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BUSINESS-ORIENTED IT TOOL DEVELOPMENT FOR SERVICE DELIVERY PROCESS

Master's thesis

Examiners: Professor Timo Kärri
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ABSTRACT

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The target of this thesis is to evaluate a bid, project and resource management IT tool for service delivery process via proof-of-concept (POC) project to assess, if the tested software is an appropriate tool for the Case Company's business requirements. Literature suggests that IT projects implementation is still a grey area in scientific research. Also, IT projects have a notably high rate of failure, one significant reason for this being insufficient planning. To tackle this risk, the Case Company decided to perform a POC project, which involved a hands-on testing period of the assessed system. End users from the business side feel that current, highly tailored project management tool is inflexible, difficult to use, and sets unnecessary limitations for the business.

Semi-structured interviews and a survey form are used to collect information about current business practices and business requirements related to the IT tool. For the POC project, a project group involving members from each of the Case Company's four business divisions was established to perform the hands-on testing. Based on data acquired during the interviews and the hands-on testing period, a target state was defined and a gap analysis was carried out by comparing the features provided by the current tool and the tested tool to the target state, which are, together with the current state description, the most important result of the thesis.

TIIVISTELMÄ

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Diplomityön tavoitteena on arvioida proof-of-concept (POC) –menetelmän avulla IT-työkalun soveltuvuutta case-yrityksen liiketoiminnan vaatimuksiin tarjous-, projektin- ja resurssinhallintaprosesseissa. Kirjallisuudessa IT-järjestelmien käyttöönoton kuvataan olevan edelleen harmaata aluetta tieteellisessä tutkimuksessa. IT-projekteilla on myös verrattain korkea epäonnistumisprosentti, mihin merkittävä syy on usein riittämätön suunnittelu. Tähän riskiin varautuakseen case-yritys on päättänyt toteuttaa käytännön testijakson sisältävän POC-projektin potentiaaliseen järjestelmään tutustuakseen. Täysin räätälöity nykyjärjestelmä on loppukäyttäjien mielestä liian jäykkä, vaikeakäyttöinen ja asettaa tarpeettomia rajoituksia liiketoiminnalle, mikä korostaa tarvetta paremmalle järjestelmälle.

Liiketoiminnan nykytilasta ja vaatimuksista tietojärjestelmille kerättiin tietoa kyselylomakkeella ja teemahaastatteluin yhtiön liiketoimintojen kanssa. POC-projektia ja käytännön testausta varten muodostettiin projektiryhmä, joka koostui liiketoiminnan edustajista jokaisesta divisioonasta. Lisäksi suoritettiin gap-analyysi vertaamalla nykyisen ja testatun järjestelmän ominaisuuksia edellä määritettyyn tavoitetilaan, jotta saataisiin mahdollisimman hyvä kuva testatun järjestelmän tarjoamasta lisäarvosta. Työn keskeiset tulokset ovat nyky- sekä tavoitetilan kuvaukset sekä järjestelmistä tehty gap-analyysi.

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At this point, it is hard for me to find words to express my gratitude to everyone involved to the thesis project, because I have been lucky enough to work with so many fantastic people. I have to settle for thanking everyone who I have worked with during these past eight months, because listing all the great people from Empower would be another eight-month project. However, special thanks to my supervisor Ari Maaninen, who was always supportive during the project, and Maria Lukkari for helping me to get familiar with the company during my time in Kotka. Finally, I would like to thank my examiner Timo Kärri. His expertise and viewpoints were valuable for me while writing this thesis. I couldn't have hoped for a better examiner.

With this thesis, one chapter in my life has been completed, and it has been quite an experience. One last time: Thank you.

Sakari Luumi
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CONTENTS

1 INTRODUCTION

1.1 Background of the study

The Case Company is a multi-disciplinary service company which operates in the Nordic and Baltic countries. The case company's business divisions have expressed a need for an IT tool that provides better support for service delivery processes. Delivery processes are heterogeneous and the resource needs come often at a short notice. This poses challenges to project planning and resource management, and requires a flexible IT tool to efficiently support business processes. Project management in general relies heavily on project managers' personal skills and individual commitment. A lot of subcontracting is used, which makes it difficult to manage resources when project entities grow larger. Also, customers often demand standard reporting, which the current system does not sufficiently provide.

Current IT solutions do not offer necessary support for the business processes of the Case Company. Discontent among the users is common and users feel that the current system is very confusing and difficult to use, and they have not had enough training and support to efficiently use current tools. They also feel that current tools are not flexible enough to adapt to constant changes in planning and workload. Due to this, each business unit has its own tools for project management, which results to a significant amount of unnecessary manual work, increases the chance of human error, and takes time from core businesses.

Previously described lack of uniform practices both in business processes and in the use of IT tools produces variety of problems in multiple areas. Several different tools for the delivery subprocesses exist but they are inconsistently used, resulting in fragmentation of data into multiple systems and decreased visibility of information to support managerial decision making. As the IT tool structure is fragmented and the use of company-wide IT tools is inconsistent, extensive and systematic IT tool development has been very challenging. Thus, further integration in IT systems is needed. Due to this, the Case Company has decided to begin assessment of possibilities to renew its IT tools to offer better support for the delivery process. However, similar issues are faced in multiple companies and industries, meaning companies and researchers could utilize observations made in this thesis more widely.

1.2 Research problems and objectives

The main research problem can be stated as follows:

Does the tested IT tool prove to be an appropriate tool for the business requirements of the Case Company?

To solve this problem, a Proof-of-Concept (POC) project is executed to investigate if the tested IT software would be suitable tool for the Case Company's business in Finland. As a result of the POC, there will be knowledge about the tested IT tool's features and if it provides solution for the Case Company's business requirements. An earlier version of the tested IT tool is already used in Sweden, and update to the latest version is currently in progress. Positive and the tested IT tool is found to be suitable also in Finland, this could provide considerable synergies if implemented as a group-wide tool.

The first objective is to present the current state and challenges related to currently used tools and processes. After this, the business requirements and target state concerning the IT tools are defined in cooperation with the Case Company's businesses. A gap analysis is executed to assess how well the tested IT tool provides support for the Case Company's business. Additionally, the currently used tools are similarly compared to the target state to evaluate if the tested tool is more capable to meet the business requirements than the current tools, and how substantial the enhancement would be. To summarize, the POC project provides answers to the following questions:

- Current state and challenges related to IT tool(s) in service delivery process
- Business requirements for the IT tool(s) in service delivery process
- Target state definition concerning IT tool(s) in service delivery process
- Gap analysis of a) the current tool(s) b) the tested tool compared to the target state

The POC project lasts approximately two months, starting in October 2014 and ending in the first half of December 2014. Preparations and planning of the project have been put into practice during August and September 2014. After the POC project the case company

is able to decide if it wants to continue to implementation with the tested IT tool in Finland.

1.3 Limitations and methods

The Case Company delimited the Proof-of-Concept project to evaluate service delivery process and its subprocesses. POC consisted of semi-structured interviews, survey, and hands-on test period. During the hands-on test period, the test enivronment had some technical limitations too. Materials used in this thesis include scientific research articles published in various journals, and the Case Company's own materials in addition to the material acquired during the interviews, discussions and the survey. Due to limited number of scientific research performed about POC as a method, even some business articles are used.

Service delivery process itself can be a complicated entity due to the connections and interfaces to multiple other processes, such as sales, human resources and sourcing. In the thesis, these subprocesses are not analyzed in-depth, the focus being on the delivery process as a whole. The case company has identified four different types of service deliveries in its business, which makes the requirements for the evaluated IT tool complex. In the POC project, it is evaluated if features of the tested IT tool will meet the requirements of each four delivery types. When defining the business requirements, the focus is on project schedule and financial perspective, but some aspects of service quality are taken into consideration also.

Although the case company operates in multiple countries in the Nordic and Baltic regions, this thesis is limited to assess the business requirements and IT tools related to delivery process in Finland only. The case company has four business divisions in Finland and all divisions are involved in the POC project. In service business, customers are often involved in the service delivery process, and in this sense, the case company is no exception. In some cases, there are integrations built between the customer and case company's IT tools. However, the POC test environment did not allow the possibility to test system integrations.

The possible benefits achieved by enhanced IT tool support are difficult to measure quantitatively. Therefore, qualitative methods are used to gain the appropriate knowledge about current practices and how users perceive the current and the tested tools. Semi-structured interviews and informal, unstructured interviews were used in the data collection. Also, Survey form was designed to collect IT tool users' views about current system and current practices. Training sessions and hands-on testing were used during the POC project to acquire information about the tested IT tool and its features. Additionally, the author gathered experience about the current tool and its applicability to the case company's business processes during three-month period in one of the case company's business divisions.

Gap analysis method was used to assess how well the tested IT tool meets the requirements presented in the target state. Finally, after the software test period potential gains from possible implementation of the system were defined, taking into account both qualitative and quantitative aspects. These potential benefits were evaluated quantitatively using net present value and payback methods. In this thesis however, details of the financial evaluation about potential benefits are not presented.

1.4 Structure of the thesis

In the first part of the thesis, terminology and a theoretical background related to the study are presented. Literature is reviewed about service deliveries, IT projects and the role of IT in the service delivery process. Risks related to IT development are also described in the literature and presented in this section. The second part of the thesis consists of organizational description. The Case Company is introduced, and the Case Company's business processes described on a general level. Additionally, IT organization and IT support model are discussed briefly.

The third part of the thesis portrays current business practices in different areas of the service delivery process, based on data collected during the project. Data collection methods and people involved are described in this section. Currently used IT tool is introduced and challenges the business functions are facing related to current IT tools are described. The

fourth part of the thesis begins with definitions of business requirements and target state related to the IT tools in service delivery process. Based on these definitions, a gap analysis is performed including both the tested and the currently used tools. These IT tools are compared to the target state requirements to better understand, how the tested tool performs related to the current tools. Finally, in the fifth part of the thesis, the results of the gap analysis, financial evaluation, and user experiences acquired during the POC are discussed. Also, a roadmap about options concerning near-future IT tool development in service delivery process is presented.

2 DEVELOPMENT OF AN IT TOOL FOR SERVICE DELIVERIES

2.1 Terminology in bid, project and resource management

The terminology related to service deliveries is often used vaguely. For example, the term "project" may refer to a single delivery, e.g. maintenance of production equipment on a customer site, or to a maintenance shutdown of a customer plant, or to an entry in the work breakdown structure in the IT system. Due to this ambiguity, it is necessary to define terminology related to bid, project and resource management to avoid misinterpretations among the personnel participating to the POC project.

Choudhury (1988, p. 5) lists projects' life cycle phases as follows: Conception phase, definition phase, planning and organizing phase, implementation phase, and project clean-up phase. In practice, projects usually begin by receiving a request for proposal (RFP) from a customer. In the RFP, customers may outline the bidding process or contract terms, and provide instructions on how the bid should be formatted and presented. For example, the customer may deliver a bid template to the supplier. The level of detail varies considerably between the RFPs. Bidding and RFP phase is positioned into the interface between sales and service delivery processes, and bidding is viewed from the project management perspective in this thesis.

The term project can refer to company's internal development as well as external business activities. Individual project may involve two or more companies, and the participating companies may even form alliances, coalitions, multi-organization enterprises, project networks or project ecologies. Project environment is often dynamic and in constant change, which raises a need for adaption with other participating companies. (Wikström, et al., 2010, p. 833) Choudhury (1988, p. 4) points out that even though characteristics of all projects are similar, all projects cannot be treated the same way, which is an important aspect to be kept in mind while managing a project. In this thesis, project refers to a delivery, such as service agreement, maintenance of a power plant, or IT system development project.

Projects require *resources* to be executed. In literature, resources often refer to a wide range of components. Barney *et al.* (2001, pp. 626-630) present resource-based view (RBV) of a firm, which proposes that human resources management, economics and finance, entrepreneurship, marketing, and international business are all resources. Brush et al. (2001, pp. 68-70) identifies six resource types: organizational, physical, social, human, technological and financial assets. However, in this study, the term resource refers mainly to workforce, so the focus is on human aspect.

To manage resources effectively, management needs information about competencies of available resources. There are several interpretations in literature about how competencies are structured. McHenry & Strønen (2008, p. 116) recognize two different approaches to competency: first has strong focus on individual competencies and workers attributes, while the second approach emphasizes organizational level competencies. Rausch et al. (2001, pp. 185-191) divide competencies into two categories: technical and non-technical or behavioral competencies. In their Ericsson case study, Hellström et al. (2000, p. 107) divided competence into three areas: technical or professional competence, human competence, and business competence. Chell (2013, p. 10) argues that instead of defining competency as a whole, it would be better to treat knowledge, skills and abilities as separate entities. Thus, it can be stated that the structure of competencies varies greatly, and depends on the nature of the business.

In this thesis, competencies are viewed in the project and resource management perspective, and competence is seen as combination of skills and knowledge, focus being on the professional or technical aspect. In literature, skill is defined as something that produces proficiency at tasks, and skills can be further trained and developed in practice. (Chell, 2013, pp. 7-8) According to Homer (2001, pp. 60-61), companies may achieve cost savings, better selection and deployment of resources, and enhanced performance management through efficient management of skills.

There are also multiple definitions for data, information and knowledge in the literature, and different opinions among researchers how these components are related to each other. One classification, which does not define the previous components separately, is based on

five questions related to information: (1) *what* information is needed, (2) *how* information is managed, (3) *why* information is needed, (4) *from where* information-related needs are gathered, and (5) *when* information is needed. Information can also be divided into two categories: internal and external information. Internal information consists of company-specific information, such as production details or employee competencies, while external information consists of information about the business environment, e.g. customers and competitors. (Pirttimäki, 2007, pp. 38-45) In the case of IT tool development for service delivery process, the focus is on internal information.

Another way to define concepts of data, information and knowledge is to structure them into a hierarchical model, where data is the lowest level, information a broader concept refined from data, and knowledge is the third level. Data is defined as unanalyzed set of elements, such as numbers, character signs, or signals, which can only be understood when the data has a certain context. Tretten & Karim (2014, p. 291) point out that inaccurate or poor data hs a negative effect on decision-making, and may result to wrong decisions. Information on the other hand, is data in a structured form, consisting of multiple units of data from separate sources. The third level in the information hierarchy is knowledge, consisting of information combined with the aspect of significance of the information. Thus, knowledge requires the receiver to process and interpret the information received. Knowledge can be seen as a basis for sound decisions, which makes it more valuable than data or information. (Pirttimäki, 2007, p. 39) Alavi & Leidner (2001, pp. 109-110) discuss the multiple definitions of knowledge, pointing out that knowledge can be seen as a realization of information, a state of mind, an object, a process, a condition of having access to information, or a capability.

2.2 The role of information systems in service deliveries

Information systems can provide competitive advantage for companies in multiple ways. Using advanced IT tools, companies can change the structure of the industry, thereby altering the rules of competition. Utilization of advanced IT systems and new information technology may transform the product or the whole value chain. By increasing efficiency, in-

formation systems offers companies a new way to outperform their competitors. Also whole new business possibilities, often based on company's existing businesses, may arise by using advanced information technology. Thus, information systems are seen as a strategically significant asset for businesses. (Porter & Millar, 1985)

According to Pirttimäki (2007, p. 41) companies need information to support in the decision making, managerial target setting, evaluation and prioritization of options, protection against business risks, and cost reductions. Optimization of an IT system is often a major target for organization that strives for efficiency and performance improvements. This raises multiple questions that organizations should ask themselves: How does the new IT system make the organization more efficient? Is there necessary coherence in the business processes, information systems, management rules and procedures, user competencies, and users' practices? And finally, are activity and master data reliable and relevant? (Botta-Genoulaz & Millet, 2005, p. 574)

It is essential, that the IT system provides right information to the right user with the right quality in the right time. To achieve this, reliable data has to be made available for users, which often requires information processing and communication between different systems. Users cannot process too large supply of information, and it may lead to distraction, stress, increased number of errors and loss of information quality. This phenomenon is described by Edmunds & Morris (2000, pp. 18-19) as information overload, and it should be avoided. In addition, the IT tool has to be carefully designed from the user's point of view and the usability of the system should be highlighted. Studies have shown that a system which is difficult to use and poorly designed increases the possibility for human errors. However, it should be noted that in addition to bad system design, organizational structure can have a negative effect on the usability of the system. (Tretten & Karim, 2014, pp. 291-292)

In the service delivery process, there are two challenging aspects for an IT tool development combined: service business and project environment. Jääskeläinen *et al.* (2012, p. 44) have recognized the difficulty of performance measurement on a general level in service operations, and most of the research discusses the topic in a specific industry with a spe-

cific need. The factors affecting performance management are largely similar to those which make IT system development difficult in service operations. Service business is challenging from the IT point of view due to their intangible nature, which means that the business consists of service activities rather than physical products (Lai, et al., 2001, p. 192).

Service activities comprise inputs, processes, outputs, and outcomes of service provision, which are often difficult to transfer into an IT tool (Jääskeläinen, et al., 2012, pp. 43-48). To ensure on-time deliveries, linkages between different operations and activities have to function smoothly (Porter & Millar, 1985, p. 150). From the IT system point of view, relevant information should be utilized and taken advantage of in the company's business processes and outputs. If IT tools fail to provide this information, the lack of information becomes an obstacle in fixing problems or utilizing existing opportunities. (Pirttimäki, 2007, p. 41) Users have to understand what the system is communicating, so system has to provide sufficient feedback for them (Tretten & Karim, 2014, p. 293). Lai et al. (2001, pp. 193-194) have recognized multiple causes for poor system performance in service business:

- Slow information flow
- High input variability
- Insufficient guidelines and standards
- Poor human resources management
- Low staff morale and incentives

The more volatile, uncertain and competitive the service business's environment, the more likely an interactive IT system is needed to facilitate a sufficient dialogue between business units and management. Constant customer presence during the service delivery process makes the IT tool development more complex. Pirttimäki (2007, p. 41) states that people in different positions have varied information needs. Additionally, managers' information requirements change even more in the service business than in manufacturing industries according to manager's position in the organizational hierarchy. (Brignall & Ballantine, 1996, pp. 14-19)

The project business has limited possibilities for standardization, high level of uncertainty, and high dependence on time. Hence, according to Brignall & Ballantine (1996, p. 14) an interactive IT system is needed to provide necessary support for business. This poses significant challenges to the design of IT tools, and the integration of systems can even be seen as one of the organization's core capabilities. (Wikström, et al., 2010, p. 833) Pirttimäki (2007, p. 49) suggests that companies can improve their competitiveness by developing their processes based on more effective information management.

One factor significantly affecting the implementation of an IT tool is if the management system is centralized or decentralized. In business perspective, Hugoson (2009, p. 107) describes decentralization as business' ability to make decisions locally, but there must be central coordination. Centralized management system provide higher quality of data management, more effective procedures and policies, and more efficient utilization of workforce and tools, while decentralized management systems are often more flexible, provide specialized know-how faster, and can respond better to the customer needs on short notice. According to Bustamante (2010, p. 926), the weakness of decentralization is that it may result to duplication or regional conflicts of interests. In practice, it is not always clear if the management system is centralized or decentralized. Some of the functions may be centralized, while others are not. This semi-centralized system is common in plant maintenance, and the combinations of what is supplied locally and what is centralized can be very diverse. (HajShirmohammadi & Wedley, 2004, pp. 17-18) Bustamante (2010, p. 925) also points out that centralization in management system could provide economies of scale, whereas decentralized management system offers better possibilities for small-scale experimentation.

According to HajShirmohammadi & Wedley (2004, p. 17) centralized management systems are generally more suitable from the standpoint of IT systems. However, there has been no clear consensus among researchers if centralized or decentralized IT systems create greater support to the business processes. Centralization or decentralization of IT systems analysis of different alternatives has to be more sophisticated. If one common system is developed, the IT system is clearly centralized. On the other hand, development and implementation of multiple systems does not automatically mean decentralized approach. For

example, the systems can use a common database, which makes it a centralized IT environment. Decentralized IT systems could be defined so that each system has to fulfill specified requirements on interaction with other systems, but it is also possible to develop each system individually. If the development of the IT systems is not coordinated and systems do not have any computerized interaction, it can be characterized as an anarchy. (Hugoson, 2009, pp. 106-107) The level of centralization in management practices has also an effect on the users' information needs.

As discussed earlier, the definition of competency is not always clear and this needs to be taken into consideration when designing IT tool for resource management. There are multiple different competencies among the resources of the Case Company. This makes it necessary to structure or categorize available resources in some way, especially if the resource management should be centralized. According to Bustamante (2010, p. 925), in decentralized management system the managers usually have sufficient knowledge about the local resources and their suitability with the local customer needs.

Competency management has gained lots of attention as advanced IT systems have recently increased their role in business and become more common. With these IT systems, organizations seek to integrate both individual and organizational competencies at strategic level. (McHenry & Strønen, 2008, p. 117) According to Harzallah & Vernadat (2002, p. 158) there is no recognized model for competency structuring so structuring is appropriate for every business case. However, information systems typically organize employees' competencies in hierarchical structure with level of expertise specifications from beginner to expert (McHenry & Strønen, 2008, pp. 117-118).

Challenge in the development of resource management IT tool is to identify critical resources with special competencies, and set up a place where individuals can find these resources. Management has to decide in which level of detail competencies are shown in the system. Other factors affecting the level of detail are exploitation fields, relevance of items and course on time and cost of the required and acquired competency identification. (Harzallah & Vernadat, 2002, p. 158) In the case of Empower Group, there are such a wide

range of competencies among divisions, so the level of detail in definition of competencies should be planned carefully to avoid unnecessary confusion.

2.3 Managing IT tool development

Information system development is still considered as a grey area from the standpoint of scientific research (Kuruppuarachchi, et al., 2002, p. 126). The ultimate goal of an IT project is to increase organizational effectiveness, so the success of the project is highly dependent on the acceptance by the actual users of the software. (Kolltveit, et al., 2007, p. 236) IT projects are often part of a larger organizational development, which involves rethinking of processes, reform of business systems, organization itself and roles of people involved. IT projects greatly affect organizational activities and may even impact the organization's strategy. (Kuruppuarachchi, et al., 2002, pp. 127-128)

Botta-Genoulaz & Millet (2005, p. 577) suggest that the main benefits that organizations desire to reach by IT tool development are information availability and quicker information flow, better interaction across the organization, integration of business processes, improved lead-time, improved interaction with customers and suppliers, and cost reductions. However, these benefits cannot be achieved unless the IT system is usable enough. Usability is defined by ISO 9241-11 (1998, p. 2) as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use". To ensure the usability and good design, actual users of the system should be active in the development of IT systems. (Tretten & Karim, 2014, pp. 292-293)

IT projects have a notably high rate of failure and research reveals, that a large portion of failures is due to insufficient planning and poor implementation. For the end user, it is very difficult to imagine how the new system will be, to decide what the system requirements really are, and how to specify these requirements. Instead of being autonomous or standalone systems for a specific task, information systems usually are somehow connected to

other systems. Because of this, information systems need to be investigated comprehensively for them to function adequately. (Kolltveit, et al., 2007, pp. 236-237)

Maguire (2002, p. 126) has stated that failure in IT system development may result to negative consequences for end users and directly influence to the business success. According to Hung et al. (2014, p. 534), user risk may lead to lower system quality and unwillingness to use the system. There are multiple risks associated with IT projects, and managers perceive these projects highly challenging because no single solution exists for risk management in an IT project. According to Baccarini et al. (2004, pp. 286-294) very few risks are actually related to technical issues, and the most significant risks in IT projects are:

- personnel shortfalls
- unrealistic schedule and budget
- unrealistic expectations
- incomplete requirements
- diminished window of opportunity owing to late delivery of software

Literature shows that the risks of an IT project depend also on the location of the company. If the company implementing new IT system is located in a developed country, it faces very different difficulties than in a developing country. Risks in developed countries include insufficient schedule and budget, lack of user involvement, change resistance, inadequate business process redesign, system drawbacks, inter-departmental conflicts, organizational change expertise, inadequate training, system integrations, and system customization. (Kolltveit, et al., 2007, pp. 237-238) Because Finland is a developed, Western Europe country, previously described risks should apply in the case of this thesis.

As organizations are striving for efficiency, thus operating with as few people as possible, personnel shortfalls are seen as the most significant risk in the IT development project. Unrealistic schedules and budget occur due to insufficient planning. Planning is most often based on time and costs, but in addition, aspects of quality and user expectations should be paid attention to. The role of user expectations in the IT system development has been highlighted in the literature, and the importance of quality, scope and communications

management is recognized. Diminished window of opportunity refers to the need of reaching the market before competitors do, thus gaining competitive advantage via more advanced IT system. (Baccarini, et al., 2004, p. 290)

According to Baccarini et al. (2004, p. 290), incomplete definition of requirements is a significant risk. It is recognized that end users cannot be excluded from the development process, and users need continuous communication with the system developers. Involving users to the IT system development process helps users to clarify their requirements for the actual functions of the IT system and to identify possible flaws in the system. If the developers themselves possess sufficient knowledge about the business, the involvement of end users is not critical. (Hung, et al., 2014, pp. 534-535) However, in the case studied in this thesis, business knowledge and involvement of end users are critical.

According to Murch (2002, p. 163) recognizing and minimizing the potential risks related to IT project management with some kind of risk management methodology is required. To reduce the risks previously described, a proof-of-concept (POC) project is put into practice. The goal of the POC project is to have a clear view about the tested software's applicability for the case company's business. As Baccarini et al. (2004, p. 290) have stated, constantly changing requirements are problematic in the IT tool development process. The POC project reduces especially the risks related to unrealistic expectations and incomplete requirements, due to the more specific requirements setting achieved by testing the system in practice during the POC project. Thus, the end users have a better opportunity to define more accurate requirements and have more realistic expectations about the tested IT tool and what the IT tool is capable of.

There are very little scientific research about POC as a method. POC may take different forms and produce diverse deliverables. Results of a POC may be for example an executable prototype, design documentation about current and best practices, an outline of capabilities of the tested system, or an assessment about the system design decision. With a POC, companies can reduce the overall risk of IT project failure. However, it should be kept in mind that POC test environments are usually developed quickly, without proper testing, and the POC system does not represent the actual deliverable. Hence, POC systems

illustrate the methods and functionality the system will provide, but the outputs of the system are stubs that would be different in real work. Possible pitfalls during a POC project are that requirements for the system are not fully understood before the project begins, users know what they want only after they see the actual system, changing requirements during the process, and new technologies make implementation very unpredictable. (Pentaklos, 2008)

The proof-of-concept project lasted approximately three months. First phase of the project, data collection, consisted of interviews and survey to map out user experiences and current state of IT system support to the business. Also, business requirements for IT tools were drafted during the data collection phase. As stated in literature (Pirttimäki, 2007, p. 42) the definition and identification of business requirements is a challenging process, because people have difficulties expressing their needs, and some requirements are subconscious. The second phase of the project involved negotiations and cooperation with the system supplier, further planning and scheduling of the project, and training of project group to the system. Third phase of the project included four weeks of hands-on testing of the system by the project group. The final phase of the project was documentation, summary of the project and drafting of a roadmap for further action.

The crucial question while evaluating IT system project is, can it be unambiguously demonstrated that the system provides progress towards mutually agreed business goals (McWilliams, 1996, p. 17). However, the case company wanted to perform a financial evaluation about the potential benefits gained, if the tested IT tool should be implemented, based on the observations and information acquired during the POC project. The evaluation is based on estimates about the value of assessed benefits. Net present value and payback time, which are common methods in investment appraisal, are used (McWilliams, 1996, p. 15). Net present value is used to support payback time method to acquire a more comprehensive view about the potential benefits, because according to Lefley (1996, p. 208) payback time only indicates how quickly the cost of an investment is recovered, not the profitability of an investment.

3 COMPANY AND ORGANIZATION DESCRIPTION

3.1 The case company in general

Empower Group was originally established in 1998 as Pohjolan Voima reorganized its service businesses into a new group called PVO-Palvelut Oy which was renamed in 1999 as Empower Oy. Several subsidiaries were also established in various business areas at this point. In the early 2000s the company began its internationalization by acquiring majority in an Estonian network construction company called Eesti Elektrivõrkude Ehitus followed by multiple corporate restructurings. (Empower Group Oy, 2014b)

Today, Empower Group Oy operates in about one hundred different locations around the Nordic and the Baltic Sea regions. Empower Group is a service company which builds, installs, maintains and repairs electricity and telecom networks, offers maintenance services for power plants and factories, and delivers IT solutions. (Empower Group Oy, 2014c) In 2013, Empower Group generated revenue EUR 325 million and employed a total of 2800 professionals. (Empower Group Oy, 2014a) Empower Group's operations are divided into five divisions: Power network services (PN), Telecom network services (TN), Industry services (IND), Information management services (IM), and Baltic division. (Empower Group Oy, 2014h) The company is headquartered in Helsinki, Finland. Figure 1 shows Empower Group's divisions and their business lines.

The mission of Empower Group is to be the best service company in its business areas. To achieve this, Empower Group has a strong focus on occupational safety and safety is measured on a regular basis using Lost Workday Injury Frequency (LWIF). As a service company, high level of work satisfaction and Empower Group's attractiveness as an employer are extremely important for the company. The company has also target to be the leading service developer. To achieve this, Empower Group has five basic principles to follow: Be an example, create winning attitude, build trust, communicate openly, and take responsibility.

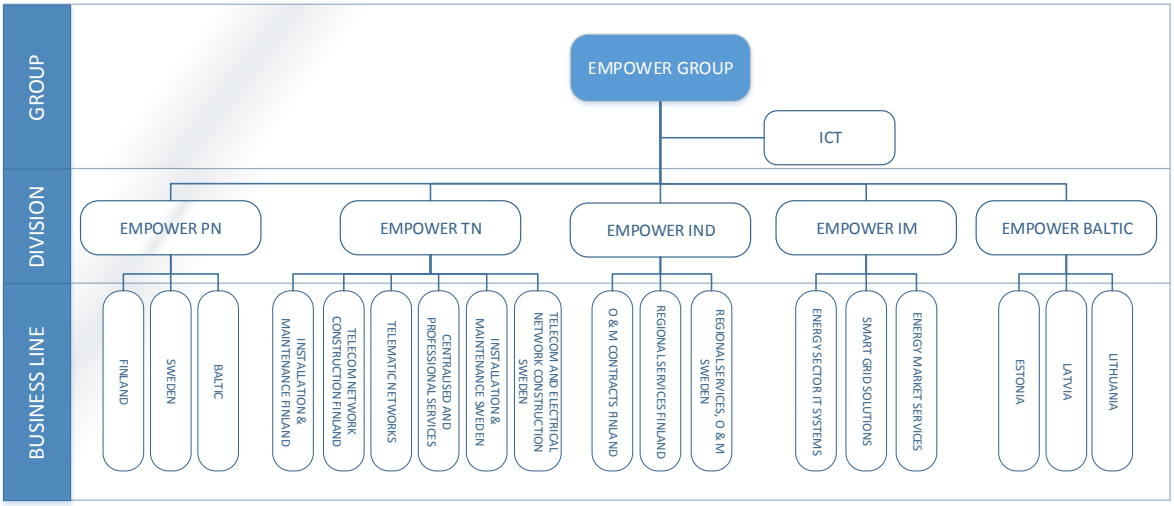

Figure 1 Empower Group's divisions and their business lines

Power network division offers wide range of services from design and construction to installation, maintenance and hosting services in Finland, Sweden and the Baltic countries, but delivers projects in other countries too if needed. Empower PN provides one-stop electrical network and station solutions for their customers in every stage of energy sector life-cycle and is a forerunner in wind power services. Empower PN's service portfolio covers the entire life cycle of a wind power plant or wind farms from development to construction, maintenance and service. (Empower Group Oy, 2014f)

Telecom network division operates in Finland, Sweden and the Baltic countries. TN division's service portfolio covers construction, network maintenance, Service Center services, design and documentation services related to backbone, access and in-house networks, and mobile and wireless networks. Customers include major telecom operators, property owners and investors, towns, and municipalities. TN's customers' needs are often ad hoc, resulting to approximately 40,000 installation or repair assignments on monthly basis. (Empower Group Oy, 2014g)

Industry division's service range is focused on the life-cycle management of production facilities, improvement of operational reliability and enhancement of maintenance. Industry division operates mostly in Finland and Sweden and has customers across mining, energy, metal, process, and forest industries. High technical availability and minimal shutdown time is essential for customers, and industry division provides contract-based overall

maintenance services to build long-term business relationships. Hence, the customers are able to concentrate on their core businesses. A lot of attention has been put on occupational safety, which plays a major part in Empower Group's strategy. (Empower Group Oy, 2014d)

Information management division provides customers in energy sector with both information system solutions and information management services. Customers are mainly from energy sector and they are offered services for every stage of energy sector's value chain. IM also provides monitoring and control services, and assists energy-intensive industries to enhance the procurement of energy. (Empower Group Oy, 2014e)

3.2 IT Organization in the case company

Empower Group operates with rather small IT department. To clarify the responsibilities of business organizations and IT department, to improve communication, and to increase transparency an IT Governance policy has been developed. Main actors in the policy are Group executive team, IT board, Business management team, and IT management group. IT board prioritizes the group's IT projects on the strategic level, prepares IT strategy and policies, and reports them to the Group executive team, which is the top decision-making level in the company.

Business management group is responsible for providing IT board information about the business needs and issues concerning IT projects and IT environment. Business management group operates on the tactical level in the cooperation between business and IT department. IT management group concentrates to issues related to IT management, technology and IT systems. IT management group acts as the forum on the operational level in the cooperation of IT department and business. For each country of operations, Empower Group has IT business partner to ensure active communication between business and IT department. IT department's responsibilities can also be divided into five areas: projects, application services, infrastructure, architecture, and information security. Each of the previous areas has its own responsible person. The IT organizational structure is visualized in figure 2.

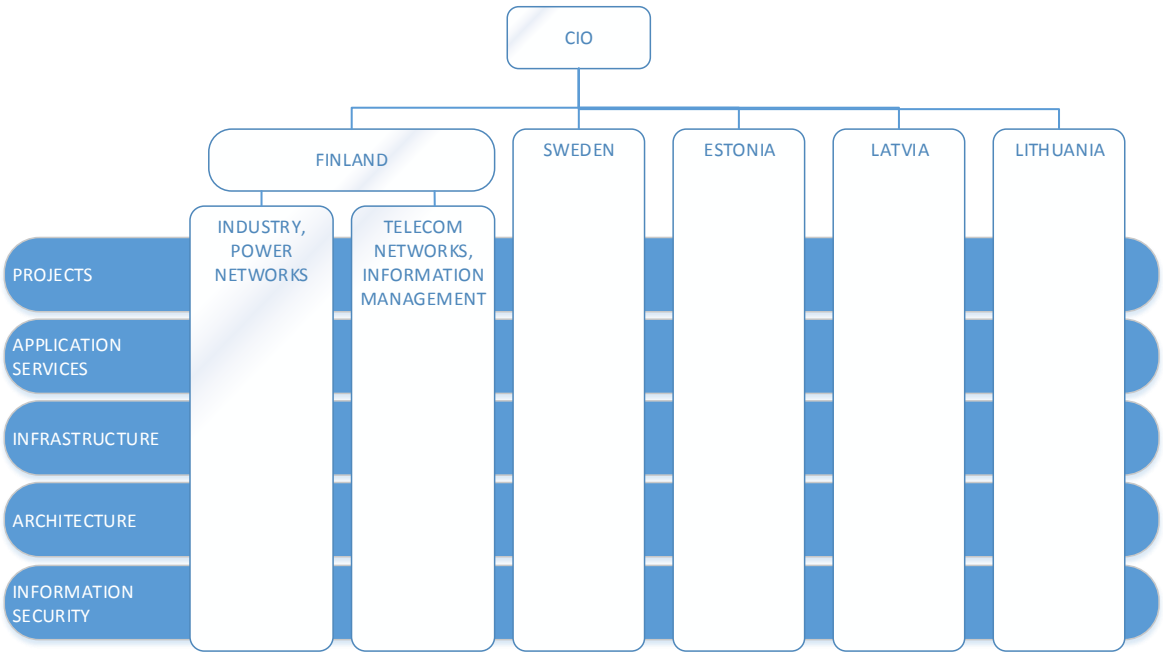

Figure 2 Empower group's IT organization

Different IT systems play an important role in company's business processes. The wide development of business processes and practices has increased the use of automated processes and IT systems. Increased automation highlights the importance of a successful IT support model, because even the slightest errors in the IT systems reflect immediately to the business process. The every-day use of IT tools sets requirements for the IT department and business organizations, and mutual understanding about both parties' processes is needed. Nominated key users from the business side actively participate to the support model in the interface between IT department and the end users. Key users possess wide knowledge about business processes in practice, and each IT system has its own key user.

As mentioned earlier, the IT department is quite small in the company, and to ensure well-functioning support for the business, the IT support model involves both internal and external resources. Service desk takes active part in the support model, represents the first level of support, and acts as a filter between the business side and Empower Group's IT department. In the first level support there are also a range of self-service tools and guides in the company's intranet. With more complex issues Empower Group's IT department offers second level support. Third level support involves development of applications and

IT infrastructure. In addition, Critical incident manager (CIM) is assigned to coordinate the process of correcting failures in serious, large-scale incidents. CIM is responsible for starting the corrective process, informing users about the incident, and closing of the corrective process. The IT support model of Empower Group is presented in figure 3.

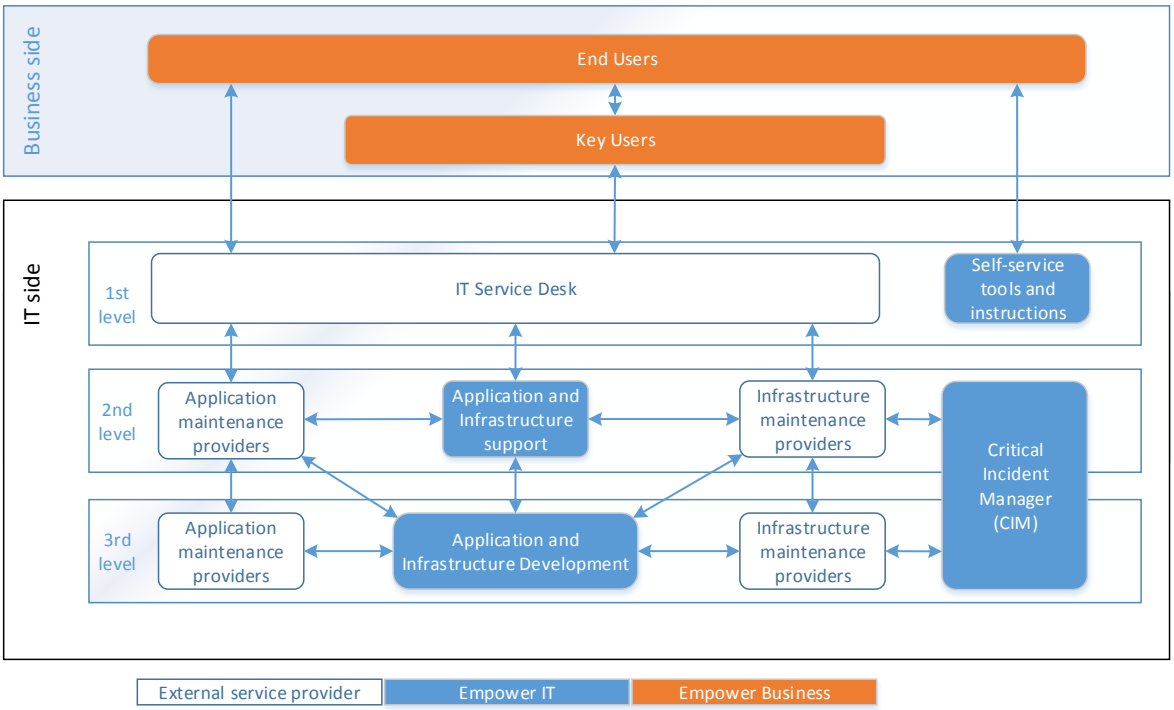

Figure 3 Empower Group IT support model

3.3 Business and delivery processes

Business processes are defined in literature as a sequence of activities. These activities refer to work, which can be performed manually or automatically, and can be executed within a single organization or across multiple organizations. (Janiesch, et al., 2012, pp. 626-627) In project environment business processes commonly require cooperation across organizational boundaries, which makes it often difficult to coordinate these processes effectively (Wikström, et al., 2010, p. 833). Due to the nature of Empower Group's business, most of the business processes involve multiple organizations, and there are limited possibilities for standardization of service processes. According to Ponsignon *et al.* (2011, p. 341) the more customized the service concept is, the higher the level of skills, greater the

employee discretion, and the less opportunity for automation in the service delivery process.

Currently, four different types of deliveries are recognized in Empower Group's businesses: unit deliveries, time deliveries, projects, and service agreements. These four types differ from each other by contract length, number of deliveries, duration of deliveries, and pricing principles. In this context, the term "delivery" refers to a service that has been agreed with customer and has a defined outcome, e.g. construction of a power line, or providing workforce to perform daily maintenance activities in a paper mill for a certain period of time. Service delivery process is positioned in the customer interface, after sales process, supported by group functions such as HR, Finance and Sourcing. The positioning of service delivery process is visualized in figure 4.

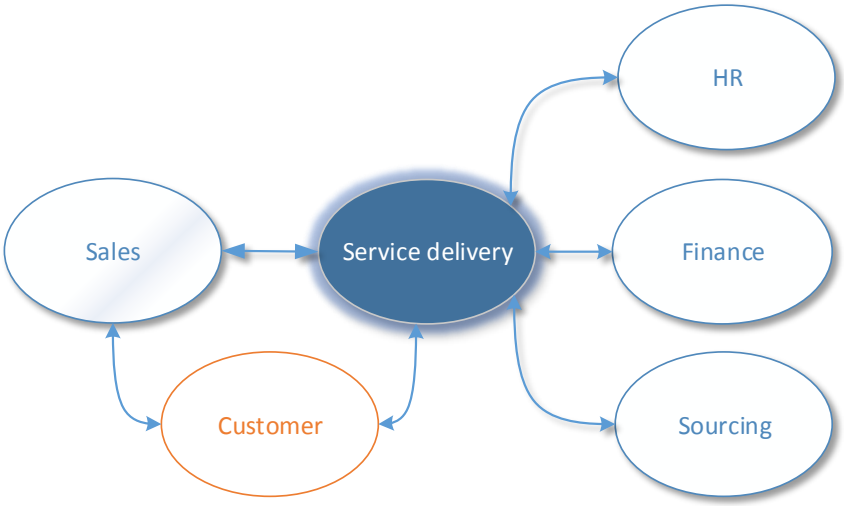

Figure 4 Position of service delivery process

Empower Group uses ABC model for management of service deliveries in all business divisions. The aim is to create systematic, uniform and efficient practices, and to achieve better business results by using the model for project management. ABC model combines both customer and delivery processes. ABC model advances phase by phase and includes different stakeholders and their roles in the delivery process. For smaller, type C deliveries, which do not need as much control as larger ones, less guidance and phases are needed. In larger and more complex, type A and B deliveries, a more thorough approach in project

management is necessary. However, general principles are similar regardless of the type of the delivery. In the categorization of deliveries multiple criteria are used and each one of these criteria are categorized either A, B or C type. Criteria to be assessed include the following:

- Project complexity and uniqueness
- Schedule
- Number of organizations involved
- Stakeholders
- Factors in business environment
- Revenue
- Strategic importance and financial benefits

Contracts for deliveries can be multi-year frame or service agreements, single assignment contracts or project contracts. Depending on the type of contract and customer needs, the number of deliveries varies considerably, from multiple, daily deliveries to a single, multi-year delivery. Duration of different type of deliveries may vary from few hours to few years. Multiple pricing methods also exist, and the pricing can be based on time or output, or a fixed price can be agreed with the customer. However, pricing methods are not always unambiguous, depending on the nature of the delivery and contract. These characteristics of each delivery type and an example of each delivery type are presented table 1.

Table 1 Classification of different delivery types

Delivery type:	Unit delivery	Time delivery	Project	Service agreement
Contract:	Frame agreement (2-3 years)	Assignment contract	Project contract	Service agreement (X years)
Number of deliveries:	Lots of deliveries	One delivery	One delivery (phases, milestones)	Continuous service
Duration:	Short (hours to days)	Short, medium (hours to months)	Short, medium, long (days to years)	Short, medium, long (hours to years)
Pricing:	by output	by time	by output, fixed price	fixed price, by output, time

Example:	Maintenance of a single component	Mechanic in common maintenance duties at a paper mill for a shift rotation	Electricity network construction project	Overall maintenance of a paper mill

Each division has its own business characteristics and portfolio of delivery types. For example, while Industry division provides all four types of deliveries, Information Management division has substantially different delivery portfolio. Typical service delivery types for each division are presented in table 2. However, it should be noted that outside these delivery types, each division performs also other deliveries, but to a lesser extent. For example, Telecom Networks division performs time deliveries, but these deliveries have less significance in volume.

Table 2 Divisions' characteristic delivery processes

Division:	Industry	Telecom Networks	Power Networks	Information Management
Delivery types:	- Unit deliveries - Time deliveries - Projects - Service agreements	- Unit deliveries - Projects	- Unit deliveries - Projects - Service agreements	- Projects - Service agreements

In figure 5 the delivery process flow is presented at a general level. The first phase of the delivery process is bid calculation and offer process, followed by project planning, resource management, and project management. However, it is not always clear where to draw the line between project planning and resource management phases, especially if both subprocesses are performed by the same people. Mobile dimension is also an important factor, so it is linked to the process as its own, separate element. Mobile dimension is closely related to project planning, resource management, and project management areas. The final phase in the process flow is invoicing, which is extremely important subprocess, because without well-functioning invoicing there is no income. Additionally, purchasing is presented as a separate element, because it is closely related to the service delivery process, although performed by group sourcing function. As stated by Choudhury (1988, p. 5) in real life rarely follow one another in sequence, although phases of a service delivery process are presented sequentially.

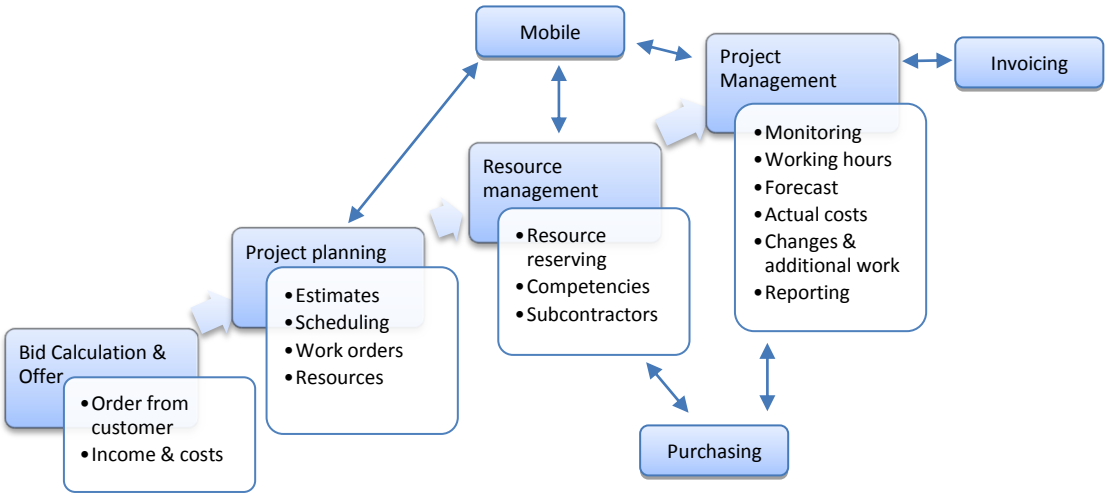

Figure 5 Service delivery process flow

Bid calculation and offer process starts usually with a request for proposal (RFP) from a existing or potential customer. The level of detail of RFPs varies significantly, and the RFP may include various predefined conditions, and detailed guidelines about the format of the bid. Bid calculation includes typically estimates about materials, labor and miscellaneous costs. Subcontracting and costs from bought services can be further distinguished from the labor and miscellaneous costs. In addition, the riskiness of the delivery has to be taken into consideration in this phase. Although there are limited insights in the current research about the bidding process from the industrial viewpoint, according to Kreyer et al. (2013, pp. 978-979), this type of cost-based bid calculation is the most common pricing method in service deliveries, and the inherent uncertainty of services can be included into the bid calculation. Choudhury (1988, p. 51) highlights the role of cost estimation as a basis for all subsequent phases of delivery's life cycle. Depending on the size and complexity of the delivery, it is classified using ABC project model, which defines the required documentation and detail in bid calculation phase.

Project planning phase may include various activities, but in general, it involves all the preparatory actions before performing the delivery itself. Usually, this planning phase involves site visit to acquire better understanding of the conditions, assessment of resource needs, what equipment is needed, scheduling, and establishment of work orders into IT system. The level of detail in planning depends on the ABC classification of the delivery.

In the case of complex projects, a project plan document is required, while in small unit deliveries this kind of detailed documentation is not expected. As stated in the literature (Choudhury, 1988, p. 7) in practice, project planning phase often overlaps with the definition phase of the project, e.g. additional customer needs may arise after the planning phase has already started. Due to this, drawing a clear line between planning phase and other related phases is often difficult.

Resource management may also be seen as part of the planning process, but in this thesis it is treated as its own process. This is due to the fact that resource management may take place also during the project, after the preparatory planning phase. After the resource needs have been defined in the planning phase, the resource management finds suitable resources for the delivery. Collaboration with the site foremen and subcontractors is required to ensure that the competencies of the allocated resources meet the customer needs.

One challenge related to resource management in Empower Group's business is competency management. When the resource management and allocation of resources is decentralized, the local site managers know their workforce well, and they have practical knowledge about every person and their competence. If the resource management is centralized, the allocation is performed by a resource manager instead of a local site manager or foreman. This results into a situation where large amount of workforce need to be managed and allocated by a single person. This means that the resource manager should know somehow which individuals have appropriate knowledge for each task. Without this knowledge resource manager will not be able to deliver suitable resources for the customer.

In the ABC model, *project management* is defined as a level in the project delivery process, including the following phases: preparation, project planning, execution, forecasting and control, and closing. Although named differently, phases of the ABC model have lots in common with the project life cycle definition presented by Choudhury (1988, p. 5). However, the delivery process flow described earlier in this chapter handles project management a bit differently. To match with all four delivery types, the project management is regarded as a phase instead of a level. This phase involves many activities which have to be considered with necessary accuracy, depending on the complexity and size of the pro-

ject or work. Activities in this phase include schedule follow-up, monitoring of actual costs, working hours recording, managing changes and additional work, communication with stakeholders, cost forecasting, and reporting.

Cost control and schedule follow-up are the core activities in the project management phase. Real-time monitoring of project or work progress has also close ties to resource management and invoicing, so the project management phase is extremely important. In addition, customers demand often some kind of projections or forecasts during the project or work about its progress. In general, internal and external two-way communications play an important role in the project management phase, not only with customers but also with other stakeholders, such as regulators, suppliers and subcontractors. Two-way communication means that the sender should obtain some kind of feedback and be aware that the receiver has interpreted the message (1988, p. 173). Internal and external reporting about the project or work have to be considered also as a part of project management phase.

Invoicing can be divided into two categories: purchase invoicing and sales invoicing. In the service delivery process flow, our focus is on the sales invoicing. There are number of ways how invoicing is performed, for example, invoicing based on actual costs or invoicing based on the bid. If the contract includes the option of partial payments, this affects invoicing too due to the variable number of invoices. Data produced by the invoicing phase provides basis for the financial analysis and profitability evaluation of the whole business, so it is an extremely important phase in the service delivery process flow.

In figure 5 mobile and purchasing are presented as their own blocks in the service delivery process flow. Although these both elements have a close connection to the core processes, these elements were not possible to test with the IT tool during the proof-of-concept project, so they are outside the scope. However, in practice mobile dimension will play a significant role in the IT environment, because the timeliness of the available information can be enhanced with mobile solutions, and effective purchasing provides potential for cost savings.

4 CURRENT STATE OF DELIVERY PROCESS

4.1 Data collection

Data concerning current practices in the delivery process and its subprocesses were collected by interviewing personnel from Empower Industry, Telecom Network and Power Network divisions. According to Metsämuuronen (2001, p. 42), semi-structured interview is a suitable method when the purpose is to acquire information about poorly recognized issues or evaluation of certain items, so semi-structured interview was selected as the main method in this phase. Interviewees were first contacted by e-mail to schedule a meeting or a web meeting using Microsoft Lync. The duration of the interviews varied between 15 minutes and two hours. Interviews were not recorded, but notes were taken during and after the interview.

These semi-structured interviews were used to collect information about current practices in delivery process, and to design a survey form which was sent afterwards to the interviewees by e-mail. During the POC project, meetings and discussions within the project group and steering group were the most important method of data collection. Financial data and data from HR system was used in the final phase of POC project to support financial estimation of potential benefits provided by the tested IT tool.

A total of 24 people were interviewed. Ten interviewees were from IND, eight interviewees from TN, three interviewees from PN and one interviewee from sourcing. Two of the Industry division's interviewees are located in Sweden and the other eight in Finland. Information Management division participated to the project after the interview phase, so there was no interviewees from that division. Instead of a semi-structured interview, the business needs of IM were discussed informally with several people from the division. Topics discussed in these interviews included the use and knowledge of current IT tools, perceived support of IT tools, strengths and weaknesses of IT tools, possible bottlenecks in business processes, and business process flow in general.

Interviewee profile of these semi-structured interviews is presented in Table 3. Interviewee profile between divisions varied due to differences in divisions' business processes and

requirements. Additionally, several informal discussions with people from business divisions and IT department in Finland, Sweden and Estonia took place to ensure that all perspectives are appropriately paid attention to. Especially support from Swedish IT department played an important role during the project, because of their knowledge and experiences about the software tested in the proof-of-concept project.

Table 3 Interviewee profiles by division

Division	**Interviewee profile**	**Interviewee location**	**Total interviewees**
Industry (IND)	4 Business line directors, 2 Unit managers, 2 Service managers, 1 Resource manager 1 Purchasing manager	8 Finland 2 Sweden	10
Telecom Networks (TN)	3 Unit managers, 3 Foremen, 1 Project director, 1 Development manager	Finland	8
Power Networks (PN)	3 Business line directors	Finland	3
Information Management (IM)	-	-	-
Sourcing	1 Vice president	Finland	1
		Total:	**22**

After the interviews, a survey form considering current IT tools was designed. The survey consisted of three sections: in the first section the recipients were asked about how often they use these tools, the users' roles, and support related to these IT tools. The second section focused on how current tools support seven different business process areas. These business processes were bid calculation, order process, resource management, work planning & scheduling, Work & project monitoring, Work & project reporting, and invoicing process. Also, questions concerning the importance of system development in these business processes were included into this section. In the second section, responses were collected and measured using a five level Likert scale, which is according to Carsrud & Brännback (2014, p. 121) one of the most common measures in entrepreneurial research.

No answer –option was included, because the profile and position of the recipients varied considerably, and many recipients were not involved in each presented business process. The final section in the survey form was an open feedback field, where recipients were asked to describe problematic issues related to IT systems, future hopes and requirements for IT systems, and general comments on what kind of data or information the IT system should be producing to better support business processes. The survey was sent to a total of 42 recipients and a total of 26 responses were collected, resulting to a response rate of 61,9%. Recipient profiles are presented in table 4.

Table 4 Survey form recipient profile

Profile	Number of recipients	Number of responses	Response rate
Business line directors	7	3	42,9%
Unit managers	13	7	53,8%
Service managers	6	5	83,3%
Foremen	11	8	72,7%
Other	5	3	60,0%
Total:	**42**	**26**	**61,9%**

As we can see from table 4, the most active respondents were service managers and foremen. This is in line with the expectations, because these people are the end users who use the IT tools related to bid, project and resource management most often. People were asked how they perceive the support provided by the current IT tools and how they perceive the importance of development in each area in service delivery process. The survey questionnaire differed from the service delivery process flow described in chapter 3.3 to make the questions more simple and understandable for recipients with very varied backgrounds. Bid calculation, resource management, project planning, and invoicing subprocesses were presented in the survey form as such, but project management phase was divided to multiple areas: order process, work & project monitoring, and work & project reporting. Also, order process category in the survey form included some questions related to sales and offer process. Results of this survey are presented in table 5, which also shows standard deviation of end users' answers related to questions about each category.

Table 5 Perceived support and development

Subprocess	Perceived support	Standard Deviation	Importance of tool development	Standard Deviation
Bid calculation*	1.20	0,40	3.75	1,48
Order process	2.82	0,96	4.24	0,81
Resource management	1.66	0,74	4.27	0,86
Work & project planning and scheduling	2.67	1,00	4.27	0,95
Work & project monitoring	2.32	0,87	4.33	0,91
Work & project reporting	2.76	0,86	4.47	0,63
Invoicing process	2.49	0,90	4.71	0,52

As we can see from the results in table 5, bid calculation phase was perceived as less supported subprocess in the service delivery process, but the respondents also perceived this as the less problematic subprocess and the less important category for IT system development. However, it should be noted that this is not fully comparable to other subprocesses due to considerably lower response rate in this category.

Another category which received very weak score was resource management. End users perceive that the current system offers very little support for this subprocess. The highest scores were in order process and work & project reporting categories. Even these categories received rather low score, which indicates that end users perceive the support offered by the current tool below average or even weak in each category. Invoicing process was perceived as the most important process for system development. However, if the bid calculation category is excluded, there was no significant deviation in the responses concerning the importance of IT tool development, which is perceived as very important in all areas of the service delivery process.

During the hands-on test period, multiple meetings were organized for the project group where members of the project group changed thoughts about their IT requirements, busi-

ness practices, bottlenecks in business processes, currently used IT tools and the tested software. These meetings played an important role in the definition of business requirements and target state. Also, Empower Sweden's experts supported the project group and provided additional information related to the tested tool. Training sessions and hands-on testing itself were of course basis for data and information collection during the POC project.

4.2 Currently used IT systems and current business practices

The current project management system was originally introduced to meet the needs of the company's industrial maintenance services business, and further implemented as a group-wide tool for project management. It was planned to include all necessary features to support project planning, project and work management, purchase order process for services and materials, and resource management. In practice, the IT tool is not flexible enough to support the delivery process as well as it should, and with some features it has serious technical issues. In consequence of heavy tailoring, the IT tool requires users to follow a narrow process if all the necessary data should be available from the system. This is somewhat challenging, due to the fact that Empower Group's businesses are very diverse.

The current tool for project management is based on Microsoft Dynamics AX architecture, which is used for the financial management and reporting alongside other tools in the company. Because the current tool is fully tailored for Empower Group, and the company itself is responsible for the tool's further development. However, according to Empower Group's IT strategy, the company operates with relatively small IT department, meaning that resources for IT large-scale IT tool development are limited within the company. Tretten & Karim (2014, p. 292) have stated that IT systems are usually capable of performing the task they are designed for, but too often fail to assist the end user to perform that task. This is the case with currently used IT tool, resulting to human error and mistakes, loss of data validity, and other criticism.

In addition to the current project management tool, a number of other supportive tools are also used. In practice, the current project management tool does not offer enough support

for the businesses' operations and some of the features included in the current tool do not provide desired output. In some cases, the current tool supplies so much information to the user that it confuses and distracts the user. As stated by Edmunds & Morris (2000, pp. 18-19) this increases the possibility for human error, mistakes, and causes stress. Also, there are some technical issues with some of the tool's features. Due to this, businesses have perceived that it is easier to use some other, simpler, and more supportive tool to perform certain operations in service delivery process management. This has led to a situation, where a set of non-uniform practices exist and data has fragmented into multiple systems. Figure 6 visualizes the features provided by the current project management tool and other systems for different areas of service delivery process.

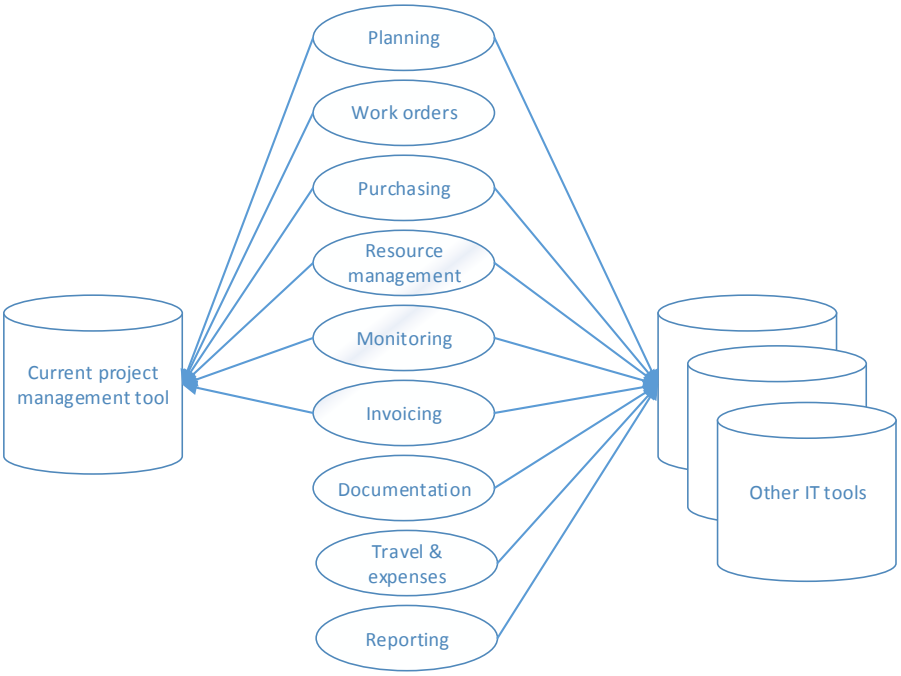

Figure 6 Current project management tool and other IT tools supporting service delivery process in different subprocesses

With currently used IT tools, Empower Group's businesses face multiple challenges which are at some level similar as proposed in literature, including slow information flow, insufficient guidelines and standards, and high input variability (Lai, et al., 2001, p. 193). One factor affecting to the lack of necessary guidelines is the fragmentation in the IT system environment. Tretten & Karim (2014, p. 293) mention consistency as an important aspect related to the use of IT systems, and with current set of IT tools in Empower Group, the

lack of consistency is obvious. Too many individual tools and systems are used, so it is difficult to maintain proper, up-to-date guides and documentation. This fragmentation results also to very high input variability, which makes the validity of the data questionable. In some cases, even with commonly used systems the input varies considerably, resulting to the loss of data validity.

Slow information flow is a result of multiple factors related to processes and IT systems. As Kuruppuarachchi et al. (2002, p. 127) have stated in their research, IT development involves often rethinking of business processes too. In practice, the time gap between operations in the field and available information in the IT systems is too wide for IT tools to offer desired support in decision making. End users cannot trust that information reported in the IT system describes the situation in reality, because the information lags behind too much. The end user has to possess detailed, in-depth knowledge about the business process to understand how actions performed with the IT tool affect the real-world business.

Bid calculation is currently performed with a stand-alone IT tool or by using a variety of Excel models. Bid calculation is usually based on history data if it is available. No single, common bid calculation method is used among the company's business divisions due to differences in the nature of businesses. Each business unit or division has its own set of Excel models, depending on the preferences of each person responsible for the bidding. The level in which financial risk assessment, such as scenario or sensitivity analysis, is performed in the bidding phase varies also greatly. Thus, there is a lack of uniform practices, which makes process and system development challenging in this area. In worst case scenario, error or failure in bid calculation process may result to a non-profitable contract.

Currently used IT tools are not able to automatically transfer all the necessary data available for project management tool. This has led to a situation where lots of manual input is needed if the budgeted or planned income and costs should be presented in the project management tool, sometimes resulting to errors, confusion and conflicts in work planning, monitoring and reporting. In addition, as a process bid calculation is positioned in the interface between sales process and service delivery process, so the bid calculation phase usually involves people who are not directly involved in subsequent service delivery process

phases. This may lead to a situation, where person responsible for bid calculation has no feedback about the success of the bid calculation.

Work order creation is currently the starting point of the work and project planning process, and based on the results of the survey, end users see this phase easy enough. However, according to interviews, it is not always clear whose responsibility is to create new work orders. After creating work orders, cost estimates and other necessary entries, such as person responsible, can be entered into the system. Technicians receive work orders or job descriptions from their foremen via e-mail, by phone, or in paper form. Thus, information sharing requires huge amount of manual work and the role of continuous communication is highlighted. Additional difficulties occur if changes or additional work is needed, due to the difficult information sharing.

Current system provides a Gantt tool to support project planning and scheduling, and option to present planned or budgeted costs and income. However, end users ignore the Gantt tool and refuse to use it, due to the technical issues with the tool. In practice, project scheduling is performed with varied set of stand-alone tools. This hinders the data availability to other end users involved in the project, and increases the risk of errors and mistakes. Very often changes occur in planning on a short notice before the actual project implementation, so adaptive tool for information sharing is a must. Currently, information flow is unclear and makes the whole project planning process prone to human error.

Several different practices exist regarding how resource management is organized, both centralized and decentralized practices being implemented. Therefore, the end users have very varied needs for the resource management tool. For example, in centralized resource management competence information is an important aspect, while in decentralized resource management this kind of feature is not perceived very important the focus being on the resource allocation. However, based on the results of the survey about IT tools, a common opinion among the people responsible for resource management is that currently used IT tools provide only little, if any, support for this subprocess. Due to the lack of support, a wide variety of stand-alone tools are used in the resource management process, and development of these tools is performed by the end users themselves, often without any coordi-

nation. Therefore, the current state of resource management tools can be seen as what is described as “anarchy” in the literature (Hugoson, 2009, p. 107).

Problem with currently used tools is that all the necessary data is not available for resource management. Although most of the necessary data exists in the IT system, the data is difficult, or even impossible, to access without contacting other group functions. Prioritization in resource allocation is challenging without appropriate information, for example relevant, up-to-date pricelists. It should be noted that IT system is not the only cause of inadequate information availability. In some situations, there might be resistance to share certain information among business functions, or the process flow structure may act as an obstacle in information sharing. Most often information sharing is performed using paper work orders or other paper forms, via e-mail or by phone. Thus, information sharing in resource management is potentially exposed to numerous gaps and blind spots in the information flow.

Both inter-organizational and intra-organizational communication play a significant role in resource management function as resource management works in close cooperation with many stakeholders, such as subcontractors, site foremen, and sourcing. Communication between business units and divisions could also be improved. Closer cooperation between divisions could potentially increase the utilization rates of resources, improving efficiency. Many customers demand that workforce has valid safety orientations or other certificates, but this information is not easily accessible for the resource management. Although resource management is not always in direct contact with the customer, resource manager is often responsible of obtaining orientation or certificate information. In general, acquiring all the necessary resource information is very time-consuming, taking time of several people involved. All this time spent to gather information that should be readily available and accessible from an IT tool could be used more wisely and effectively.

Project management subprocess receives, as a whole, the most support from currently used IT tool. Information flow to the purchasing function works well, and responsibilities among the current tool’s end users are usually clear. However, there are multiple issues related to project management also, including old-fashioned mobile solution, inadequate

tracking of changes, challenges in project or work monitoring, lack of linking between project management and resource management, and lack of filtering options to show relevant project information only. Additionally, low usability and absence of clear, plain views of project portfolio are weaknesses of the current tool. Experienced users know relatively well how to use the software, but even they face challenging situations when deviating from standard routines.

The current mobile software is capable of recording working hours, but there are some technical issues with the software. Also, with current data produced by the system and approval process of working hours may result to difficulties when external resources are used and they record their working hours using Empower's system. In addition, there is another tool for managing short-duration unit deliveries, which is capable of performing work allocation to resources. This mobile application also includes the possibility to define multiple skills for each resource, and optimization logic based on geographical location.

Most of all, project management suffers from absence of real-time information about the operations on the site. To gain real-time information, a modern mobile application is a must. The current mobile software is simplistic, and offers very little additional value. In addition to inadequate mobile dimension, the project management tool itself sets technical limitations to work monitoring. For example, costs cannot be allocated to a work order on the same day the work order has been created. Also, there is no way to highlight projects or work with upcoming schedule deadlines or approaching budget overrun. Project managers have to use considerable amount of time to make sure that everyone has the relevant information, that should be available straight from the project management system.

In terms of invoicing subprocess, our focus is on sales invoicing. According to the survey results, invoicing was seen as rather challenging with the current tools. The entire procedure is not clear for every end user involved, which has resulted to unwanted situations where completed work has not been invoiced correctly or in the right time. Status of invoicing is perceived as difficult to follow with current tools, and it is not possible to monitor if the payment has been received of sent invoices. In addition to the currently used system, many end users have their own excel tools to monitor projects' invoicing statuses.

In general, such a fragmented IT environment, where a large number of stand-alone tools and numerous different IT systems for each, very specific purpose poses challenge to IT support system. Although every system has a key user, it is not always clear for the end users who they should contact when facing a problem with IT tools. End users often feel that they need more training to the use of IT tools. However, Empower Group operates with rather small IT department, so large-scale IT training sessions are very challenging to organize. Additionally, it would require numerous training sessions to orientate end users to all necessary systems due to the great number of IT tools in use.

IT development is difficult to coordinate systematically in highly fragmented IT environment. End users often develop locally their tools even more, because they feel that current project management tool is insufficient. This kind of autonomous, uncoordinated development is seen as problematic also in literature (Hugoson, 2009, p. 107). Often there are certain people in the business units who use the current project management tool, and these "trusted users" know the current system well. Although there is IT tool-related discontent among these users, they know how to use the system rather fluently. They know all the tricks needed to dig deep in the system and acquire the data they need if it is available.

However, for someone who has not used current tools, the threshold to learn this complex IT system is very high. The current tool is not very visual, and for inexperienced user it is often difficult to find what he/she is looking for from the system. The vast amount of views and options displayed often confuses users, and the chances for configuring views to show only relevant information are limited. Additionally the current system is highly tailored, which has led to a reduction in flexibility. As Empower Group's divisions' businesses differ quite a lot from each other by nature, flexibility is an important element of an IT tool: IT tool has to provide a frame that can adapt to different business processes, not vice versa. The currently used IT tool sets too much restrictions and limitations for the process, so businesses have to adapt to the requirements of the IT tool. This is just the opposite situation that has been desired, and the result is that the strictly defined IT process does not meet the needs of a single business division.

5 REQUIREMENTS, TARGET STATE AND GAP ANALYSIS

5.1 Business requirements and desired benefits

Empower Group has decided to further develop its IT tools for bid, project and resource management to provide better support for business. As the IT tool development process is supposed to be business-oriented, the first phase is to assess the business requirements for the IT tool. Involving people from the business side to the development procedure at this point gives the businesses better understanding about how well the current and the tested IT tools meet these requirements. It also increases the understanding of IT side and the system supplier about the needs and requirements of Empower Group's businesses, which is important as the process is based on the business needs. However, definition of business requirements is very complex, due to the fact that Empower Group's four business divisions each have their own characteristics in business, thus requiring a wide variety of features. Common business requirements for all the business divisions are defined, not going into too much detail.

Generally, business perceives that it needs additional support in every area of service delivery process. The usability is an extremely important aspect regarding the IT tool, and end users highlight the option to modify the user interface (UI) to better meet each end user's needs. Hiding unwanted views and features makes the software easier to use and enhances the end user's experience in general. For effective communication across borders, end users feel that option to freely change the language of the UI is necessary.

Bid calculation, planning, resource management, project management and invoicing each have their own needs and these requirements are described in the following. In this section, possible benefits achieved by implementing a more supportive system are described for each service delivery subprocess. These benefits can be roughly divided into two categories: quantifiable benefits and quality improvements. Most of the improvements related to IT system development are qualitative, such as better communication to customer, increased transparency, better data quality, reduced number of mistakes, or enhanced usability. These improvements may have positive effect on Company's professional image. Also, qualitative improvements can be seen to transform the value chain or product, thus offering

competitive advantage (Porter & Millar, 1985, pp. 151-154), which potentially results to increase in sales. Everyone have their own subjective view about definition of quality, which makes quality improvements even more difficult to measure.

Quantifiable benefits include items that can be derived into measurable unit, which can be evaluated in terms of money. In practice, quantifiable benefits are efficiency improvements, consisting of personnel's time savings, better utilization of resources, and increased potential for sales. These savings can be roughly quantified and converted into monetary unit. Even though quality improvements are extremely important in the IT tool development, quantifiable benefits form the basis when analyzing the financial aspect of IT tool development.

For bid calculation process, a versatile tool is needed that can support multiple types of deliveries. Customers' RFPs are rarely standard, so the flexibility is one of the most important features of the bid calculation functionality. Customers often demand bids in some pre-defined form, most often using some kind of Excel template. Due to this, it is important to have both import and export features in the bid calculation tool. Also, bid calculation step should be possible to skip if necessary. For example, in delivery that takes only an hour or two to implement, it is not reasonable to perform an advanced bid calculation. Additionally, the system has to be able to adapt to the needs of the ABC model as it is in use at Empower Group.

If the bid calculation phase can be performed in the same system as the following subprocesses, it will potentially enhance data visibility, data availability and make reporting easier. For example, budgeted costs and income are readily available for the planning phase and visible for the person responsible of planning. This reduces the possibility of mistakes, and working time needed to transfer relevant information to the appropriate stakeholders using multiple IT tools. Also, the use of single system enables better cost control, because the cost data is centralized to one database, thus resulting to a decrease in the number of mistakes in accounting and reporting. Overall, the benefits of well-performed bid calculation are fully realized when moving forward in the delivery process.

During the project and work planning phase, the scheduling procedure requires a more supportive and flexible IT tool. Necessary customer, contact and location information has to be available and information about the work site is also needed, for example pictures and description about the working area and environment. In addition, project or work budgeting requires a more practical tool and costs need to be divided into categories, such as materials and labor. Also, in the case of common, repetitive work orders or projects where similar work occurs often, the option to prepare project plan templates for later use is desired. Changes occur often at a short notice in the work or project planning phase, so the IT tool must be able to adapt to changes in planning.

By fulfilling the previous requirements regarding planning considerable improvements in the availability of the necessary data could be achieved, resulting to savings in working time and reduction in mistakes. Additionally, plans and planning information would be easier to share with the customer, potentially improving the company's professional image. Budgeting would also take less time, if the data from bid calculation is readily available. Potential mistakes in budget would be easier to notice from categorized view, resulting to reduced error correction time.

The most important requirements for efficient resource management are resource competencies and resource availability. The system should be able to categorize or filter resources by their competencies to better meet the resource needs requested from the resource management. However, level of detail in which the competencies are reasonable to present may vary in different business units. To visualize complexity of definition and structure of competencies, an example competency profile of an imaginary mechanic is presented in figure 7. Example in figure 7 involves a total of five dimensions, but there might be fewer or more dimensions in some other cases. However, customers often request such information, but currently not available from an IT tool. If the IT tool used in project or work planning would also offer features to support resource management, this could potentially make the information sharing quicker and enhance the data visibility in general, resulting to reduced amount of mistakes in resourcing.

Figure 7 An example of requested competency information for a mechanic

Another important requirement to support resource management is the monitoring of resource availability. Resource management needs information about resource availability in the present moment, and in the near future to assist the project or work planning. Additionally, history data about resource utilization rates is required for management reporting. Business units are rarely aware of each other's resources or workload especially in decentralized resource management. This may result to inefficient use of own resources and unnecessary subcontracting. In many cases, other divisions' resources could be made use of, but this is difficult due to the lack of information sharing among business divisions' resource management functions. Enhanced information sharing could provide opportunities and leads for new business.

In addition to resource competency and resource availability, resource management has other needs too. To support prioritization in resource allocation, subcontractor pricelists and sales pricelists are required. Currently, this information is not always available for resource manager, which may cause difficulties and challenges related to cost control. In the worst case scenario, sales prices are lower than prices paid to a subcontractor because no price information could have been acquired, resulting to a non-profitable project. Additionally, resource management often requires information about the equipment needed to perform the work order, so it is necessary to have the information available from the IT tool. Otherwise, this information has to be acquired some other way, in practice by calling several phone calls or by sending several e-mails involving several people, which takes unnecessary amount of valuable time from multiple people involved.

In project management phase the core functions, cost control and schedule follow-up, have suffered from slow information flow, and require a tool which provides more real-time information. Without this information, other project management activities cannot be performed effectively. To acquire the near-real-time information, a mobile software for the recording of actual working hours, actual costs, and performed tasks is required. Also, this mobile tool would be used to distribute work orders, including attachments such as pictures, to technicians in the field. If additional work is needed, the mobile software needs to have a possibility to create work orders also from the field. Some customers demand a periodic follow-up from the site, so some sort of diary or site logbook would also be beneficial for the business.

To achieve efficiency in the purchasing function, the purchasers require accurate and real-time information about the purchasing needs. At this point, the project management IT tool comes to play a significant role. Using effective mobile tool, work performance can be enhanced resulting in time and cost savings, and easier cost control. Potentially, the amount of mistakes and errors in the performed work reduces also, due to better information sharing. When users receive more comprehensive information about the working area, less undesired surprises occur.

Better possibilities in project or work monitoring reduce time spent to communication and reporting in general. For example, project manager would not need to create a monitoring report for the customer from a scratch in excel. Instead, he or she would be able to retrieve this information straight from the IT tool using export function. A more advanced monitoring and project follow-up would enhance the company's professional image from the customer's point of view, which could result into higher sales via better customer commitment.

Invoicing process requires most of all flexibility to serve the business requirements. Multiple different payment options are in use, depending on the agreement made with each customer. The system has to adapt to function with all these types of payment. Invoicing should be connected to the previous phases of the service delivery process to make sure that costs and income are allocated correctly. To enhance communication with the cus-

tomer, it would be good to be able to add description of the work performed and attachments to the invoice. Additionally, follow-up of invoicing status is critical, to make sure that each task, work or project performed is invoiced appropriately.

When statuses of invoicing are easy to monitor, people responsible of invoicing need to spend less time to perform invoicing and are less likely to perform invoicing incorrectly. Errors occurring in invoicing function are very expensive, and have a negative impact on the Company's professional image. Well-functioning invoicing feature in the IT tool could reduce these errors significantly, which would save money and enhance the Company's professional image. Additionally, when invoicing is easy and swift to perform, it could reduce order to cash (OTC) cycle, which has a positive impact to short-term liquidity.

5.2 Target state

When defining target state concerning business support provided by information systems, the delivery process is divided into six areas as described earlier in chapter 3.3: Bid calculation and offer, project & work planning, resource management, project management, purchasing, and invoicing. The target state is defined for each area respectively, based on the interviews with business divisions' personnel, and on the business needs defined in cooperation with the project group. For each delivery process area, a number of desired features are listed and priority for each feature is presented based on the importance of the feature. In general, the target state can be summarized so that users in production need to use only one easy-to-use tool or software to complete their daily routines, and the tool's features cover the whole delivery process cycle from bid to reporting and invoicing. It should be noted that target state is a vision about future and possibilities, so all requirements are not supposed to be fulfilled 100% at this point.

Bid calculation and offer process creates the basis for all the following steps in a project. The specifications in customers' RFPs vary considerably, which poses challenges for the bid calculation tool. Some customers strictly define the contents and design of the offer while other clients' RFPs are very vaguely designed and informal. Due to this, the IT tool should have a possibility to flexibly assist the bid calculation process. Business units desire

a tool that could be used to import data from external sources, such as excel. This would make it easier to handle strictly designed RFPs. On the other hand, some RFPs come at such a short notice, that the bid calculation should not take more than few minutes. This means that the system should offer possibility to save templates for the most common items requested to make the offer process more straightforward. Pricelists for suppliers and service providers should also be included into the system. On the general level, the offer should include the following categories for items and pricelists for these categories:

- Materials
- Labor
- Services & subcontracting
- Other

Materials category includes all the materials used in the delivery. There should be a possibility to include estimation of waste for material to make the calculation more accurate. If the customer demands a list of materials used in the delivery, the materials list should be easily exported to an external software, e.g. Excel. In the ideal situation, the system is linked to suppliers systems to automatically update the materials price lists.

Work category includes all the work done to the delivery. The work category should include some pre-defined items such as planning, installation, and maintenance, but also possibility to add custom items. The category view should be customized for each business division to avoid confusion and limit the visibility of items so that only relevant information is shown to the end user. For example, industry division does not need all the items that are relevant to the telecom networks division.

Services and subcontracting includes estimates about bought services and their price information for the bid calculation. Often at this point it is not clear, how much subcontracting is going to be used in the actual project execution. This means that some of the items included in work category are actually executed by subcontractors. In such cases, the system should provide the end user with easy access to the information about the original and the updated estimate project item structure. Other category may include costs related to

accommodation, transportation, travelling, or some unforeseen events and item needs. Basically, every item that does not fit into previous three categories should be allocated here.

It is necessary to have the possibility to determine profit margins by category and by item for each previous category respectively. The IT tool has to be flexible enough to adapt to different types and non-uniform RFPs. The time scope of the RFPs has also be taken into consideration, and the system has to be able to provide support at a short notice as well as for multi-year contract bid calculation. As a result, the level of detail into which the system has to be able to offer support varies significantly between different types of projects. Finally, option to allocate fixed and variable costs separately, and possibility to perform sensitivity or scenario analysis would be beneficial, especially with riskier projects. Target state requirements for bid calculation and offer process are summarized in Table 6.

Table 6 Target state of bid calculation and offer process

	Target state features	**Priority**
Bid calculation and offer	1) Item categories: Labor, materials, subcontracting/service, other	High
	2) Cost categories: Direct or indirect, variable or fixed	High
	3) Margins for each category or item	Medium
	4) Possibility to create templates	Medium
	5) Import/export to excel	High
	6) Attachments, terms and conditions	Medium
	7) Risk assessment: scenario analysis, sensitivity analysis (internal)	Medium
	8) Compatibility with ABC model (gates)	Medium
	9) Possibility to add free text to offer	High
	10) Different pricing methods: unit-based, time-based, fixed price…	High
	11) Bid calculation data basis for work planning, resourcing and work management	High
	12) Supplier and customer pricelist availability	High
	13) History data about bids	Low
	14) Integration to CRM	Low

Project and work planning can be divided into two main areas: scheduling and financial planning. In the target state, both of these aspects of planning are executed using the same

tool, and the planning can be based on bid calculation data to reduce manual input. Furthermore, this tool would be integrated to customers' information systems, and customers' order process would be more automated. In practice, customers would input their orders into their own information system, and the order would be ready for planning, transferred automatically via system integration to Empower's IT system.

Scheduling should be easy and flexible in the system. Gantt tool is a must to visualize the schedule in more complex projects. It should be possible to divide projects to subprojects, and have their own specifications for each subproject. For example, subproject may have different person responsible than the main project. Overall, scheduling should be possible on multiple levels, whatever the required accuracy will be. During the planning phase, sites are often visited to acquire more specific information about the work area and the project in general. Information gathered during these site visits should be transferred into the system using mobile devices and made available for other users involved in the project. Additionally, amount of resources needed to perform each project or work is defined in the planning phase. Thus, it has to be possible to input resource needs using the IT system.

Financial planning includes budgeting using cost and income estimates. Costs are divided into categories, such as materials, labor, subcontracting and miscellaneous. Financial planning of projects or work has a strong connection with bid calculation, so all the necessary information that has already been defined in bid calculation phase should be available for the project planning phase to reduce the need for manual input. Also, it would be useful if the IT tool could learn from history data, and assist the planner using this data. For example, history data about certain assets that are maintained regularly would make the work planning quicker and easier. Target state of project and work planning phase is presented in Table 7.

Table 7 Target state of project and work planning

	Target state features	**Priority**
Project & work planning	1) Site, asset and work information using mobile devices from the site	High
	2) Attachments to work orders a) to and b) from the site	High
	3) Data transfer from customers' IT systems: order and work	Medium

	details 4) Planning on different levels: task, work, subproject, project… 5) Visualization of upcoming work orders (Gantt) 6) History data from previous projects to assist planning 7) Definition and input of resource needs to the system 8) Financial planning based on bid calculation data 9) Linkage between scheduling and financial planning	 High Medium Medium High Medium Medium

Resource management, has two major challenges: how to upkeep the order book about resource needs, and managing resource competencies. In the target state, resource management is performed using the same tool as project or work planning and management, and the tool should have a visual planning board or Gantt view. This makes it possible to have all the necessary data, defined earlier in the planning phase, automatically available to the resource management function, which reduces the time spent on manual input of data. To support prioritization in the resource allocation, resource management does need information about resource costs and their sales prices, easily accessible from the system. Resource utilization rates in business unit should be available for resource management. This way the resource manager will be better aware of resource availability at all times. Also, preliminary resource allocation for prospects should be possible to have a more explicit view about resource needs in the near future.

In centralized resource management system the target is that business has unlimited amount of resources always available. To be functional, such system requires a pre-defined resource pool consisting of internal resources and subcontractor resources. Additionally, resource management function requires information about other divisions' resources and their workload. This information would provide synergies by improving the utilization of group's own resources, reducing unnecessary use of subcontractor resources, and opening possibilities for new business via improved transparency.

In many cases, authorities and regulators demand certain information delivered to them about the resources who perform the project or work. Typical example about the regulation related to resource management function are collective bargaining agreements, CBAs. Especially in case of a service company, which has multiple different CBAs among its em-

ployees, this kind of regulation is very common. Additionally, customers demand valid safety orientation or other necessary training or certificates for each site, so it would be beneficial to have this kind of information in the resource management system. Especially when resource needs come at a short notice, this information would be valuable, because usually the technician is not allowed to work on the site at all if the previous certificates or orientations are out of date. Target state requirements for resource management process are presented in Table 8.

Table 8 Target state of resource management

	Target state features	**Priority**
Resource management	1) Categorization and filtering of workers by competencies and skills	High
	2) Licenses and certificates information	Medium
	3) "Resource pool"	Low
	4) Work information from planning phase	High
	5) Filtering of work based on competencies or skills needed	Low
	6) Information of resources needed for each work: amount, competencies	High
	7) Subcontractor and sales price availability in resourcing	High
	8) Current and history utilization of resources, comparison between business units	Medium
	9) Near-future work prospects	Medium
	10) Resource requests using to the system	Medium
	11) Resource requests listed, "order book"	High
	12) Status of resource requests	Medium
	13) Resource allocation tool	High

Project management has to have a clear view about the resources performing the project, real-time information about the project's progress and comparison to planned schedule, actual costs compared to budgeted costs, and possible changes and additional work needed. Using the previous information, project manager can create more reliable forecasts about project's progress. This information has to be available on different levels, such as task, work order, subproject, and project or agreement. Thus, the work breakdown structure, or hierarchy, should be logically structured and easy to interpret. Additionally, critical or urgent work has to be highlighted somehow, and the status of the work has to be easy to fol-

low. Users should be able to notice the status of the project with one glance to the project view.

In project management phase, communication between different stakeholders plays an extremely important role. Reporting of projects' progress and costs to the customer should be flexible, and there should be option to use various key performance indicators to assess the success of the project. The mobile dimension has a crucial role in enhancing communication. With mobile devices and applications integrated to the project management tool, the field operations can share information about actuals in real-time and with better accuracy. Using the mobile application, the field operations should be able to communicate also what tasks they have actually performed during they project. Finally, project management tool should include feature to request purchases of materials and resources, so close communication or system integration with purchasing function is a must. Definition of project and work management target state is summarized in Table 9.

Table 9 Target state of project and work management

	Target state features	**Priority**
Project managemet	1) Work breakdown structure	High
	2) Work order book / portfolio	High
	3) All the necessary information to work order: Contacts, location, team, work description…	High
	4) Option to save drafts / templates	Medium
	5) Change orders and additional work	High
	6) Information to trace back changes performed: Edited when and by whom?	Medium
	7) Mobile distribution of work orders	High
	8) Highlighting of critical or urgent work	Medium
	9) Material requests from the site	Medium
	10) Working hours monitoring, actual versus planned	High
	11) Costs monitoring, actual versus budgeted	High
	12) External / temporary resources' working hours	Medium
	13) User interface for external parties to view work progress	Medium
	14) Transfer prices	Medium
	15) Approval of working hours (2-step)	High
	16) Customer approval and feedback	Medium
	17) Data for purchasing: materials and services required	Medium
	18) Necessary data for financial analysis	High

Purchasing involves two main categories: materials and subcontracting. In addition, purchasing covers other services, such as accommodation, but the focus is on direct material and subcontracting costs. In the ideal situation, purchases could be performed directly from the project management system, or the purchasing system would be integrated to the project management system, so data transfer between these two systems would be automatic. Purchase orders could be sent based on the requirements defined in bid calculation and production plan, and suppliers' invoices could be easily transferred into the system to display actual costs as real-time as possible. Additionally, purchasing feature should be able to handle group's internal purchases and transfer pricing policy. System should be able to display some sort of tracking or change log to support monitoring of purchasing function. Target state of purchasing process is presented in Table 10.

Table 10 Target state in purchasing process

	Target state features	**Priority**
Purchasing	1) Material purchases	High
	2) Subcontracting purchases	High
	3) Other services purchasing	High
	4) Import of supplier invoices to project management tool as costs	High
	5) Internal purchases and transfer pricing policy	Medium
	6) Change log and tracking	Medium
	7) Integration to the project management tool	Medium

Invoicing in this case, refers to sales invoicing, which should be performed from the same system as the preceding subprocesses. If performed with a separate tool, comprehensive integrations between this tool and the project management software have to be built. Table 11 summarizes the requirements set to the IT tool related to invoicing process. IT tool has to be able to visualize invoicing status and the status of payments. Although invoices are sent most of the time electronically, the possibility to have the invoice printed should also be included. Approval of invoices should be performed in this system also to keep the process simple enough. Attachments and descriptions about the performed work should be possible to include into the invoice. Invoicing feature of an IT tool has to support multiple types of payment options including

- Actual-based prices
- Offer-based prices
- Fixed prices
- Partial payments
- Periodic or collective invoices

Table 11 Target state in invoicing process

	Target state features	**Priority**
Invoicing	1) Approval of invoices in the system	Medium
	2) Electronic invoices and printable invoices	Medium
	3) Internal and external notes or text to the invoice	Medium
	4) Attachments to invoices	Medium
	5) Multiple payment options	High
	6) Invoicing status follow-up views	High
	7) Payments received follow-up	Low

Additionally, few other requirements were collected during the target state definition. These requirements are not clearly part of any previous subprocess, so they are presented separately in Table 12. In optimal situation IT tools would cover customer feedback and quality metrics. These metrics would be addressed to different levels similarly to costs and incomes. For example, notes of defect would be addressed to the correct entry in the system. Users also feel that it is necessary to choose the UIs language freely, highlighting the importance of a good translation.

Table 12 Other IT tool features in target state

	Target state features	**Priority**
Other features	1) Option to select the user interface language	High
	2) Notes of defect for projects	Low
	3) Customer feedback	Low

5.3 Gap analysis – Target state, current tool and tested tool

To evaluate how well the tested tool can correspond to users' requirements and preferences, a gap analysis is performed. In the gap analysis, the tested tool's features are compared to the target state presented in chapter 5.2. In addition, current project management

tool is compared to the target state to assess how much improvement the tested tool could bring compared to the current system, and to visualize the limitations of current tool. End users' own, stand-alone excel models are not included into the comparison. The support provided by the current tool and the tested tool to the target state is performed using a three-level scale: no support, partial support, or full support. In figures 8-12 blue and orange bars represent the level of support for each requirement. Each feature's level of priority is taken into account by using a multiplier: 0,5 for low priority features, 1 for medium priority features and 1,5 for high priority features. Using this scale, level of support and gap versus the target state were calculated for each subprocess as percentages.

Gap analysis follows the structure of the service delivery process flow, which is divided into five subprocesses: bid calculation, project and work planning, resource management, project management, and invoicing. In the target state definition, requirements were presented also for purchasing function. However, purchasing subprocess is excluded from the gap analysis, because purchasing will be performed using a different tool, thus being irrelevant to perform deeper analysis of this feature in the bid, project and resource management tool. Additionally, even though the service delivery process flow includes mobile dimension as an independent entry, it is treated as part of other subprocesses in the gap analysis.

Currently, the project management tool does not provide sufficient support for *bid calculation*, but there is another, stand-alone IT tool in use for this purpose. Additionally, end users responsible for bid calculation have constructed their own excel models to support bid calculation. These excel models are excluded from this gap analysis. However, to form a more reliable view about the current state, the comparison of current tools involve both project management tool and the stand-alone tool for bid calculation. This way it can be assessed if the tested tool could replace both tools that are currently used in the bid calculation subprocess.

In the target state concerning the bid calculation and offer subprocess 14 requirements were defined. The tested tool provided 73% support, while currently used combination of bid calculation tool and the project management tool provided only 27% support, which is

visualized in figure8. The project management tool on its own does not support well the bid calculation subprocess providing only 10% of the features defined in the target state. The strength of the tested tool is based on the fact that data produced in the bid calculation phase is readily available to the following subprocesses. Additionally, unlike current tools, it offers the possibility to create and save bid templates for later use. Data import from external files is also possible, while current tools lack this feature.

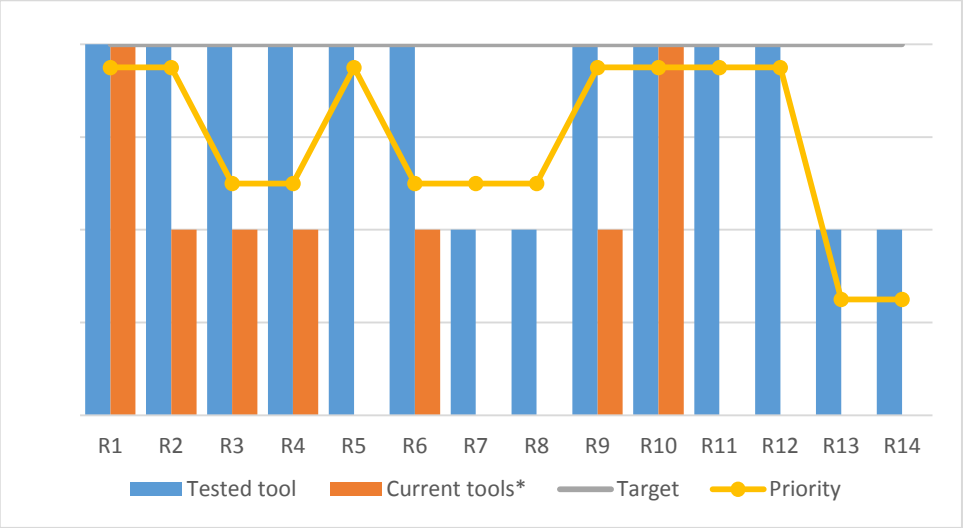

Figure 8 Gap analysis of the bid calculation and offer process.
*Comparison includes project management tool and the stand-alone tool for bid calculation

Project and work planning subprocess involved 9 requirements in the target state. In the gap analysis presented in figure 9, the tested tool provided 59% support for the planning phase, and the current tool provided 21% support, resulting to gaps of 41% and 79%. Compared to the current tool, the tested tool offers more support in almost every area of the planning process. However, it should be noted that at this point, the planning tools in the tested system are separate modules, and the integration between these modules and the core system could not be tested during the POC due to the limitations of the test environment.

The current tool lacks the mobile dimension in the planning phase and connection to the preceding bid calculation phase. In theory, the system offers a Gantt tool to assist the planning and scheduling of projects or work orders, possibility to structure the project or work hierarchy to match the businesses' needs, and use integrations to other systems. In practice,

these features are often limited due to the complexity and inflexibility of the system, and some technical issues. Due to these issues, end users feel that the support provided by the current tool is insufficient, and users do not always use the tool even if it had the desired feature. Therefore, the real gap is potentially even larger than previously stated 79%.

The tested system provides better support for the planning phase in every area than the current tool. It has Gantt planning tool for scheduling and the financial planning is relatively easy with the tested system, because data input from the bid calculation phase can be used. However, the tested tool, similarly to current tool, does not have as comprehensive feature as desired for defining resource needs. Also, the tested tool has a more advanced mobile application to enhance data sharing in the planning phase, and it has a more visual and flexible work breakdown structure. One of the tested tool's modules has a feature to collect history data about maintained assets, which could offer additional value to the project or work planning.

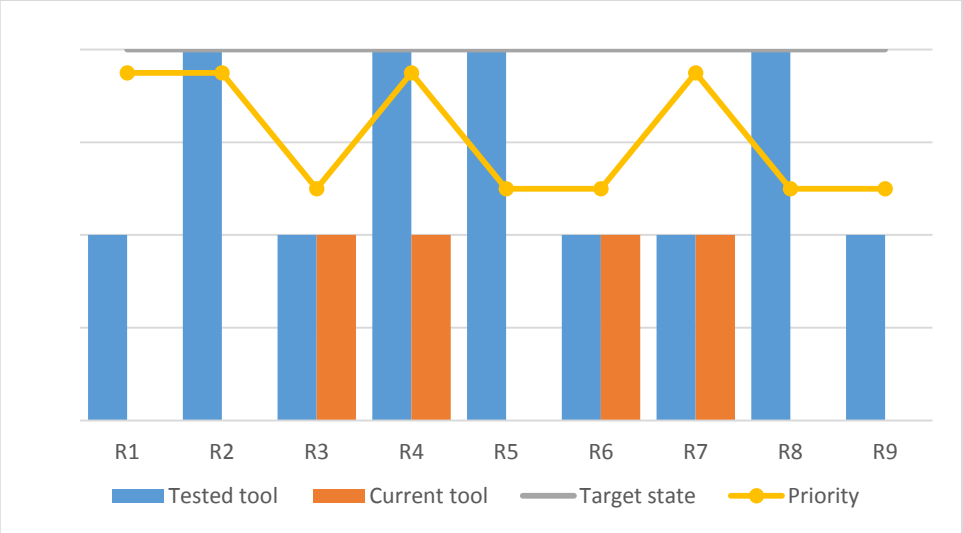

Figure 9 Gap analysis of the project and work planning process

Resource management subprocess has 13 desired features in the target state. Based on the survey results, the resource management phase has been perceived as the least supported subprocess in the service delivery flow, and gap analysis of the current tool supports this perception. Compared to the target state, level of support in the resource management phase was only 10% with the current tool, resulting to a gap of 90%. On the other hand, the

tested tool provides 57% level of support, which is considerably better, but still far from the target state. This is presented in figure 10.

Currently, the IT tool in use provides only partial support in few areas described in the target state. The Gantt tool exists, but it is not suitable for resource management. IT tool does not provide report about resource utilization rates, but this information is available rather easily. Also, pricelists about resources are in the system, but this data is not always available to resource management. Monitoring the status resources requested and data visibility in general are the most crucial shortcomings with the current IT tool in resource management. In addition, information about resources' competencies, trainings, and certificates are insufficient.

The tested system provides visual planning board and Gantt tool for resource management, but both of these are additional modules to the core system. In addition, the tested tool has a module to perform resource requests, but this module was not possible to test in the environment provided by the system supplier. Resources can be grouped into teams, and preliminary resource allocations can be performed.

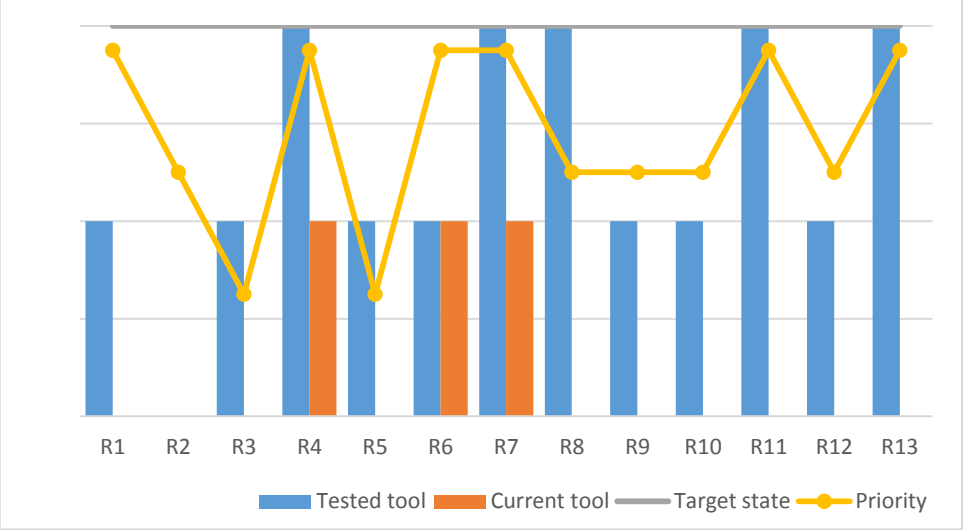

Figure 10 Gap analysis of the resource management process

Project management had the largest number of requirements in the target state, a total of 18. The tested tool fulfills 60% of these requirements, resulting to a gap of 40%. Currently

used tool does not succeed as well, fulfilling only 27% of the requirements which results to a 73% gap. The tested tool provides more features than the tool currently in use, and in most cases offer better support to those business needs that the current system can already support. Gap analysis of project management subprocess is visualized in figure 11.

Currently, project or work progress is difficult to follow, because information about actual costs and actual working hours lags too much behind compared to the real-world processes, although the data does exist. The lack of real-time information makes forecasting extremely challenging, and in practice, forecasting with the current tool is not possible. Budgeting demands lots of manual input if the data should be transferred into the project management tool, and scheduling possibilities with the Gantt tool are inadequate. Mobile application is somewhat old-fashioned and lacks many desired features. Work breakdown structure can be difficult to understand due to poor visualization. Also, highlighting of critical work is insufficient, and change orders are difficult to perform. Current system could also be more versatile when it comes to resourcing of projects, and have stronger connection to resource management subprocess.

With the tested tool, monitoring of project or work progress could improve significantly, because in addition to actual working hours and costs, the same system shows the planned costs and working hours. Project diary feature Tested tool also has forecasting feature, and the information is potentially more real-time than in current tool, due to the better utilization of mobile dimension. Compared to current system, the tested tool has a lot better visualization of work breakdown structure, project and work statuses on different levels, and highlighting of critical work. Resource needs can be defined in the project management phase, potentially improving transparency of information between project and resource management processes.

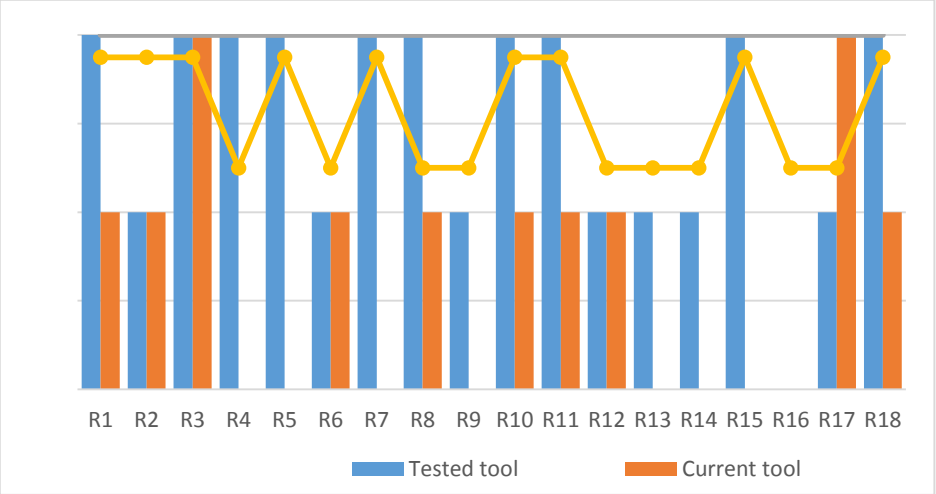

Figure 11 Target state of the project and work management process

A total of seven requirements were defined related to invoicing process, as shown in figure 12. Both systems performed relatively well in this area, level of support being 73% for the tested tool and 40% for the currently used tool. This means that gaps compared to the target state are 27% for the tested tool and 60% for the current tool. The tested tool provides most of the desired features. The currently used tool loses to the tested tool in few areas: its visualization of invoicing status is not as clear, and feature to add attachment to invoices is not as comprehensive as in the tested tool.

Figure 12 Target state of the invoicing process

The results of the gap analysis indicate that the tested tool provides better support in all areas of service delivery process. If tested tool should be implanted, purchasing process will not be performed using the tested system, but will have an IT tool of its own, so purchasing process is excluded from the comparison in gap analysis. Due to limitations of the supplier's test environment, it was not possible to investigate all features and modules of the tested IT tool, making the comparison of current and tested tools more complex. Results of the gap analysis are presented in figure 13. The tested tool achieved overall coverage of 63% and the current tool 23% compared to the target state. Thus, resulting to overall gaps of 37% and 77%.

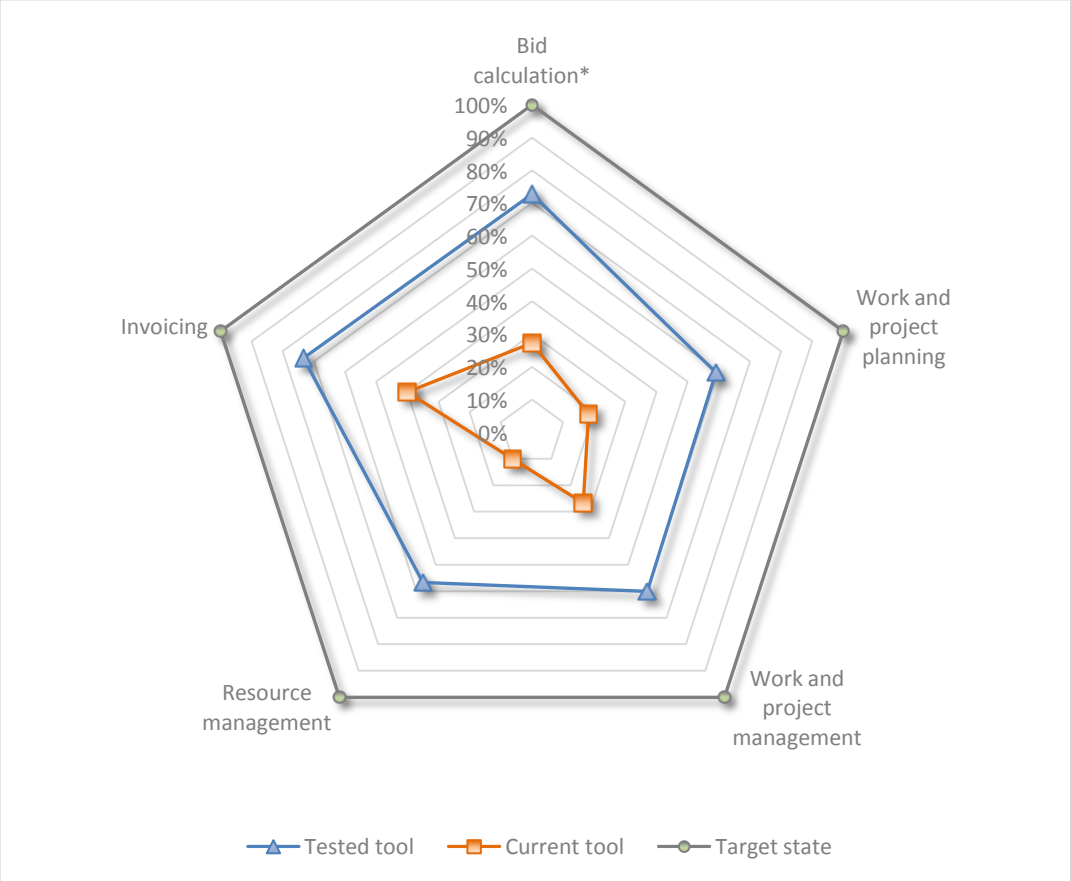

Figure 13 Gap analysis of a) tested IT project management tool b) current project management tool

6 CONCLUSION

During the data collection phase, it became clear that even the definition of the target state was not easy. Interviewees were from different divisions and from different organizational levels, and as presented by Brignall & Ballantine (1996, p. 14) each person had their own views about what the business requires to perform efficiently. All business divisions have their unique business characteristics, affecting users' requirements and vision about the future. However, a consensus about the target state and business requirements on a general level was reached through multiple meetings, discussions and continuous communication between the people involved into the POC project.

If the definition of target state and business requirements was challenging, definition of current practices and processes was no easier. People working in different functions related to service delivery process had considerably different views about which features were important and which were not so important. Business divisions have varied practices how they manage certain tasks and functions in the service delivery process, and people often feel that their requirements for the IT tool are unique and special. Despite this, numerous common business requirements were identified and described on a general level, not going too deep into the detail. During the POC, multiple risks described in the literature (Kolltveit, et al., 2007, pp. 237-238) were identified also in the Case Company, such as inter-departmental conflicts, system drawbacks, integrations, and at some level change resistance.

One of the current IT tool's weaknesses is that it ties users' hands too strictly to predefined process. This would not be an issue in a highly standardized, repetitive business, but in case of Empower Group's diverse businesses, the current tool is too inflexible. IT tools should provide a flexible, supportive frame for its users to perform their work efficiently, but users feel that they have to struggle to perform all the necessary actions for the current IT tool to function properly. The current tool has lots of features, but only few of them are easy enough to be actually used in practice, and some features face serious technical issues. Low usability of the current tool makes the threshold of learning the system considerably high. Training of new users is insufficient, and difficult to organize due to non-uniform and

varied practices in the way system is used. These reasons for poor system performance are also recognized in the literature (Lai, et al., 2001, p. 193).

Although the current tool lacks multiple features, end users feel that they are able to perform their daily tasks with it, supported with their own stand-alone tools. Challenge with these stand-alone tools is information sharing: necessary information flow between stakeholders depends heavily on each individual, and people have to spend a great amount of time to communicate basic information to each other. This is not a problem in normal circumstances, but if business units temporarily require resources from other business units to assist in a project, information sharing is inefficient. Thus, more transparency is required to utilize Company's internal resources more efficiently. Also, development of business processes suffers, because daily routines with the current tool take so much time from business development.

Based on the results of the POC project and the gap analysis performed, it can be stated that the tested IT tool would offer significant value for Empower Group's businesses. There were mixed feelings among the project group members, but on a general level group members had positive opinions about the tested software. Some users felt that they can perform few tasks more easily with the current tool, but the tested tool provides support to the service delivery process as a whole. Some technical issues occurred with the test environment, but these issues are common with POC systems (Pentaklos, 2008). However, technical issues with the test environment caused some confusion among the project group, particularly in the beginning of the test period.

Project group perceived that especially the utilization of mobile devices would provide major improvements to planning, monitoring and reporting. Currently, work monitoring is difficult, because information comes available for the project manager too late. Using mobile devices and better approval procedure provided by the tested tool, the project manager would be able to access necessary information, thus having better overall view about the whole project and enhanced support for decision making. For the needs of resource management, the tested tool's planning module was seen as a potential tool. Even though the tested tools resource management function is an improvement to current practices, further

development is still required to meet the needs of resource management function. Test results showed that bid calculation and invoicing processes should work adequately with the tested tool, and no crucial features were missing in these areas.

The test environment provided by the system supplier had certain limitations and technical issues during the POC. These limitations and issues cased some confusion among project group members and made it challenging to test some of the tested tool's features. All of the desired modules were not included to the hands-on testing period, but the system supplier organized demo presentations to introduce these modules. Additionally, Empower Sweden supported the project group and provided practical information and training about the tested IT tool during the POC. Due to limitations of the test environment, further investigation of planning and resource management tools is necessary. Other matters that the Company should prepare to examine before possible implementation are structure of the work hierarchy, system integrations, how the tested tool's modules communicate with the core system and how data transfers from module to module.

Based on the target state definition and the results of the gap analysis, financial estimation was performed about the potential benefits provided by the tested tool. Although the estimation is not accurate, it indicates the volume of the potential benefits reached by more supportive IT tool in service delivery process. First step in the evaluation process was to calculate life-cycle costs and income for the tested IT tool. After the estimation of yearly cash flows, net present value and payback time were calculated. Using these methods, the IT project seems promising, but more accurate calculations in addition to more in-depth estimation of potential savings and costs would be beneficial.

The key question after the POC is that how to move on from this point. In practice, the Company has three options as visualized in figure 14: continue to further testing and implementation with the tested tool, to continue using the current tool, or to begin searching for another alternative tool. Before full-scale implementation of the tested tool, some further investigation, for example by piloting, is still required. Implementation process of the tested tool is expensive and requires lots of resources to perform the implementation prop-

erly, but the benefits would be considerable if the implementation is performed successfully.

The second option is to continue with the current system, which would require development in multiple areas to meet businesses' requirements. The development of the current tool would require great amount of resources and time from the Company's IT department. However, it is not certain that the rather small IT department could provide the necessary resources for a large-scale, company-wide IT tool development project or that development of the current system would be any cheaper than implementing a new tool. The final option is to start looking for alternative IT tool which could match even better with the businesses's needs. This would mean that the Company should begin the IT tool assessment process all over again, meanwhile using and developing further the currently used IT tool. Virtually, lots of uncertainty is related to this option.

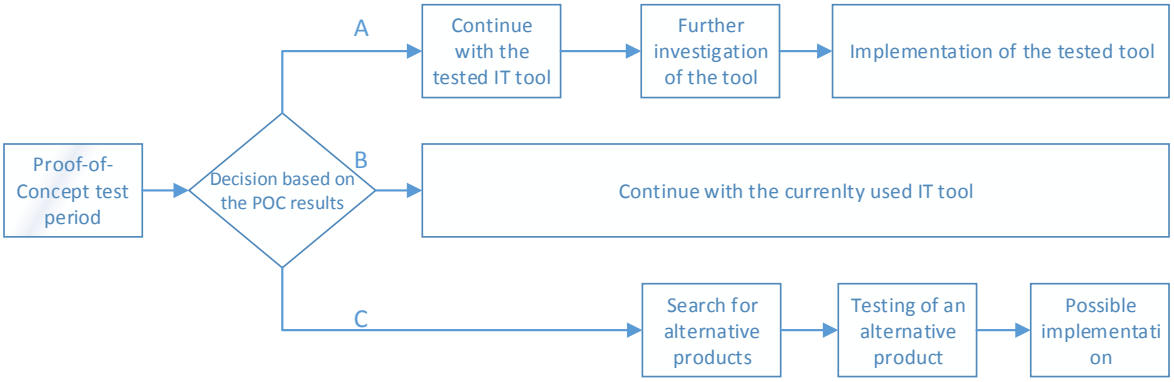

Figure 14 Roadmap for the IT tool development

All in all, the tested tool showed a great potential and could be a valuable asset and appropriate tool for businesses if implemented. If Empower Group decides to proceed with the tested tool, attention should be paid into careful implementation of the tool. Risks presented in the literature (Kolltveit, et al., 2007, pp. 237-239; Baccarini, et al., 2004, pp. 286-294; Hung, et al., 2014, pp. 534-535) should be taken into account, plans for training of users prepared, and sufficient resources ensured for the project group performing the implementation. The POC proved to be a good method to introduce new software to the people using it and to commit people involved into the POC project. Additionally, managerial support and commitment is needed to coordinate the system implementation and to ensure that necessary process development or redesign are performed.

7 SUMMARY

The multi-disciplinary service company's business divisions have a need for more supportive IT tool in service delivery process area, because end users perceive that the currently used system is difficult to use and too inflexible, resulting to mistakes, errors, and considerable amount of unnecessary manual input. Therefore, the case company has decided to investigate alternative option for the current system and performs a proof-of-concept project to test an alternative system and investigate, if it provides more support for the diverse business needs. Background and the objective of the study, limitations, and methods are furhter described in chapter 1.

In the first part of the thesis, a theoretical background was presented in chapter 2, including literature review about services in project environment and IT system development. In literature, terminology related to service delivery is very often ambiguous, and research about IT tool development in this area is still considered as a grey area, focusing often on a specific area of the delivery process in a specific industry. With better IT systems, companies pursue competitive advantage to improve their efficiency, reduce mistakes, reduce costs, better setting of targets, prioritize options, and to enhance information availability. IT system's role in making the right data and information available for the right people in the right time is commonly recognized. However, IT tool development often requires more comprehensive organizational development and possible rethinking of business processes. Research has proven that usability of an IT tool has an impact on the amount of errors and mistakes performed, so importance of usability is also highlighted. IT projects have a significantly high rate of failure, and involving the actual end-users of an IT tool in the development phase is seen as critical for the success of an IT project.

The case company, Empower Group, is introduced in chapter 3. Empower Group operates in the Nordic and the Baltic countries, offering a variety of services for different industries. In this thesis, the focus is on four business divisions located in Finland: Power network, Telecom network, Industry, and Information management divisions. Four service delivery types, which each have their own characteristics, are recognized in the company: unit deliveries, time deliveries, projects, and service agreements. Also, ABC model is used in

Empower Group to manage and classify service deliveries. Service delivery process itself is divided into five subprocesses: bid calculation, project and work planning, resource management, project and work management, and invoicing. Additionally, purchasing is closely related to the service delivery process, but it is excluded from the gap analysis performed in this thesis. Due to diverse portfolio of services, the company requires a flexible IT tool to manage its service delivery process efficiently.

Current state of service delivery process was introduced in the third part of the thesis, in chapter 4. Data collection was performed using both qualitative and quantitative methods. Qualitative methods included semi-structured and unstructured interviews, and quantitative methods a survey form concerning current business practices and current IT system support. Based on the interviews and survey results, a comprehensive view was formed about current practices related to business processes and IT tools currently used in service delivery process. Many challenges were identified, which are also presented in the literature, including slow information flow, high input variability, insufficient dialogue between business units and management, lack of guidelines, and difficulties in usability. Also, diverse businesses in the case company have often varied information requirements, which has led to a situation, where business units have developed a wide set of their own standalone tools, resulting to fragmentation in the IT environment. Hence, coordinated IT system development has become very difficult. The IT department, which operates with limited resources, has the main responsibility of developing the current IT tool for service delivery process.

Target state related to IT tools in service delivery process was defined during the numerous interviews, informal discussions, and meetings during the POC project. This was presented in chapter 5. For each subprocess in service delivery process a number of target state requirements were defined. To assess how well the current and the tested tools perform compared to the target state, a gap analysis was performed. Based on the results of the gap analysis, the tested tool provides considerably better support in every area of the service delivery process than the currently used IT tool. Although some critical views were also expressed among the project group, most of the end users participating into the testing of the IT tool had positive opinion about the system. There were some technical limitations

and issues with the test environment provided by the system supplier, which may have affected negatively to some end users views about the tested tool. Overall, it can be stated that the tested system has a great potential and offers multiple features which could add value to Empower Group's business. Members of the project group felt that POC as a method was a positive experience.

Overall, to answer the main research question, if the tested tool provides an appropriate tool for the business requirements, it can be stated that the tested tool showed great potential. Further investigations about the software are still needed, but basic understanding about the functionality of the system was acquired through POC project, and the testing period showed that the system could be suitable tool for the case company's businesses. Additionally, this thesis offers a general view to IT tool development in service delivery process area. Case study revealed multiple issues similar to factors presented in literature related to IT system development. Although previous research often focuses on single business process area in a specific field of industry, the case company in this thesis has a very diverse service portfolio, resulting to a more comprehensive and diversified research.

Previous research in IT tool development very rarely presents financial analysis. In this thesis, financial aspect is also taken into account, although accurate calculations are not presented. Estimates about financial feasibility were however performed internally in the case company. Further research about proof-of-concept as a method and its benefits, financial estimation of potential benefits acquired by implementing a more effective IT system in service industry, and utilization of IT systems in skills and competency management are required.

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