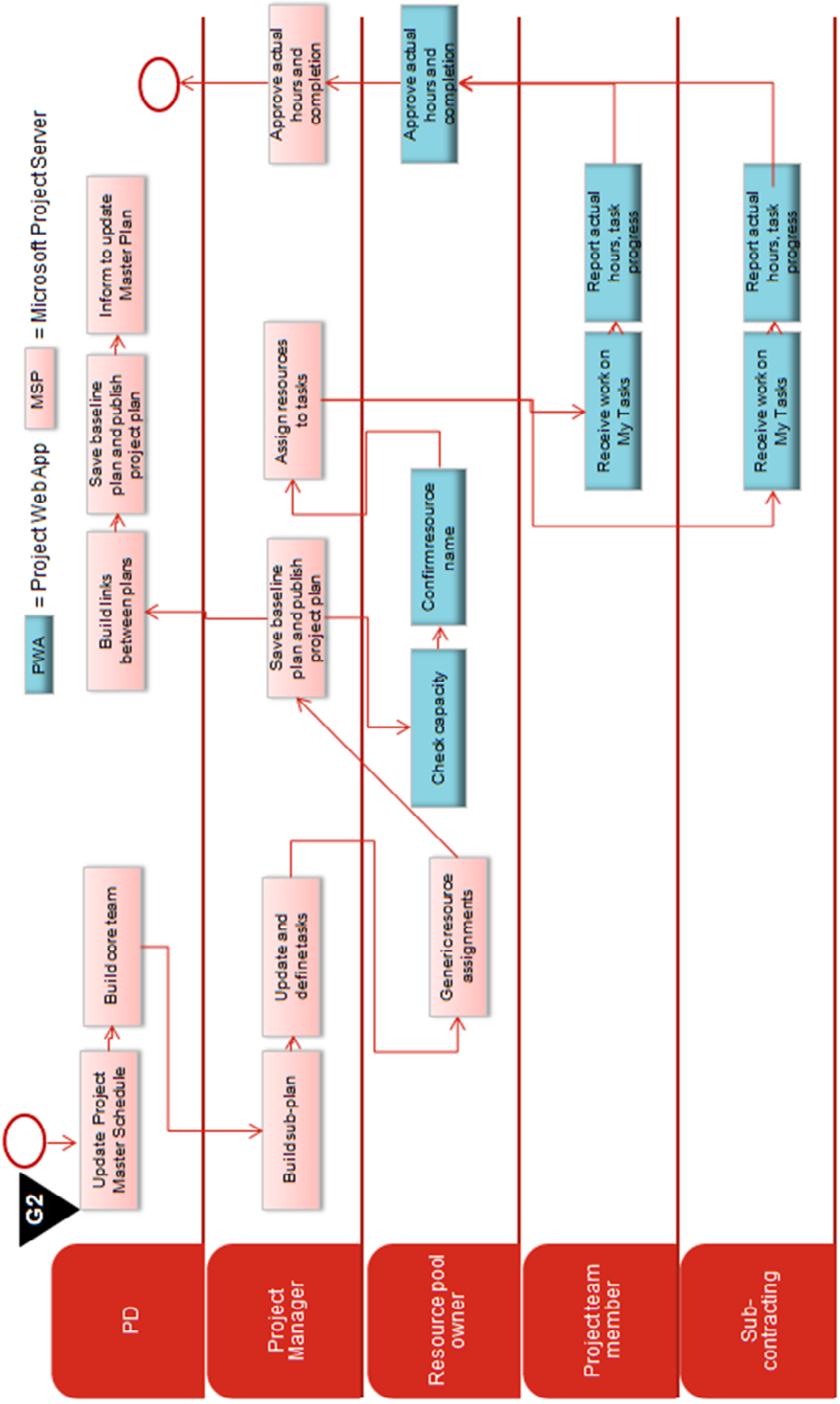

***Figure 26**. Designed resourcing process in the Case company*