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Industrial Engineering and Management

DEVELOPMENT OF PROJECT CASH FLOW FORECASTING PROCESS

Master's Thesis

Johanna Ranta
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Supervisors:
Professor Timo Kärri
Post-doctoral researcher Miia Pirttilä

ABSTRACT

Author: Johanna Ranta

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Process management refers to improving the key functions of a company. The main functions of the case company - project management, procurement, finance, and human resource - use their own separate systems. The case company is in the process of changing its software. Different functions will use the same system in the future. This software change causes changes in some of the company's processes. Project cash flow forecasting process is one of the changing processes. Cash flow forecasting ensures the sufficiency of money and prepares for possible changes in the future. This will help to ensure the company's viability. The purpose of the research is to describe a new project cash flow forecasting process. In addition, the aim is to analyze the impacts of the process change, with regard to the project control department's workload and resources through the process measurement, and how the impacts take the department's future operations into account.

The research is based on process management. Processes, their descriptions, and the way the process management uses the information, are discussed in the theory part of this research. The theory part is based on literature and articles. Project cash flow and forecasting-related benefits are also discussed. After this, the project cash flow forecasting as-is and to-be processes are described by utilizing information, obtained from the theoretical part, as well as the know-how of the project control department's personnel. Written descriptions and cross-functional flowcharts are used for descriptions. Process measurement is based on interviews with the personnel – mainly cost controllers and department managers.

The process change and the integration of two processes will allow work time for other things, for example, analysis of costs. In addition to the quality of the cash flow information will improve compared to the as-is process. Analyzing the department's other main processes, department's roles, and their responsibilities should be checked and redesigned. This way, there will be an opportunity to achieve the best possible efficiency and cost savings.

TIIVISTELMÄ

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Hakusanat: prosessi, prosessin johtaminen, prosessikuvaus

Prosessijohtamisen keinoin voidaan kehittää yrityksen keskeisiä toimintoja. Tutkimuksen kohdeyrityksen päätoiminnoilla, projektien hallinta, hankinta, talous ja henkilöstöhallinta, on ollut jokaisella käytössä omat järjestelmät. Yrityksessä otetaan käyttöön yhteinen järjestelmä, jota kyseiset toiminnot käyttävät. Tämä aiheuttaa muutoksia joihinkin yrityksen prosessihin. Projektien kassavirran ennustaminen on yksi muuttuvista prosesseista. Kassavirran ennustamisella voidaan varmistaa rahan riittävyys tulevaisuudessa sekä varautua mahdollisiin muutoksiin. Tämä takaa yrityksen elinvoimaisuuden. Tutkimuksen tarkoituksena on kuvata uusi prosessi, jossa saadaan aikaan projektien kassavirtaennuste. Lisäksi analysoidaan prosessimittauksien kautta prossimuutoksen vaikutuksia projektivalvonta osaston työkuormaan ja resursseihin sekä kuinka nämä vaikutukset tulisi ottaa tulevaisuudessa huomioon osaston toiminnassa.

Tutkimuskohdetta käsitellään prosessijohtamisen näkökulmasta. Työn teoriaosassa tutkitaan kirjallisuuden ja artikkelien perusteella mitä ovat prosessit ja kuinka niitä kuvataan ja kuinka prosessin johtaminen käyttää tätä tietoa hyväkseen. Lisäksi kerrotaan projektien kassavirrasta ja sen ennustamisen hyödyistä. Tämän jälkeen kuvataan projektien kassavirtaennustamisen nykyinen ja tuleva prosessi käyttäen hyväksi teoriaosuudesta saatua tietoa sekä projektivalvonta osaston henkilöstön tietämystä. Kuvauksissa käytetään sanallisia kuvauksia ja uimaratakaavioita. Prosessimittaukset perustuvat henkilöstön, lähinnä kustannusvalvojien ja osaston johdon, haastatteluihin.

Prosessimuutoksella sekä kahden eri prosessin yhdistämisellä pysytytään vapauttamaan työaikaa muuhun työhön, esimerkiksi kustannusten analysointiin. Myös kassavirtatiedon laatu paranee entiseen prosessiin verrattuna. Saavuttaakseen parhaan mahdollisen tehokkuuden ja kustannussäästöjä, osaston roolit ja roolien vastuut kannattaisi tarkistaa ja suunnitella uudestaan analysoimalla osaston kaikki pääprosessit.

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1 INTRODUCTION

1.1 Background

Business process modeling is a way of describing work process. The best way to represent the internal elements of business processes is by using process models or process descriptions. Models describe all necessary activities and their dependencies, data flow, roles, and involved factors, as well as goals, which should be attained. Business process models add clarity and understanding to aspects of a problem by giving a snapshot of what is perceived at a point in time. The main purpose of business process models is to transfer past knowledge, already know, to present practice. Describing the process helps one to familiarize with the process. Process descriptions can be used to describe the practices of the organization, which helps to organize co-operation with other organizations. They are important for decision-making when it comes to process design and development. The business process management should be focused on activities, which have no value for the business, and these kinds of activities have to be reduced or totally eliminated. Process descriptions help to improve the processes so, that it is possible to achieve optimal, smooth and economical flow of activities without obstacles and interruptions. These activities should enable the company to improve its efficiency and achieve cost savings and business will be profitable. Continuous improvement is necessary. Clients of today know what they want and their requirements grow and grow. This means that the expectations have to be met or, even better, exceeded. This is to ensure the competitiveness of the company. Improvement and renewal is needed in order to maintain a good process performance level. If the process performance level cannot be maintained and continuously improved, competitors will get the clients.

The client for this research is a company, belonging to a global company group. The company designs, manufactures and erects a full line of boilers and environmental products for utility, industrial, and cogeneration clients. Aftermarket services, like boiler maintenance and outage construction, are included in the business of the company. The clients of the company operate in

Europe, South America and Asia. The company deals with business project, mainly delivery projects. Projects of the company are very different. They range from small modernization and repairing projects to large power plant projects. Project duration varies from a few months to a few years and project costs vary from a few hundreds of thousands of euros to hundreds of millions of euros.

As the company has branches around the world, it is very important to get compact information about the business. Company management needs recent economic figures, which help them to react quickly to economic changes. The economic data has to be in intelligible form. This helps the company management to understand it correctly. Decisions are made in various situations and for this reason, the economic data should be accessible everywhere and always available. Correct, compact, reliable, and quick data transmission is a basic element of a successful business.

There are different systems in use in different functions of the company. Procurement department has its own procurement system, project management has its own project cost management system, and finance department has its own system. The information, used by one function, is not received in real-time elsewhere. Thus there is always a gap between systems and data transferring between systems. There are also different systems used at parent company level. An ERP project (Enterprise Resource Planning) is now taking place within the company. Its aim is to harmonize the operations between companies. It is very important to improve data transfer and reporting between companies in order for them to operate within the same system. The current procurement, accounting, and project cost controlling systems will be replaced with a new system. Due to the system change, there will also be changes in processes. A change in project cash flow forecast process is one of these changes. The current project cost management system provides the project cash flow information to be seen directly from the system. The new ERP-system does not allow scheduling of project costs and income. Cash flow information is not available directly from the new system. That is why there is a need to develop a new way to make cash flow information.

Project cash flow forecast is important when controlling and monitoring the economical status of projects but it is also needed for company level cash flow in order to design, control, and forecast the whole company's financial resources.

Project control department creates and maintains project cash flow and reports to the company management. The department's duty is to support the project team in the execution of the project, so that the project will achieve the best possible financial result.

1.2 Scope and limitations

The main aim of this research is to describe the future project cash flow forecasting process. The research examines the project cash flow forecasting process, its present state and what it will be like after the implementation of the ERP-system. This research deals only with cash flow processes of delivery projects and how they maintain the project cash flow forecast. The company cash flow is not included in this research. The ERP project will be handled only from the point of view of cash flow processes. Other types of processes have not been described in this research. Cash flow processes – and how the process change affects the activities and resources of the department – are examined from the point of view of the project control department.

The main research problem of this thesis consists of the following question:

- *How is the project cash flow forecast made after the system change?*

The project cash flow forecast process changes completely after the implementation of the ERP-system. The ERP-system does not provide the scheduled information for project cost and income. Timing for cost and income will be done in excel, using different reports from the ERP-system and other functions. There is no ready-made model for the way that the cash flow forecast information should be produced, so the model must be developed. The process description helps people to understand the process and make it easy to teach the

employees of the project control department. The process description is a very good tool to check that all needed information has been taken into account in the process – and in this way to ensure that the output of the process gives accurate and reliable data. In addition, the description helps to understand the relationships between different functions.

The main research problem will help to find answers to the following sub-questions:

- *How does the process change affect the project control department's workload and required resources?*
- *How should the process change be taken into account in the project control department's operations?*
- *How can the process description be utilized in the future?*

When the new process is clear, it is important to think about what has changed, compared to the previous process, and how the changes affect the activities of the department. At the same time, one should think about how the obtained information can be used in the future.

1.3 Research methods

This master's thesis work is qualitive research and it is based on business process management. The theory consentrates mainly on processes. The theory unravels by starting from a single process and continuing towards a boarder entity via process modeling and process management. Project business and project cash flow is examined, as well, in the theory part. The theory is based on literature and articles.

Current and new processes were studied and described in the empirical part. Part of the empirical data was collected by interviewing employees – mainly project cost controllers and management – in the project control department. In total,

there are 10 people operating as project cost controllers in the department. Management consists of four people. There were five cost controllers and three management's representatives available for the interview. The first thing was to define the basic information of the process via the basic information form. This was done together with the process owner. The next task was to define the process steps for the as-is process. They were listed in a chronological order and by functions, which make the steps. This was done together with the project cost controllers. On the basis of the process steps list, the flowchart for the as-is process was drawn out, and it was examined by the project cost controllers. After that, the same steps were carried out for the to-be process. The cost controller's work flow for the to-be process was also described. When all this was done, the descriptions were presented to the process owner, and his changes were updated to the descriptions.

Process measurements based on interviews. Measures for the process measurement related to time, cost, and quality. The actual measurement of cycle time with the clock could not be done, because the old systems were no longer in use. And this is why the measurement data based on interviews. Information of pros and cons of the processes were collected via the interviews.

1.4 Structure of the research

There are eight chapters in this master's thesis. Table 1 summarizing the content of the master's thesis.

Table 1. The content of the master's thesis.

Chapter	Title	Contents
Theoretical part		
Chapter 1	Introduction	Background, scope and limitations, research methods, structure of the research
Chapter 2	Processes	Definition of the processes, elements of the process, different types of processes, process thinking
Chapter 3	Business process modeling	Process description and its phases
Chapter 4	Business process management	Definition of the business process management, continuous improvement, performance measurement
Chapter 5	Project cash flow	Project business, project cash flow and its elements, cash flow forecasting
Empirical part		
Chapter 6	Case study	Company introduction, project cash flow description, process measurement, effects of the process change
Chapter 7	Conclusion	Conclusions from the research, recommendations for the case company
Chapter 8	Summary	Brief symmary of research

The master's thesis is divided into two parts, theoretical and empirical parts. The theoretical part consists of chapters 1-5. The background, scope, and limitations are defined in the introduction, together with the research methods and structure. The second chapter defines the process and various process types, together with

the benefits of the process thinking. The third chapter explains the different phases of process modeling, and the fourth deals with process management. Business process management is in the lead of the processes towards the company strategy. Measuring the processes and continuously improving them can achieve this. In the empirical part, the subject of the examination is project cash flow, and that is why chapter 5 describes the theory for the project business, as well as the elements of the project cash flow.

The empirical part introduces the case company and describes its as-is and to-be cash flow processes, as well as the effects of the process change. In addition, you will find the conclusion of the research and recommendations for the case company. The summary of the research is presented at the end of this master's thesis.

2 PROCESSES

A process can be seen as a method that is used by all the resources of an organization in a repeatable, reliable and consist way to achieve its goals. It is an approach that connects inputs and outputs. (Zairi 1997, p. 64.) Plenkiewicz (2010, p.45) gives a very general meaning for a process. His opinion is that a process is a specific order of work activities across time and space. Activities have a beginning and an end, and clearly identified inputs and outputs. Processes can be found everywhere in industrial or service activities. According to Burlton (2001, p.72), a process includes all the things we do to provide someone who cares with what they expect to receive – in addition, processes include all activity that refers to failing to meet those expectations. There are many definitions for processes but their principle is the same. Processes are relationships between inputs and outputs. Inputs are transformed into outputs by using a series of activities, which add value to the inputs (Aguilar-Savén 2004, p.133.). Laamanen and Tinnilä (2009, p.122) define a process, which directly delivers value to external customers, as business processes. Burlton (2001, p.67, 69) describes business and process the following way: A business refers to any organization with an aim to create valuable results for people who care about the results. A process is the only way to split a business that can be described in precisely the same terms as the business itself. A process can also be seen as a vehicle that delivers valuable results to those who care. Plenkiewicz and also Andersen (1999, p.4) describe processes and business processes simply by stating that a process can be found both within the business, as well as in private life. That is why the word business will be added to the word process when it is related to business life.

2.1 Elements of process

According to Plenkiewicz (2010, p.45), a process consists of different elements:

- A goal
- Value to clients (internal / external)
- Specific inputs
- Specific outputs
- Resources, used by the process
- A number of activities and order for them
- More than one organizational unit which the process may affect

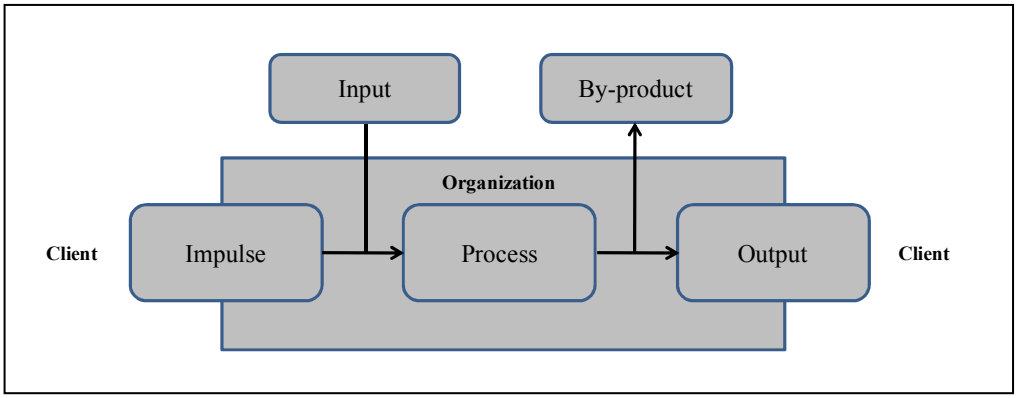


Figure 1. Elements of the process. (Tuurala 2010.)

The elements of the process are shown in figure 1. The main thing is that all business processes have either external or internal clients, as well as a clear product or service. That product or service is the final goal of the process, bringing added value to the client. In addition, the end result of the process may be actualized as by-products. According to this definition, almost all activities within a company can be seen as a business process or as part of one. The process begins with an impulse. Within a process, all kind of inputs, for example raw

materials, information, and knowledge, are transformed into outputs and results. This is achieved by using different resources. The organization has the necessary resources. These resources can include facilities, equipment, technologies, and people. In order to achieve the desired results, the process undergoes a number of activities in a logical and sometimes in an illogical order. These activities usually cross professional functions and organizational units. Davenport & Short (1990, p. 12) define two important characteristics for processes. The first is the previously mentioned client and the second refers to processes, crossing organizational boundaries. That is shown in figure 2. The departments are presented vertically and processes, going through different departments, are presented horizontally.

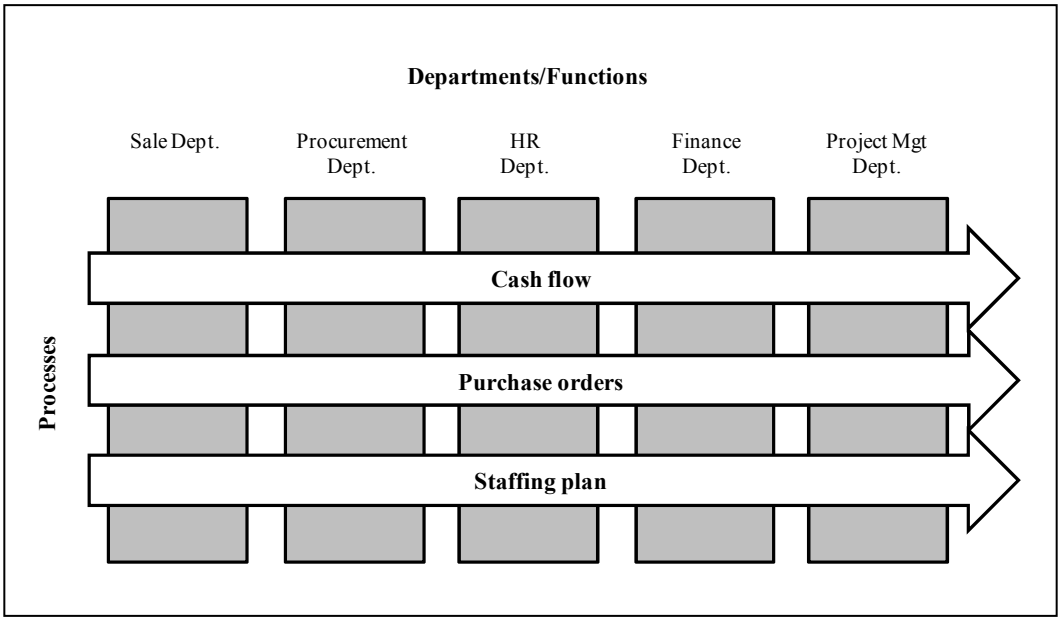


Figure 2. Vertical departments and horizontal processes. (Adapted Andersen, 1999, p.2.)

2.2 Different types of processes

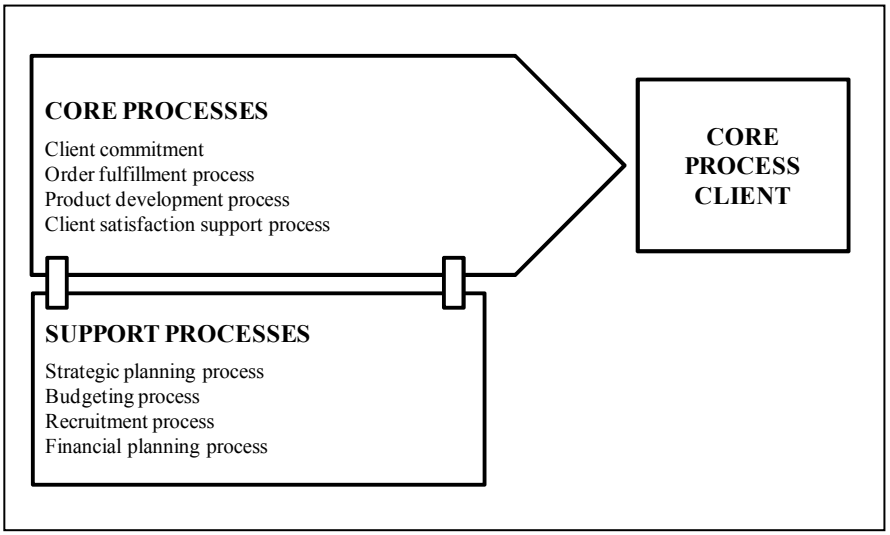


Figure 3. Main groups of business processes. (Laamanen & Tuominen 2011, p.21.)

There are different types of processes that can be grouped according to their nature or meaning. In general, business processes can be divided into main groups: Core processes and support processes, figure 3. Processes can also be divided more loosely, as shown in figure 4.

Core processes refer to those, which deliver value to external clients directly, as well as processes, refining the product or service. These kinds of processes are, for example, client commitment, order fulfillment and client satisfaction support. (Laamanen 2001, p. 55, Laamanen & Tinnilä 2009, p.122.)

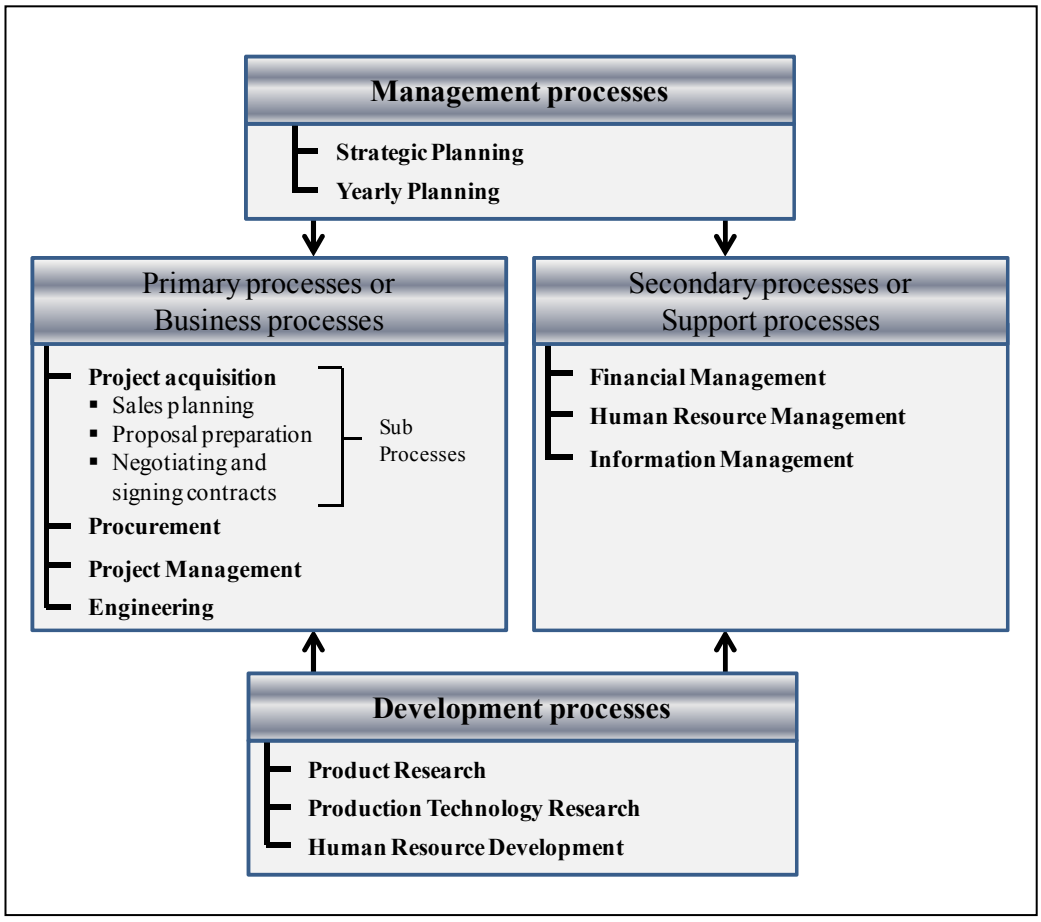


Figure 4. Example of different processes within the company.

Operating through value delivering processes to external client is not possible for organizations. Enablers need to be developed. Secondary processes, or support processes, are internal and needed to support the primary processes. They are not, directly, value-creating processes and they serve the company's internal clients only. (Andersen 1999, p.4-5; Tuurala 2010.)

Business or primary processes are called the company's key function chains. They are central and value-creating processes of the company and they have either internal or external clients. Processes go from client to client, crossing departmental and organizational boundaries. (Andersen 1999, p.4-5; Tuurala

2010.) Management processes are related to organizations' strategic and yearly planning. (Laamanen & Tinnilä 2009, p.122.)

When a primary process is very wide-ranging, it can be divided into smaller units, – sub-processes. Sub-processes refer to different stages of operation and parts of process. (Andersen 1999, p.4-5; Tuurala 2010.) Development processes are supposed to bring a higher level of performance to the value chain via primary and secondary processes. This kind of process refers to, for example, product development in Research and Development functions. (Andersen 1999, p.4-5; Tuurala 2010.)

Davenport & Short (1990, p.18-20) have a different perspective on the matter. They divide processes into three different categories: Inter organizational, inter functional and interpersonal. Inter organizational processes involve two or more business organizations. For example, the case company of this research used inter organizational process approach in its ERP-project (Enterprise resource planning-project). It ordered a new system from the system supplier and the representatives of the supplier help them implement the system. A second type of process is inter functional process. These processes are taking place within the organization and cross several professional functions. Case company's cash flow process is just that kind of process. Inter personal process is within a function or department. It is typical for small work groups. Case company's work flow for cash flow process from the cost controller's point of view is a good example for that.

2.3 The benefits of the process thinking

According to Laamanen (2001, p.22), process thinking helps us to achieve the following main benefits:

- Improved cooperation with client.
- Improved management of the organization's resources and knowledge.
- Improved development of the operation.

Cooperation with the client works well, when the client feels they are getting a good service, the right products, or products that were even better than expected. The client is satisfied – and so is the future client. The process behind the satisfied client has been well designed. There are two main points for well-designed processes. First of all, the client's operations and the needs are the basis for planning processes. In an optimal case, the processes start and end with the client. This way, the client's needs go through the whole process. Just like the in figure 1, at the beginning of the process the client gives an impulse – the goal, or output, of the process is to ensure that the product or service meets the client's needs. Another significant factor has to do with the client's impulse at the beginning of the process. It is very important to start the process by client's impulse and not to begin operation with huge production planning. The amount of products should equal the client demand. This helps to reduce costs and to improve service capacity.

There is an increase in overall knowledge, when the employee is familiar with the processes. Learning about the processes helps individual employees understand their position in the process and to perceive the whole process. Perceptions of know-how will be more realistic and it will encourage improvement in different knowledge areas – thus creating multi-skilling. Process knowledge helps to understand the work of colleagues. Therefore, the colleagues gain more respect and overall job satisfaction is improved. When different parties analyze and model their work together, cooperation improves in the work community. (Leppänen 2000, p. 45-46.)

The organization's overall goals and client needs provide the basis for the development of operations. Acts of the individual member of the organization or even the results of departmental activities are not the basis for organizational performance. The performance comes from processes that satisfy the client's needs and these processes must be individually set goals. (Laamanen 2001, p.22-23.) The important goal of operation development is to achieve cost savings. In

practice, this can mean a new kind of centralization, the elimination of overlapping work or adding parallel phases to increase the lead-time to speed up.

3 BUSINESS PROCESS MODELING

Business process modeling is a way of describing work process. It describes the target and object of work process, raw materials or articles in use, productive means, working methods, and activities of people. Business process modeling includes a description of processes by text and graphic presentation, and also modeling techniques, and tools. According to Lindsay et al. (2003, p. 1018-1019) the main purpose of business process models is to transfer past knowledge, already known, to present practice. The best way to represent the internal elements of business processes is by using process models or process descriptions. Models describe all necessary activities and their dependencies, data flow, roles, and involved factors, as well as goals, which should be attained. Business process models add clarity and understanding to aspects of a problem by giving a snapshot of what is perceived at a point in time. Sustainable business processes are a balancing act between learning from the past and experimenting and adapting to the future, as well as between constrains and rules versus flexibility and freedom.

Aguilar-Savén's (2004, p.146) and Laamanen's & Tinnilä's (2009, p.124) conclusion is that business process models might be used either to develop software that supports processes or to analyze the processes themselves. The main purposes might be divided into four categories:

1. Learning about the process.
2. Decision support to process development and design.
3. Decision support during process execution and control.
4. Development of business process software.

Describing the process helps one to familiarize with the process. Process descriptions can be used to describe the practices of the organization, which helps us to organize co-operation with other organizations. Managers use the process descriptions for workload measurement, the division of labor and responsibilities

clarification, resource needs, problems, and duplicate work situations. Familiarizing and supervising new employees with their job is also one very important aspect of process description.

Process modeling helps decision-making when it comes to process design and development. The purpose of these models is to use them for analysis of adequate process development. To ensure correct process performance, one is sometimes required to make decisions to improve or change a process when executing it. Process descriptions are used in the change management tool, for example, connecting organizations. Controlling and monitoring processes also requires their own process models. Process descriptions can be used to collect tacit knowledge and to set the performance indicators to evaluate the performance. A situation may arise, in which it is necessary to develop a process supporting software and process models are essential for programming the software.

3.1 Process description

Process description provides information on how people perform their functions and how work flows within a company. Process description helps us to identify problem areas. Good design and well-described process description has to show relationships between different items. They have to cover all critical items, which affect the process. It helps to outline the whole process and understand everyone's role in order to achieve goals. In turn, this generates process teamwork and offers the possibility to work flexibly. There are also technical factors for process description. It should be short, the text consisting of not more than four pages with a flow chart on one page. The main purpose of process description is to highlight critical items and to separate important and less important items. Long description might lose the prime message of description. Another thing is that people are not able to concentrate on long reports. Terms should be coherent and used as agreed. The Process description should not be too detailed, which makes it easier to understand. It should also be logical and lack any discrepancies. (Laamanen 2001, p.75-78.)

3.2 Phases of process description

The starting point of process describing is to identify why a particular process is described. Process descriptions must be appropriate, and they have to benefit from the activities. Phases of process description have been shown in figure 5.

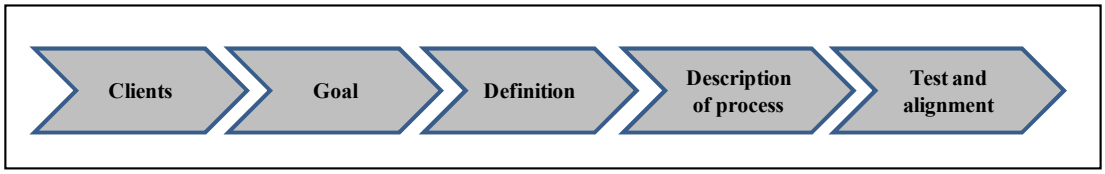


Figure 5. Phases of process description.

3.2.1 Clients

Each process has a number of products and the number of clients. The client is the recipient of the product. The first step is to consider who the clients of the process are. There can be many different types of clients for one process. The second step is to identify product and service demands and the needs of the client. The people who work in the process are one of the client groups. They want to perform, professionally, as well as possible. That is why the definition and description of the process has to be clear. It should help them understand the target of the process and how that target can be achieved. The process has to be realistic and the people, working on it, have to be competent. They should also have a possibility to improve their skills and know-how. The management of organization has set a target for the development of the process. The definition of the process must equal an achievable goal. Another very important point is that the process executes the organization's policies and key strategies. The process has internal or external clients. They have certain expectations and needs, which the process must meet. (Laamanen 2001, p.89-90.)

3.2.2 Goal

The next step is to think about the goal of the process and the success factors behind it. There are two main perspectives for a goal: Strategic and operational. A strategic perspective means that the goal of the process focuses on strategic goals. For example, the strategy of the organization is cost management and the purpose of the product development process is to reduce product and service production costs. The operational perspective is to get the best product on the market, whereas the goal of the process is to design a new product or create new services. It is also important to be aware of the success factors of the process. The success factors can be related to several things – skills, technology, speed, volume, cost level, the phases of process, and method of working or cooperation with client, for example. The performance of the process will be monitored with pre-set requirements in mind. Performance refers to the capability to act in purposeful and result full way. The goal of the measurements is to understand relationships between cause and effect. This helps to focus on and develop critically important factors and functions. (Laamanen 2001, p. 90-91.)

3.2.3 Definition

Process definition refers to the beginning and end of a particular project. At the same time, it refers to identifying clients, suppliers, outputs, and inputs. One process includes three main areas to focus on: Clients, continuous improvement, and inputs and outputs. The client is where it all begins, and where it ends. Practically, the first and last phase of the process is made by the client. For example, the first phase of order to delivery process means placing an order, not approving one. And the last phase refers to the inspecting a received product, not delivering one.

Continuous improvement begins with a design and ends on performance evaluation. In other words, the process is connected to the developmental and control processes of an organization. When connecting the continuous improvement to a process, a proactive approach is promoted within the

organization. The more detailed description of continuous improvement and performance measurement are in chapter 4.1 and 4.2. There should be equivalents to important inputs and outputs between different processes. This is to ensure that the process map is whole and processes work well together. (Laamanen 2001, p. 66-68.)

At this stage, it is good to choose a process owner. A process owner is responsible for developing a process, which improves efficiency and effectiveness. The process owner will also plan the process, work methods and information systems. He or she is also responsible for continuously evaluating the performance level of the process. A process owner develops processes together with other parties and gives instructions when changes are needed. Sometimes, processes go beyond organizational boundaries – therefore the different stages of the process have different process owners. Sometimes a process owner is given full responsibility for all activities in the process and the fulfillment of client needs. The process development team is responsible for developing the process and supporting the process owner in developmental task. (Andersen 1999, p.27-28, Juhta 2002, p.4.)

3.2.4 Description

The first phase of a process description is to clarify why the process is described and what it will be used for. The level of the process description determines the use of process description. For example, if the description is used for the orientation of a new employee, the description is more detailed than it would be for management level needs. Processes can be described at various levels and the accuracy of these levels varies. The description levels of the process can be divided into four different levels: Process map, business processes, process flow and work flow. Different levels are shown in figure 6. Differences in levels may be small. Descriptions for different levels can overlap. This is due to, for example, the size of the organization, the use of the description and the versatility of activities. The process is meant to be described according to one level, not all four. (Juhta 2002, p.5-6.)

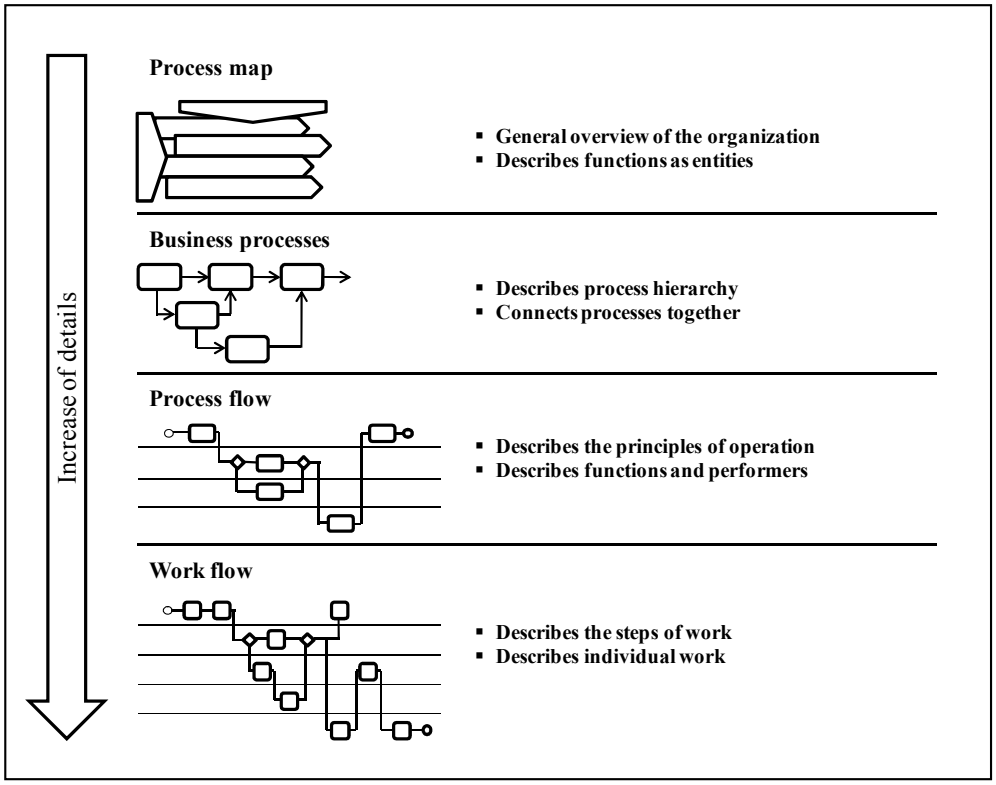


Figure 6. The description levels of the process. (Juhta 2002, p.6.)

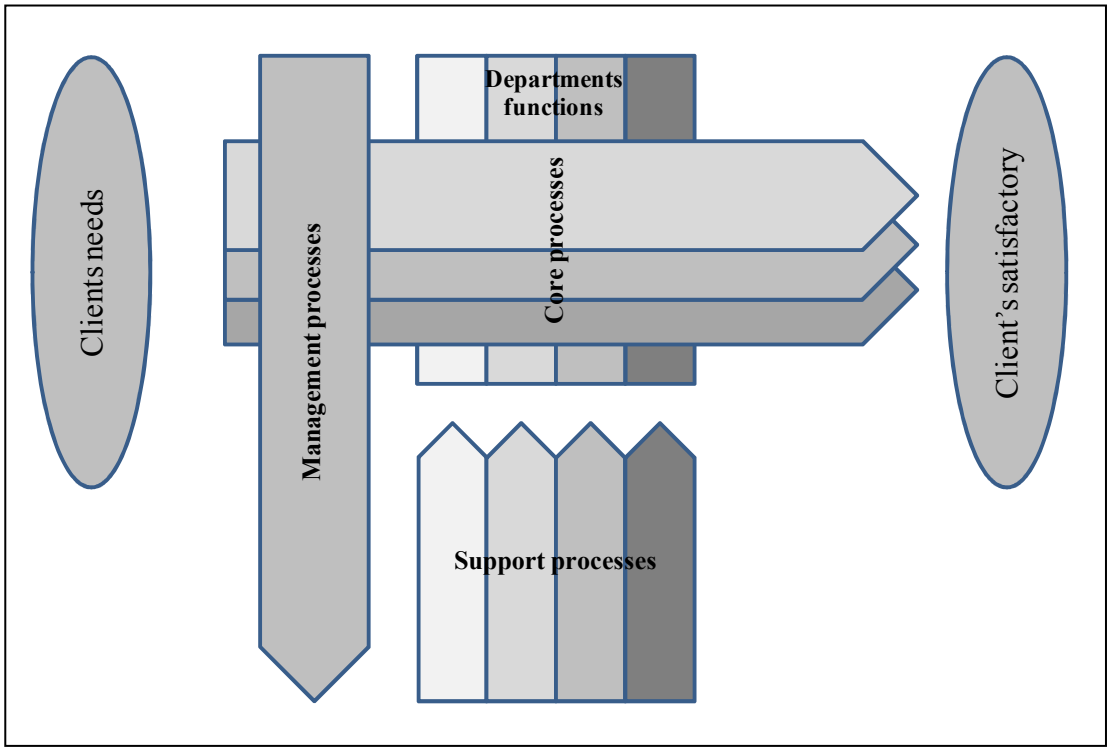


Figure 7. An example of a process map. (Edu)

A process map is the highest level of process description. The main point of it is to describe the overall picture for the organization's activities. A process map is also used as an external communication tool, used to aid decision-making. A process map can show the core, support and management processes, the structure of the organization, and clients. There is an example of a process map in figure 7. (Juhta 2002, p.7.)

Next is the business processes level. At the business processes level, the operation of the organization will be monitored in a more detailed level than that of the process map level. A business processes level describes how the core processes are divided into sub-processes, what the purpose of the processes is, and what the outputs of the processes are. It also defines the process owners, the target values and indicators. Relationships between different processes and interactions, as well as interfaces to other contexts are also described at this level. A business processes bounds processes together and allows the management to see the overall picture of the operation. (Juhta 2002, p.7-8.) There is an example of the business processes in figure 8. It is showing processes for the delivery project.

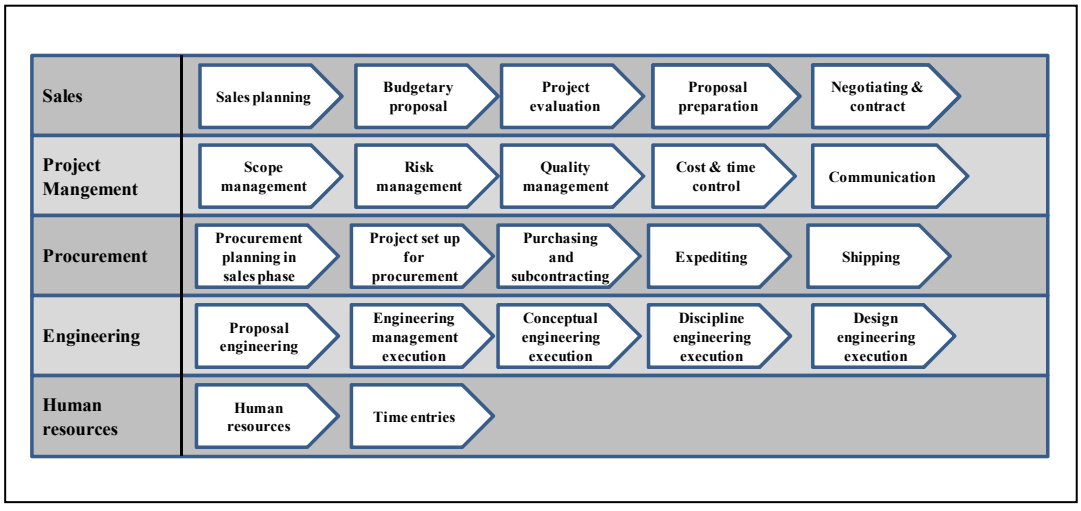


Figure 8. An example of the business processes.

Process flow level describes action steps, sub-processes, functions and roles, which are responsible for the functions. The interaction between services and sub-processes, data inputs and purpose as well as process outputs are also described. A

description may also include information systems that are involved in the implementation of the process. (Juhta 2002, p.8-9.) There are examples of process flow level in appendix 5 and 6.

Work flow levels are the lowest and more detailed ones. They are used, for example, when a process needs developing or when process work instructions need to be drawn up. This level describes individual operations, as well as internal and external process and data dependencies, which are needed and produced for the process. This data should be so detailed that it allows an automatic process or to electric services. Data recording at this level gets more attention than the levels, described earlier. Data type and field length are, for example, described at this level. (Juhta 2002, p.9-10.) An example of work flow level is shown in appendix 7.

The first step of business process modeling is to capture and document the company's existing processes. If we do not have knowledge of where we are now, it is hard to know where we are going. After the as-is process is defined, it is easy to start defining the to-be process.

As mentioned before, process description might include a written description of the process and also a graphic presentation. A written description may consist of a basic information form and a written description on the progress of the process. The first thing is to draw up basic information for the process. An example of a basic information form is in appendix 1. The purpose of the form is to clarify the purpose for which the process is modeled and record the key information of the process. A process owner can, together with his process development team, fill in the form. A basic information form can be filled in at the stage when the process is delimited and defined. (Juhta 2002, p.5.)

A written description can be a free-form description of the process flow or as Leppänen (2000, p.22-23) suggests, the different process steps can be listed in a chronological order. There are examples of that in appendix 2 and 3. These

written descriptions support the graphic presentation of the process. Flowchart is an often-used term for this graphic presentation. A flowchart is a graphic depiction of activity flow in a process. Graphically presented charts are easier to understand than written descriptions. There are many business process-modeling techniques, and the flowchart technique is one of the most important ones. The term is used for that, also. A flowchart technique is used for graphic presentation in the case section of this study. The meaning of symbols is defined in appendix 4, and appendix 5 and 6 consist of flowcharts for the process. The flowchart symbols represent operations, data, flow direction, and equipment, for example. With these symbols, graphic presentation helps to define, analyze and find a solution for problems. The flowchart identifies process steps and the preliminary sequence, which consists of the process outputs and clients, as well as inputs, needed in order for the process to produce outputs.

Workflow is one of the graphic presentations of the process. Workflow is a flow of tasks between people in an organization or computer application. Two or more members of a workgroup, who aim to reach a common goal, can define workflow as well as any task performed in a series or in parallel. Appendix 7 shows the workflow for project cash flow from a cost controller's point of view. Only those tasks are shown, which are part of the cost controller's duties. He or she doesn't see the whole process or other related functions and processes. That is the downside of this modeling technique states Aguilar-Savén (2004, p.140). She mentions, as an advantage, that work phases won't be forgotten easily. In addition, changes are easy to make and used in process improvement, and the process is easily analyzed.

Appendices 5 and 6 show the process flow of the whole project cash flow process. It is called a cross-functional flowchart (Andersen 1999, p.22-23). Plenkiewicz (2010, p.47) uses the name 'swim lines' for horizontal lines. They describe process activities and give an opportunity for indicating who performs the activities, and which functional department they belong to. This gives a very clear presentation of the process. By having a formal method for indentifying and

integrating processes between departments and teams, the connections can be ensured. In addition, communications and hand-offs are well designed and well managed. This way, the risk of processing gaps, inefficiencies and duplications can be avoided.

According to Aguilar-Savén (2004, p.134) and Damij (2007, p.86-88) the advantage of a flowchart is flexibility and simplicity. The designer of the chart can put the different building blocks together in a wide variety of ways. At the same time, flexibility is also a disadvantage. There is a possibility to make flowcharts too large and therefore to lose simplicity. It is very important to define a process properly and keep the detail level high. This way a flowchart can quickly help identify bottlenecks or inefficiencies of the process, in order for it to be streamlined or improved. Another disadvantage is that the gaps or deficiencies of the process are not easily noticed. Another advantage of it is the communication ability. It is easy to recognize the process from a flowchart representation almost at first glance.

According to Damij (2007, p.88) it is complex and difficult to model business processes. Using only one technique does not necessarily ensure an accurate picture of the process. A combination of different techniques gives the best and most reliable description of the process. Aguilar-Savén's (2004, p.146-147) conclusion states that different techniques do not create a gateway to an ideal process. The business modeler supports them when he or she designs and manages the processes.

3.2.5 Test and alignment process to the overall process map

The last phase of process description is to test and align processes to the overall process map. The process is a part of the organization's process architecture. The process owner must ensure that the process interfaces operate with other processes and there are no separate processes. (Juhta 2002, p.6.) A second very important issue of this stage is to test the process and introduce it to the people, working on

it. They have to understand their role in the process and their tasks in order to achieve the objective of the process. They should also be given the opportunity to state their views on the process performance and the possible improvement ideas. A good way to introduce the process is to go through the process together with the people who are working on it and to test the process at the same time. (Laamanen 2001, p.96-98.)

4 BUSINESS PROCESS MANAGEMENT

The basic idea for business process management is that there is an organization that creates sufficient value for the client in relation to costs. This makes the ground for financial success possible. Process thinking focuses directly on action, and that is the reason why it differs from other management concepts. People are not asked to do more in process thinking, but rather to do something differently. (Laamanen & Tinnilä 2009, p.52-54.) According to Burlton (2001, p.73), business process management ensures continuous improvement in an organization's performance and it is itself a process. Business process management requires leadership and guidance, in the same way as any other process. According to these separate opinions, there are two different fields of leadership: process management and process improvement. Process management can only be operated on management level, and managers of a line organization deal with the organization's most important processes and key processes. The design of processes is the process owner's responsibility, in addition to functionality and efficiency of processes. It is also the owner's duty to set a developmental goal for processes. Changing daily work in the process is included in process improvement. If there is something, which has to change in order for it to improve, it is not possible to do so without changing methods. This may require development of work methods, co-operative relationships, information acquisition, competence, and information systems. Development is always possible without processes but it is not efficient or effective. (Laamanen & Tinnilä 2009, p.55.)

Nowadays, business process management focuses on business value creation via ongoing business process improvement and innovation, supported by business process management technology, which human resources use in the best possible way. Harmon (2007, p.xxvi) defines business process management via three separate levels, figure 9.

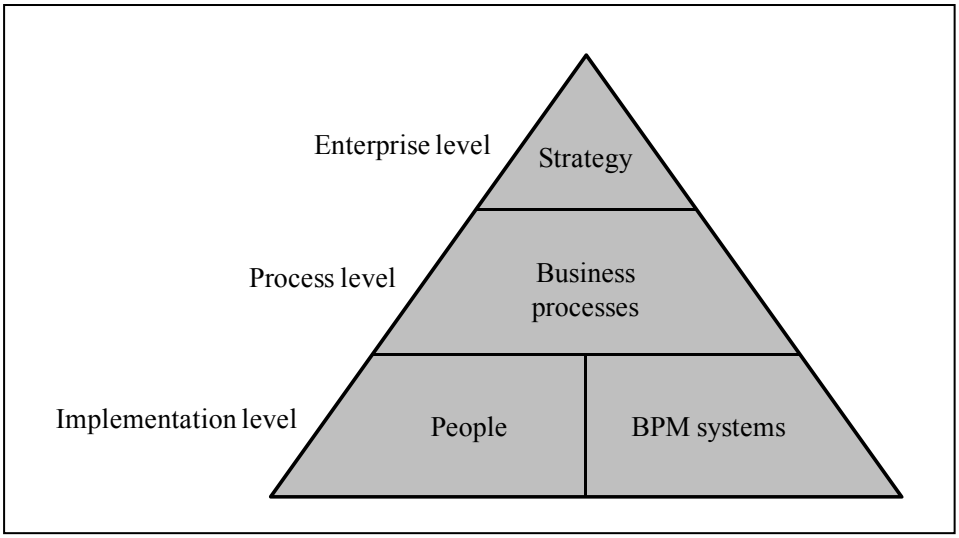


Figure 9. A holistic model of business process management. (Modified from Harmon 2007, p.xxvi.)

The levels consist of an enterprise, business process and implementation level. Harmon's opinion is that processes or activities at different levels require different participants, different methodologies, and different types of support. Strategy is part of the enterprise level. According to Marjanovic and Freeze (2012, p.182), strategy is realized through processes or, vice versa, the strategy gives a goal for processes. The strategy involves making choices, models or plans for what will be done now to ensure future success for the organization. At process level, improvement and changing business processes towards strategy is the main focus, in addition to developing new methods for process analysis and design. At the implementation level, there are technological and human resources, for support processes. The main focus of technological resources – different business processes systems – is on process standardization and process efficiency, achieved through automation. People are seen as supporters of a strategy-driven process.

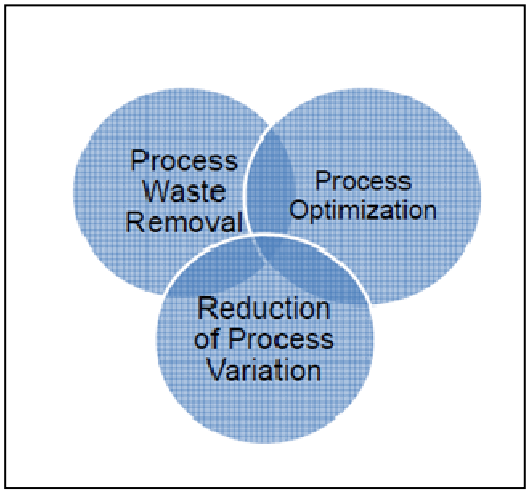


Figure 10. Business process mainstreams. (Plenkiewicz 2010, p.49.)

According to the view of Plenkiewicz (2010, p.49), there are three major mainstreams in business process management. They are shown in figure 10. Process waste removal means that business process management should be focused on activities, which have no value for the business, and these kinds of activities have to be reduced or totally eliminated. Process optimization or flow improvement is focused on the process flow improvement model to achieve optimal, smooth and economical flow of activities without obstacles and interruptions. Plenkiewicz's third item is reduction of process variation. The differences between outcomes of consecutive executions of the same process are a part of this item. The results will be slightly different every time we execute the process, even if the same people with the same equipment use them in the same sequence of activities, the same way.

The view of Jeston & Nelis (2008, p.9-11) states that business process management is an integrated part of normal management. It consists of more than just improving or reengineering business processes – it also deals with the managerial issues. Their opinion is that there is no finish line for the improvement of business processes and it is very important for leaders and managers to recognize that. In business process management, technology can be used as help but a significant business process improvement can be achieved without

technology. It is not just modeling processes; it also deals with the implementation, execution, and analysis of these processes.

Burlton (2001, p.74) has condensed a business process management into a few words: “Business process management is the never-ending journey to maintain a balance, keeping an organization pointed in the right direction.”

4.1 Continuous improvement

Different phases for process description are described in chapter 3.2. The next phase after the process description is very important for process thinking. That is continuous improvement, figure 11. According to Rampersad (2004, p.118), improvement means that existing things are done in a better way. This makes business processes more efficient and effective, and things run smoothly. Renewal is closely linked to the improvement. Things are going in a new direction when renewal is discussed. The key issue for renewal is to do the right things. Continuous improvement is successful when it is continuous.

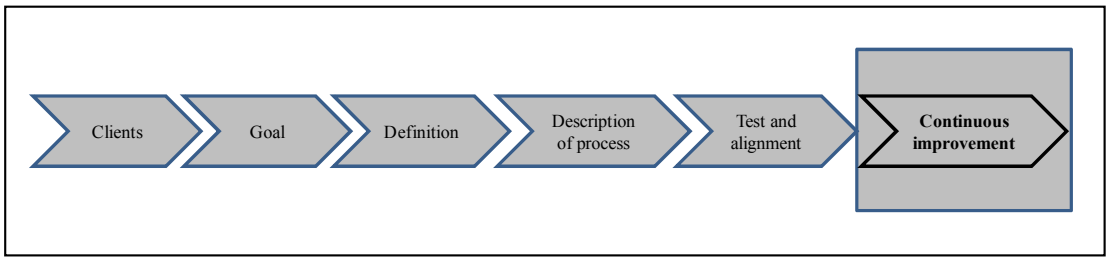


Figure 11. Continuous improvement.

The standardization of processes is an important step after process modeling. According to Liker (2008, p.142-143) and Rampersad (2004, p.138-139), process improvement is based on process standardization. The latter can be used to establish the best way to execute the process. This means that every time that a process is carried out, the means of working are the same and they are repeatable. If the process execution can vary each time, then each improvement is treated as a developmental variation. In that case, the development is not consistent and those

developmental steps are either taken to use or disregarded. Standardized process is also the basis for good quality.

Improvement is necessary. Clients of today know what they want and their requirements grow and grow. This means that the expectations have to be met or, even better, exceeded. This is to ensure the competitiveness of the company. Improvement and renewal is needed in order to maintain a good process performance level. If the process performance level cannot be maintained and continuously improved, competitors will get the clients. (Andersen 1999, p.7.)

PDCA-wheel is an iterative four-step management method, used in business for the control and continuous improvement of processes and products. It is also know as the Deming wheel. PDCA-wheel describes the cyclical development, which proceeds in small steps and will lead to the development of the processes. It is a philosophy in which the development is seen as a continuous chain of small changes. PDCA-wheel has four phases: Planning, doing, checking and acting. PDCA is formed from the first letters of these words. (Laamanen 2001, p.209-210, Rampersad 2004, p.143-147.)

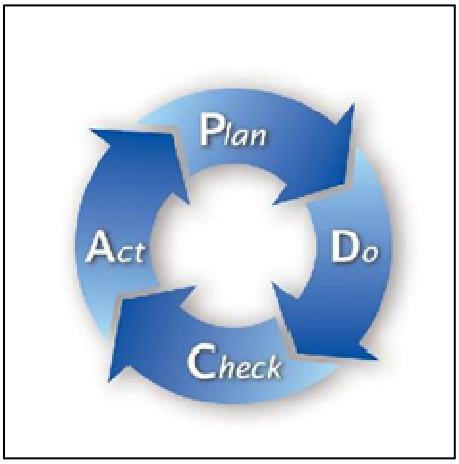


Figure 12. PDCA-wheel. (PDCA security.)

- Plan. When a problem occurs, make a plan to fix it. Improvement targets – ideas and theories on how to achieve these objectives, will determine it.

- Do. Implement the plan and execute the process. Start on a small scale to test possible effects.
- Check. Assess the impact of the tests and improvements by using different measurements and analyses. It is important to see if desired objectives or effects have been reached, so results should be compared to the expected results.
- Act. If the problem has been solved, a solution will be implemented. Necessary corrections are made and a new knowledge will be shared within the organization. It is important to update process descriptions.

After development and corrections, the next matter is taken into consideration and the spiral start, again, from planning. The improvement is a spiral process, and each round brings us closer to the goal. Thus fluctuations in the process are reduced, and results improved. PDCA-wheel aims at finding solutions to a current problem, not to all potential problems simultaneously. This makes the continuous learning idea easier to adopt. People who work in the process have limited knowledge but that knowledge improves during the spiral process. (Laamanen 2001, p.209-210, Rampersad 2004, p.143-147.) The advantage of small improvements is that they are normally quick and easy to implement – with visible results. This also provides the employees with a feeling that they are making a difference and a contribution to the organization.

4.2 Performance measurement

Performance measurement is used to measure issues, which are based on critical success factors and strategic objectives, and it is used to evaluate the performance of individual processes. Measures are keys to the implementation of strategic plans. When measures are correct and managers can control the activities of the organization in accordance to them, they give current signals to operation control. This is based on measurement of the changes in processes and the comparison of measured results and standards. This way, the performance measures will make

the organization´s vision and objectives measurable. (Laamanen 2001, p.149-152.)

Laamanen (2001, p. 152) as Lönnqvist et al. (2006, p.19) also state that performance is the ability of a measured object to achieve the desired goals. According to Brown (1996, p.3-10), these goals or targets have to be based on research – and not on arbitrariness or history. Goals may be based on, for example, a competitor´s or a benchmark company´s activities and how they are doing things. Goals should have a reasonable basis and they should be challenging but achievable. This way, employees will do their best and try to achieve the best results. Performance and performance measurement should also be linked to the organization´s key success factors, vision and values. These aspects should be extended to the organization´s important stakeholders, like owners, clients, company management, employees, and authorities. The goals of various stakeholders can be very different and that should be taken into account when performance measures are designed. Even if the goals of various stakeholders are different, they have to be linked to the organization´s overall success. First, it is important to design and define measures for the highest level of the organization and then flow down to all functions and levels. The measure of the one level should lead to measure at the next higher level and so on. This eliminates inconsistency and the disconnections of the measurement system. It should be critical with respect to the number of measures – the fewer the better. Only a few vital overall variables should be measured. Various measures can be combined into one overall result of performance. This helps an individual to control and manage results and activities. The maximum number of measures – that can be managed effectively – should be 20 overall indices. After the measurement system with its various measures have been created and implemented, measures and their usefulness must be continuously assessed. There could be changes within the company or in the environment surrounding it. Clients' needs may change and all these changes may affect to the measures. The organization must be ready to change measures according to the environment and strategy changes.

According to Laamanen (2005, p.166-168), there are two main aspects to be considered when designing process performance measurements. They are the purpose of the process and how this purpose can be measured, and the critical steps of the process and how their success can be measured. The most important factor of the purpose of the process is the client. One process may have many clients. When process measures are designed, it is important to choose a specific client and design a measure, which measures things for this particular client. One measure cannot be used for all clients in the process. A critical step for the process may be a step that requires a lot of resources, time and it contains high risks. The measurement of the critical step seeks to understand how the process should work and develops a process. This improves the performance of the process.

The process performance measurement may be related to all elements of the process, figure 13. The client measures can be divided into two categories: client related measures and measures, related to products or services for a client. Client related measures may include, for example, market share, client satisfaction, client loyalty, and the number of new clients. Client product and services related measures include, for example, price or quality of product or service and quality of client service. (Malmi et al. 2002, p.25-26.)

The inputs and outputs of the process can be measured. Measurements may be applied, for example, for the features or functionality of the inputs or outputs. The activity of the process and the use of resources may be subject to measurement. The measurement of the process can also be structured in what is measured. Performance measurement can be divided into the following themes: time, money, and quality.

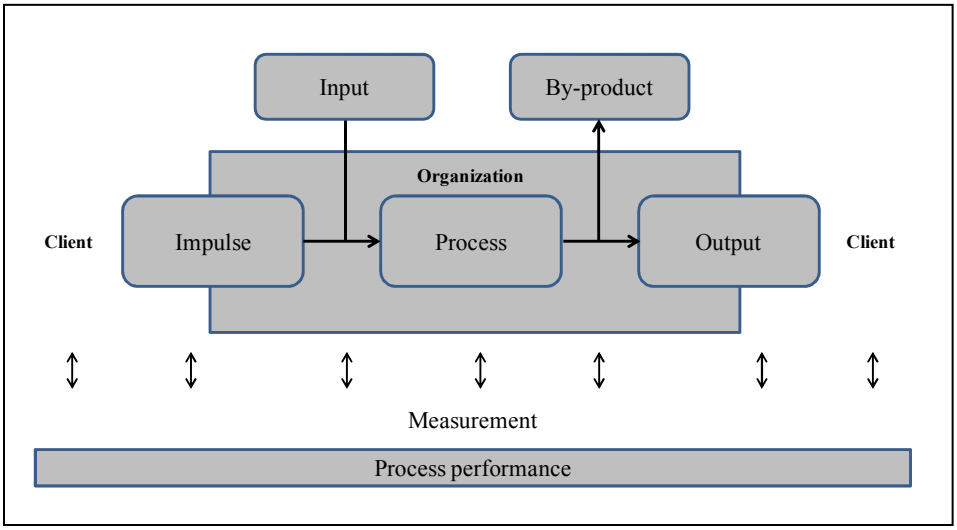


Figure 13. Process performance. (Combined: Tuurala 2010 and Laamanen, 2001, p.152.)

The cycle time of a process is one of the most common performance indicators for time. In addition, the exact delivery time and flexibility are commonly used indicators for time. Flexibility is related to, for example, the cycle time of changes. Money is connected to the cost of the process. Another indicator for money is capital, which is committed to the process. Qualitative indicators may be related to the output´s, product´s or service´s ability to satisfy needs and expectations. (Laamanen 2001, p.152-157.)

5 PROJECT CASH FLOW

5.1 Project business

According to Artto et al. (2006, p.17-19), project business is related to projects managed and goal-oriented activities. The objective is to achieve the company's goals. There are two different aspects to project business: the delivery of solutions and the development of them. The delivery of solutions can mean either the service or product, delivered to the client. The development of solutions can mean the development of a business. Such development will provide more value to clients, or the company's internal operation will be more efficient.

Silfverberg (2007, p. 21) defines a project as unique task assignments, where objectives are clearly defined and scheduled and the company has its own organization. According to Project Management Institute (2004, p.5), a project is a temporary effort to create a unique product, service, or result. The view of Artto et al. (2006, p. 26-27) states that a project is a time-limited unique entity, which has a predetermined goal, cost, and scope. A unique entity is formed together with complex tasks.

Artto et al. (2006, p.20-22) divides projects into two different categories: investment and delivery projects and research and development projects. They are two separate projects and two different project types of investment and delivery projects. Client executes the investment project. Client invests in the project and the product, which is the outcome of the project. The client seeks significant benefits from the investment. The client has their own project organization and project plan and they control and monitor the progress of the project. Client's project buys from contractor's project. The contractor executes the delivery project. The contractor creates and supplies a solution, which the client has ordered from the contractor. The contractor is interested in value for the client and the price for that. The greatest interest of the contractor is the cost-effective implementation of the project and how much profit they will gain from it. The contractor has a project organization and project plan of their own and they

monitor their own project very carefully. The investment and delivery project has common parts, also. A contract is drawn up between these two projects. There can be a common project plan and a steering committee, which consists of both parties. These help to support and manage work in both projects. The investment and delivery projects are shown in figure 14.

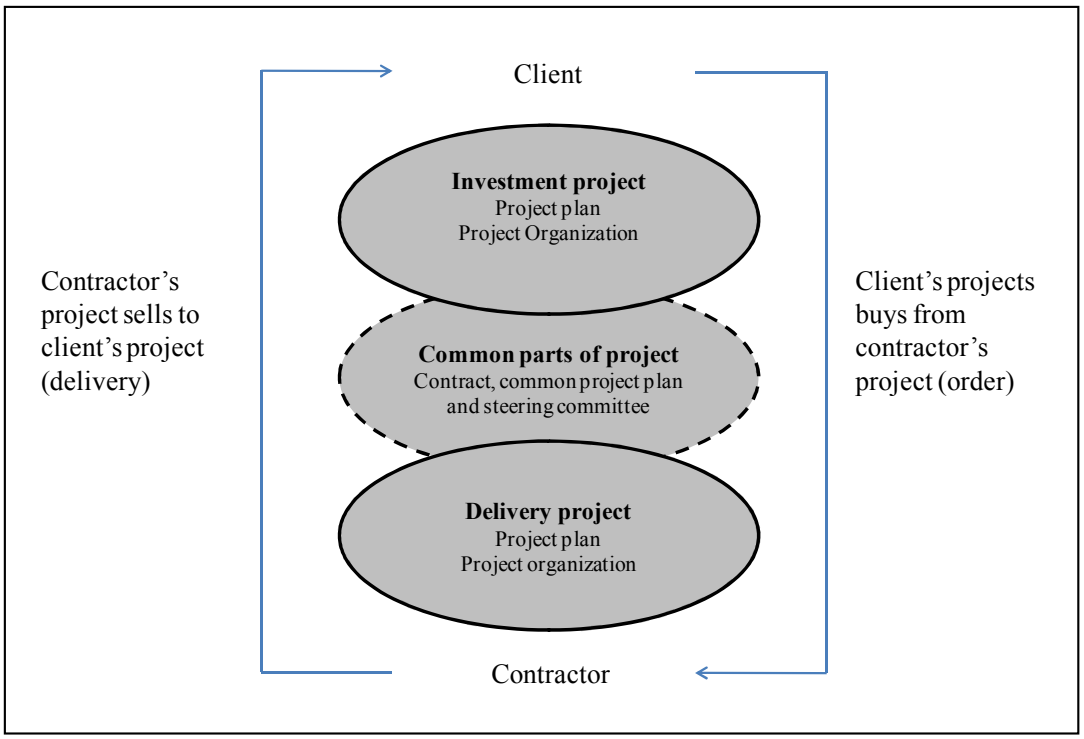


Figure 14. Investment and delivery projects. (Artto et al., 2006, p.21.)

Targets and results between research and development projects, figure 15, are different. The main target of the research project is to create new knowledge or find adaptable facts. Creating new products, services, solutions, capabilities and functionality or improvement are the main targets of development projects. This is done by using application of knowledge. The research projects are done on very uncertain areas and the results and benefits of projects are unknown. The uncertainty of development projects is lower than in research projects. The performance expectations and criteria for success of development projects can be determined more accurately. The common focuses for these two different types of projects are products or services, organizations or types of action, devices or processes, systems or human resources. (Artto et al. 2006, p.23-24.)

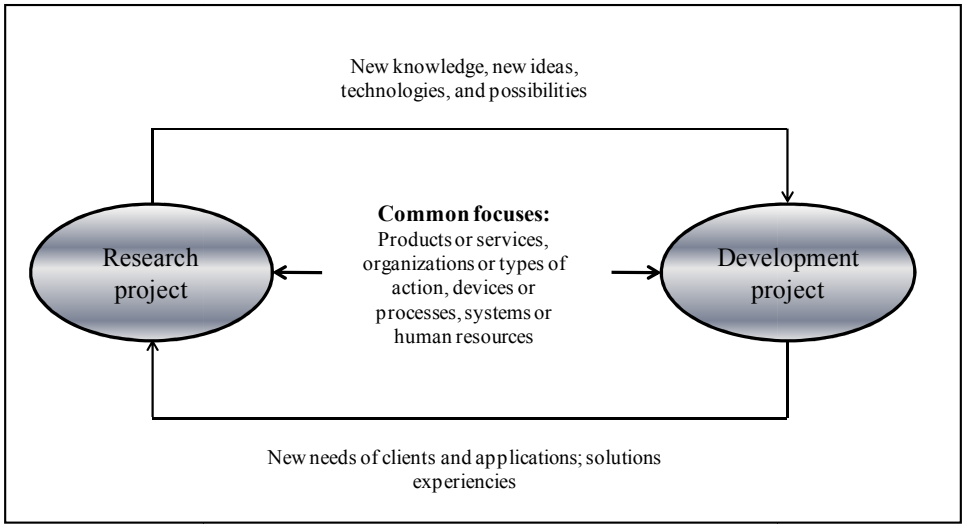


Figure 15. Research and development projects. (Artto et al. 2006, p.23.)

The case company of this research carries on a project business. It delivers products and services to the client. But at the same time, the company does research and development work to improve previous solutions and develops new solutions for the new requirements of the client. Sharing the project business or projects literally between delivery and development projects is not always possible because they affect each other. One project can include another types of projects, figure 16.

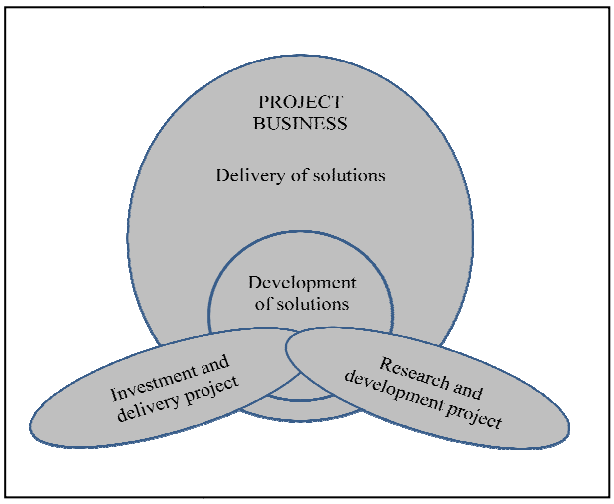


Figure 16. Project business.

5.2 Project cash flow

In a successful business, information about the future is the most valuable factor. Visions and views are things, which give the company a direction. The big problem here is the lack of methods to produce reliable information about the future. Typically, in many companies, future planning is based on accounting data. Company accounting gives information from the past and that is why accounting is not a useful tool for future decision-making. Accounting data is always received too late and it tells what should been done in the past. The most important task of accounting is to find out gain or loss for the accounting period, and the conventional method for that is budgeting. Through budgeting, companies try to foresee the book result and the financial status in the end of accounting period. But this is not a warning about liquidity crisis. Accounting gives information about the profitability of the company from a period in the past. But with this information, the company management is not able to forecast the future of the company. The best way to run a business is not based on accounting or budgets that are founded on accounting. (Eskola & Mäntysaari 2006, p.108.)

What are the company's success factors? There is a wide variety of opinions on this issue but most of them include cash flow. According to Hwee & Tiong (2002, p.351), during project implementation, cash flow is the most critical factor affecting profitability. Good operational performance in cash flow control and management impacts project management and project success significantly. Early knowledge of project cash flow trends should represent a critical advantage in terms of ensuring project, and through this, the whole company profitability. Whether we are referring to a small or large multi-national company, Jack and Suzy Welch (2007, p.107-109) view that cash flow, along with employee commitment and client satisfaction are the most important indicators of wellbeing in a company. Cash flow reveals the true state of the business and tells of the company's own empowerment: whether it can shorten a loan, return money to investors, or borrow more to accelerate growth.

According to Mäkinen (2012, p.31), there are three factors, which are very important in the economy of a company: profitability, liquidity and capital adequacy. They all depend on each other. A company receives income when it sells produced goods or services. Goods and services generate costs. The difference between incomes and costs is called profitability. Income statement reveals the difference of incomes and costs, and this is how profitability is measured. Capital adequacy is the relationship between a shareholder's equity and liability of the company. Capital adequacy is measured by the balance sheet of the company. There are two different sections in the balance sheet: assets and liabilities and shareholder's equity. Assets include the long - and short-term capital of the company. Assets and liabilities and the shareholder's equity are equal, so they are in balance. Liquidity describes the ability of the company to pay outstanding invoices and debts. The balance sheet is a very common way to measure liquidity but it is not the best way to do that. The balance sheet is only meant for the last day of the accounting period. Liquidity is a continuous transaction, and the best way to do that is by cash flow. Capital adequacy changes slowly, and a reasonable measuring time for that is a year. Profitability can be measured monthly. Liquidity changes all the time because the company sends charges and makes payments every day.

Deliverables, products or services, are the company's core business. A company produces deliverables to a client, who pays an agreed price of the deliverables. A company has to buy goods and services from suppliers to be able to produce the deliverables to the client. When a company buys products and services, it must pay the agreed prices to suppliers. The cycle of the company means that purchases are made prior to the sale. The money goes to the purchases before there will be money from the sale. There is a gap between outgoing and incoming money. This temporal gap will be fulfilled by the investments of investors. Later, when the business is running properly, investors will get their money back – in addition to interest, dividends or other income. A cash flow in the cycle of the company is described in figure 17. (Mäkinen 2012, p. 28-30.)

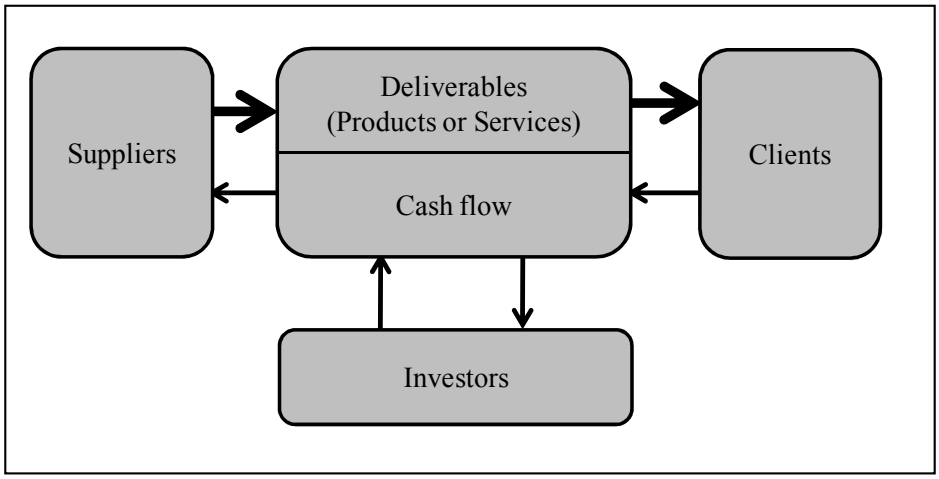


Figure 17. Cash flow in the cycle of the company. (Mäkinen 2012, p.28.)

5.3 Components of project cash flow

A cash flow describes the difference between cost and income. It simply tells how much money a project will get and how much money it will lay out by paying payments and timing different payments. If cash receipts are greater than the expenditure paid in cash, cash money has accumulated a profit. It is easily completed from a clear overall picture of the profitability of the project. The main elements of the project cash flow are income, cost and net cash flow. A budget, actual and forecast is made for all these elements. The best way to understand cash flow is to present it as a graph. There is an example of cash flow in figure 18. There is a monthly time line in the x-axis. The y-axis refers to euro amounts. Different terms are used in figure 18 than those that are used in other parts of this research. Disbursed means cost, receipts income, plan budget and fcst means forecast.

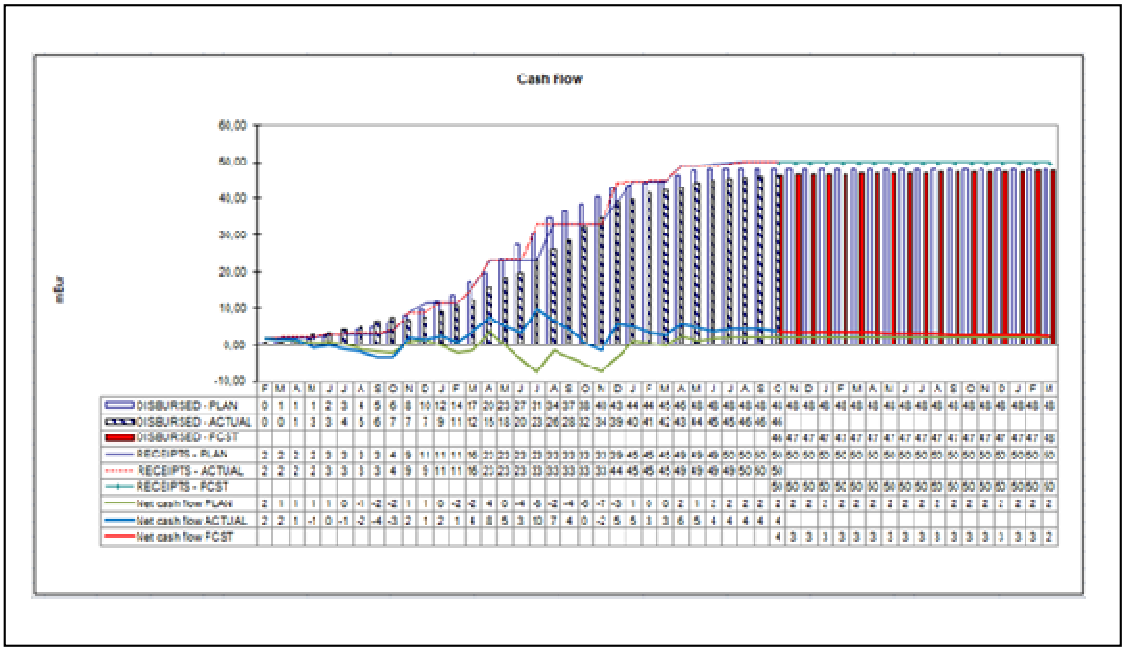


Figure 18. Cash flow graph. (Case company's material.)

Income

Income comes from sales. A client will pay compensation to a company for any products or services, according to the contract. From a cash flow point of view, the most important part is the payment; transferring into the company's account, figure 19.

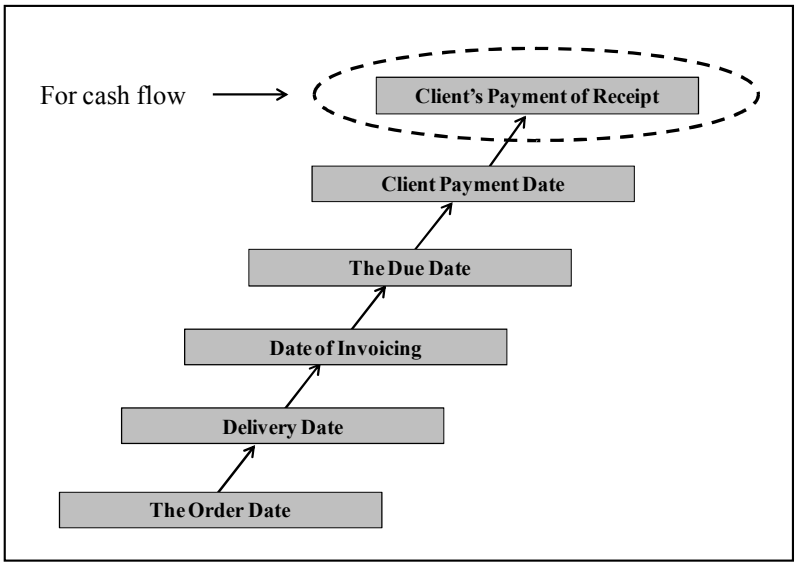


Figure 19. Cash flow income. (Leppiniemi & Puttonen 1996, p.33.)

Cost

The project cost includes all purchases, products or services from suppliers, the company's own staff work, travel expenses, and project contingency reserves. Project contingency reserves include cost for risks, estimation errors, and warranty period. The project cost includes other costs also, for example, insurances and differences in exchange rates, if these costs relate to the project. When a company pays the suppliers' purchase invoice, figure 20, or for a staff member's travel expenses, is the most important to cash flow. A staff member's work will be liquidated by the time, when work has been reported to the project, figure 21.

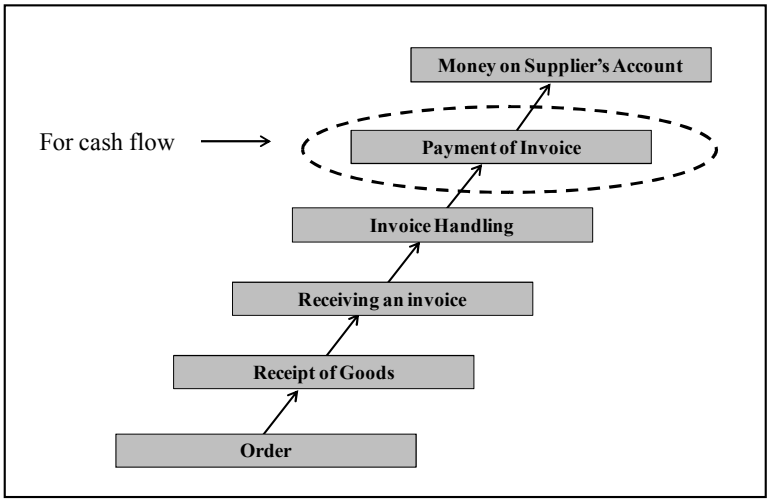


Figure 20. Cash flow cost – purchase invoices. (Leppiniemi & Puttonen 1996, p.34.)

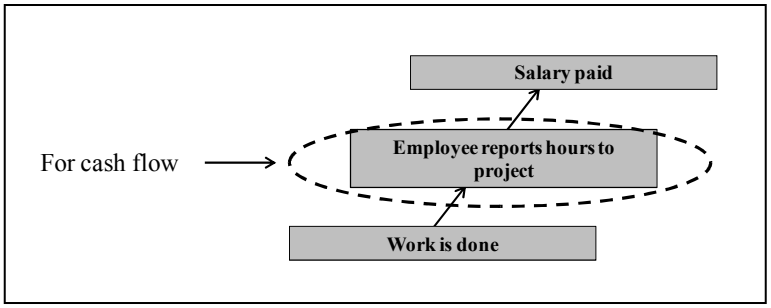


Figure 21. Cash flow cost – project hours.

Net cash flow

Net cash flow is taken into consideration when payable invoices are deducted from receivables from the client. Net cash flow tells you how much extra money or the lack of money the company has at any given time. If there is a shortfall in cash, plans can be made on how to get the money to cover all payments. If there is a lot of extra money in cash funds, plans can be made on sensible investments or other usage in that point in time.

Budgeted cash flow

Project cash flow is based on a project budget. The project budget includes both cost and income. The project cost budget has been scheduled by the project schedule and income, according to the payment milestones of the contract. The first payment milestone is often related to the signing of the contract. There are typically many payment milestones during the project and their payment time is related to a certain completion level of the project. If payment milestones and the work completion level are not balanced, the supplier's project funds client operations or the client funds the supplier's project. Cash flow is based on accruals of the cash receipts and cash disbursements. (Pelin 2008, p.177.)

Actual cash flow

Actual cash flow tells when the company is being paid purchase invoices and other costs, and the time when staff members have finished their work and reported their working hours to the project. It also tells when payment is received from the client. This is information from the past and that won't change.

Forecasted cash flow

Forecasted cash flow is the future. It will tell you when to pay bills and, respectively, when get the money from the client in the future. The forecasted cash flow is based on a budget. During the project, however, situations may arise where the budgeted cost has to be changed. For example, a purchase is more expensive than had been budgeted and there is a change in the payment schedule. These changes are told by the budget figures. This will create a project cash flow forecast.

5.4 Cash flow forecasting

According to Hedman (1992, p.19), a company's success requires operational and financial know-how, so the cash flow and its provided information is important. The purpose of a company's cash flow control is to think ahead at all the times. Good forecasting is just as important as the ability to influence future results.

The main functions to predict the future are trend detection in advance, to identify the threats and opportunities, to question the prevailing assumptions and anticipate corrective actions. The defined targets are checked on a regular basis. Listed actions make it possible to step in before they cause problems. According to Leppiniemi & Puttonen (1996, p.30) and Järvenpää et al. (2010, p.250-255), the most important factors for cash flow management are rolling forecasting and a regular reporting of cash flow. The rolling forecast is a process for controlling the project. It allows users to get new strategic information from outside and also from inside the project to be used in the project. Rolling forecasting is projected to the project schedule and costs on a regular basis. During the project, its development can be continuously anticipated, according to new knowledge on what should and could be done to improve the cash flow. The project budget remains fixed, it is changed only in the forecast, when compared to the budgeted data. The management of the company monitors the achieved results and forecast.

The project team will monitor implementation and think of actions for future changes. The advantage of the rolling forecasting is that the future is under control. Company management will improve their understanding of economy when cash flow forecasts are updated continually and regularly. It will also improve the whole process of the company's financial management.

According to Leppiniemi (2009, p.167-174), the ultimate purpose of cash flow forecasting is to optimize the existence of money in company control as long as possible. The payment of the sale should be in the company's account as soon as possible. The aim of procurement is to keep money within the company for as long as possible. This way, the company can plan to invest money and get interest income or it can pay debts and reduce debt costs. Large investment also requires financial planning – cash flow forecasting will help in this case, too.

6 CASE STUDY

6.1 Company introduction

The company of this case study is part of a global company group. It is a global engineering and construction company and power equipment supplier, delivering technically advanced and reliable facilities, as well as equipment. The company designs, manufactures and erects a full line of boilers and environmental products for utility, industrial, and cogeneration clients. Aftermarket services like boiler maintenance and outage construction are included in the business of the company, as well as boiler training. The market areas of the company include Nordic Countries, Central Europe, South America, and Asia. The personnel in Finland consist of approximately 500 people. Subsidiary companies in Sweden and Germany consist of approximately 30 people in total. Revenue of the company was 187 million euro in 2013. The parent company is located in the United States.

As the company has branches around the world, it is very important to get compact information about the business. Company management needs recent economic figures, which help them to react quickly to economic changes. The economic data has to be in intelligible form – this helps the company management to understand it correctly. Decisions are made in various situations and for this reason, the economic data should be accessible everywhere and always available. Correct, compact, reliable, and quick data transmission is a basic element of a successful business. For these reasons, the company standardizes its systems. There is an ERP-project (Enterprise Resource Planning) going on within the company. This means that both the parent company and its subsidiary companies will use the same system in the future. Functions, using the same system globally, include finance, procurement, and project management. The main functions of the case company are described in figure 22. Project management, procurement, finance, and a part of human resources will use the same ERP-system in the future. Today, all these functions have their own separate systems. The problem between separate systems is that data transmission always occurs with time lag. For example, if the procurement department enters an order to the procurement

system today, the cost management will not see it in their system before tomorrow. The data is not real-time. There is also a bigger possibility for incorrect data transmission between separate systems. Interfaces do not work properly and thus the data is not reliable.

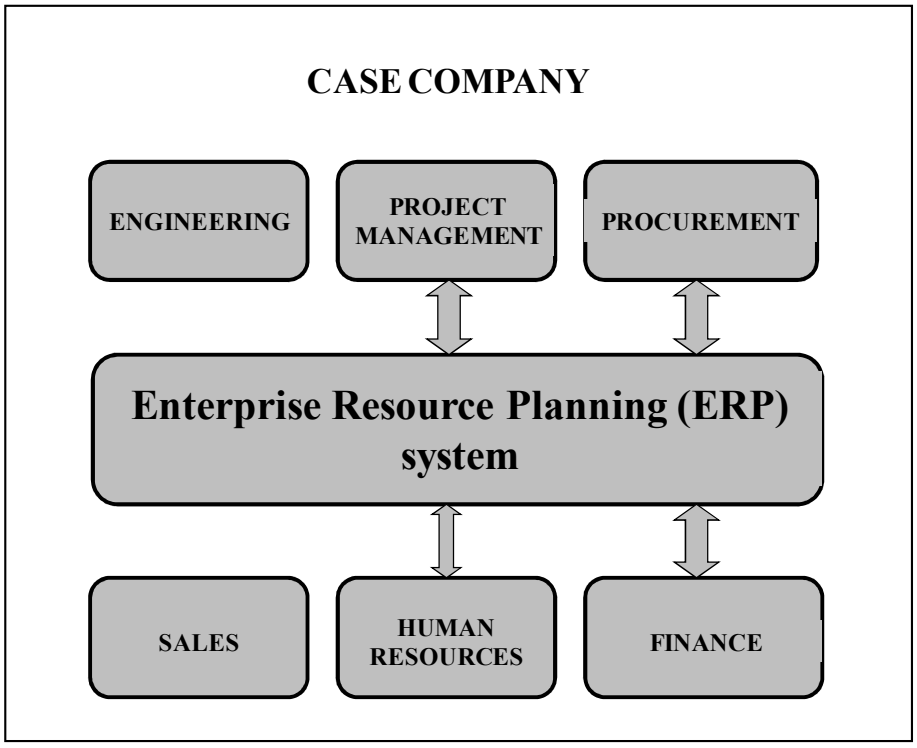


Figure 22. Main functions of the case company and ERP-system.

Current main applications of the case company are described in figure 23. The new ERP-system will replace procurement, accounting, project cost systems, and purchase invoices. Project cost management system has been used by the project control department, which belongs to project management functions. Accounting system is for finance functions. Finance functions include accounting and treasury departments. Purchase invoices are also processed in the finance functions by the treasury department. The procurement department uses a procurement system.

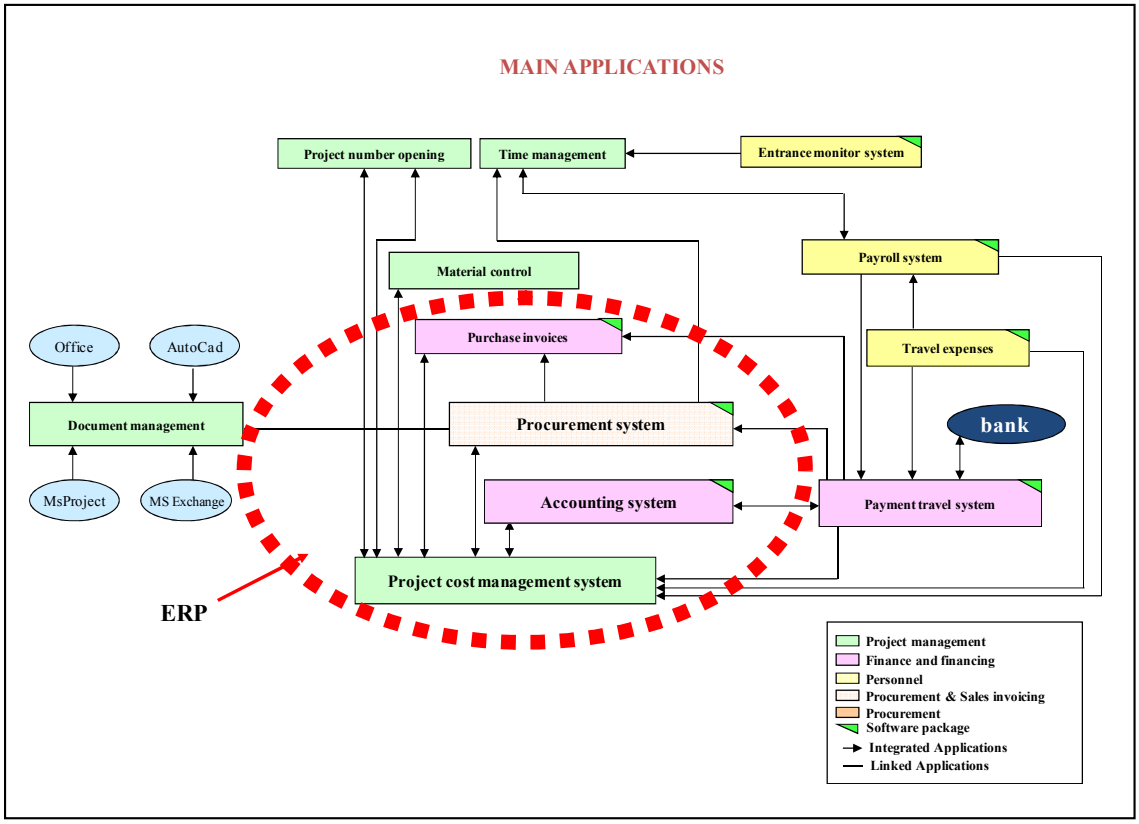


Figure 23. Main applications of the case company and applications, which will be replaced by a new ERP-system.

Projects of the case company are very different. They range from small modernization and repairing projects to large power plant projects. Project duration varies from a few months to a few years and project costs vary from a few hundreds of thousands of euros to hundreds of millions of euros. The case company has been divided into two different divisions: new business and services. New business takes care of new, large projects and modernization and repairing projects that belong to service division.

The project control department controls and monitors the cost and time schedule of projects. They set up the project baseline budget for costs and the schedule. They also maintain forecasts for costs and schedule, monitor the changes, and analyze their impact on costs and schedule. Project reporting to the management is also one very important duty of the project control department. Their role is to

support project-related decisions of the project manager and the project team during the project. In the project control department, there are three different roles: project control manager, project cost controller and project scheduler. The organization chart is described in figure 24. The project scheduler creates and controls the project schedule. The project cost controller creates project cost structure and budget to the ERP-system and maintains and updates figures in the system. The project control manager collaborates with a project manager and project team and he shall be assisted them on project schedule and cost issues. Project control manager prepares, together with cost controller and scheduler, project reports for management.

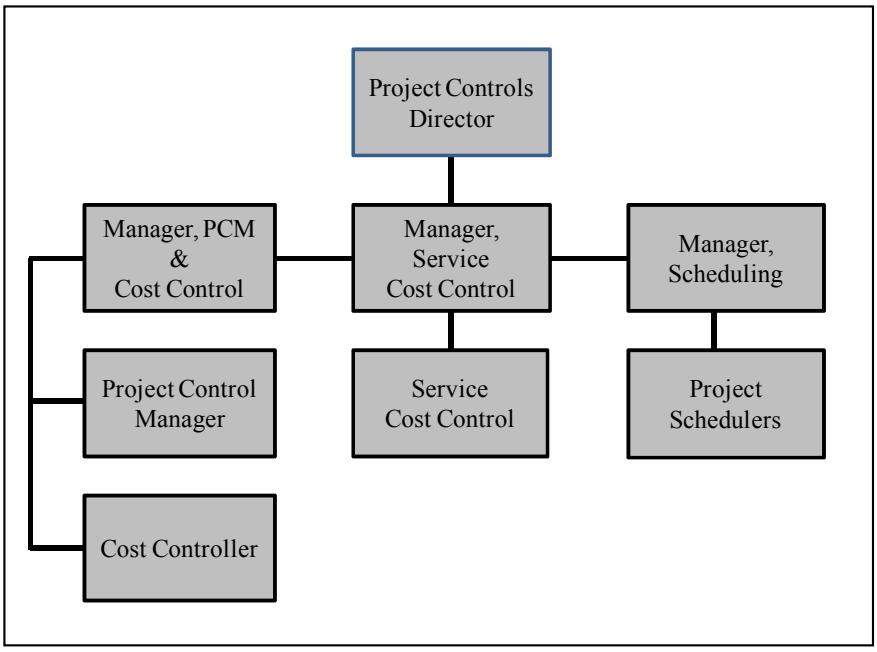


Figure 24. Organization chart of project control department.

Project cash flow

The project control department creates and maintains project cash flow and reports to the company management. The current project cost management system provides the project cash flow information to be seen directly from the system. The new ERP-system does not allow scheduling of project costs and income.

Cash flow information is not available directly from the new system, either. That is why there is a need to develop a new way to make cash flow information.

The project cash flow includes project costs and income. There is a cost structure for project costs and the cost structure is based on cost codes and cost types. All costs of the project have been divided into different cost codes. Cost codes have also been divided into different cost types. The case company designs boilers and these boilers are composed of different parts, for example furnace, superheater, and separator. All the above-mentioned parts have different cost codes. One cost code, furnace, for example, has different cost types. Cost types could be materials, manufacturing and design. The project income is defined by a contract, and the client and the case company agree its payment milestones.

6.2 Project cash flow description

6.2.1 Client

Project cash flow process has many potential clients. Potential clients are listed below:

- Project control department management
- Project control department employees
- New employees
- Project manager
- Project team
- Company management
- Finance department
- Treasury
- Estimating department
- ERP project team

The output of the process refers to project cash flow. The by-product of the process is the staffing plan for each project. Project control department

management requires knowledge of the process, as well as the process description for resource planning, both the resource planning of the department and the company capacity planning, familiarization, project reporting and confirmation that cash flow information is based on accurate information. This means that all information related to cash flow is involved. The process description helps project control department employees to understand how the process goes forward and what the inputs are. They need cash flow and staffing plan data when they prepare project reports. In addition to current employees, new employees are also easily familiarized with the process via a process description. The project manager receives project cash flow as an output of the process for project reporting. The project team will also benefit from the cash flow information. The team can, together with the project manager, use that information, for example, when they are changing suppliers´ payment terms. Staffing plan is an important tool for project managers and the project team. It allows them to monitor and control the manpower of the project. Company management uses staffing plans, too, for company level capacity analysis. Company management needs cash flow information when they report the status of the projects forward. Finance department uses cash flow data for budgeting and forecasting reports and treasury for company level cash flow forecasting. Estimation department may use both cash flow and staffing plan data for estimating future projects. Cash flow and staffing plans are important tools for the project control department, the project team and the company management to control and monitor the company's operations. ERP project team uses process description for defining ERP system.

6.2.2 Goal

The main goal of the process is learning. A process description is particularly important to the whole project control department, because cash flow is done in a new way. It would be very difficult or perhaps even impossible to understand how the cash flow should be done if the process is not described. When the knowledge of the process increases, it can be developed and improved. This will increase the efficiency of the process and helps to achieve cost savings. In addition the

objective of the process is to generate reliable information. The success factor of the process is that description is realistic, logical and understandable. It can be an effective communicational channel with clients. It can be used to make quick, practical improvements in the process and even before the clients understand to request them. Table 2 is a summary of the clients and what are their purposes and goals for the process.

Table 2. Clients and their purposes and goals for the cash flow forecasting process.

Client	Purpose	Goal
Project control department management	Resourcing, familiarization, reporting, controlling	Learning, cost savings, reliable information
Project control department employees	Familiarization, reporting, controlling	Learning, cost savings, reliable information
New employees	Familiarization	Learning
Project manager	Reporting, controlling	Cost savings, reliable information
Project team	Reporting, controlling	Cost savings, reliable information
Company management	Resourcing, reporting, controlling, budgeting	Cost savings, reliable information
Finance department	Budgeting, forecasting	Reliable information
Treasury	Forecasting	Reliable information
Estimating department	Estimating new projects	Reliable information
ERP project team	Determination of ERP	Learning, reliable information

6.2.3 Definition

The aim of the process definition is to agree on what the process contains. The main things in definition are: Clients, inputs, outputs, the beginning, and end of the process and process owner. In this case, the main clients of the project cash flow forecasting process are project control department management and employees, as well as the project manager and project team. Clients give an impulse for the process. Project control department employees need to understand how the project cash flow forecasting process is done in the future with the new system. This helps the management of the department to plan what and how many

resources are needed. Project team, together with project manager, needs cash flow and staffing data for project reporting and controlling.

The inputs of the process are a project budget for euros and hours and timing for them. Basic information is also important information for the project initiation phase. The outputs of the process are project cash flow forecast and staffing plan. In addition to these, one output is the description of the process, which the project control department needs for learning. It is essential to define the beginning of the process. What happens before the process? Prior to the determination of the project and its cash flow, the project must be sold and, the same time, the project budget must be prepared. These processes take place right before the project execution. After the project cash flow process, the company-level forecasts for cash flow and capacity, and reports, can be prepared. The definition of the project cash flow forecasting process is been shown in figure 25. The process owner is the director of the project control department. All this information can be saved in the process basic information form, appendix 1. Other things can also be added, for example, the purpose of the process, key resources, success factors, and process measures.

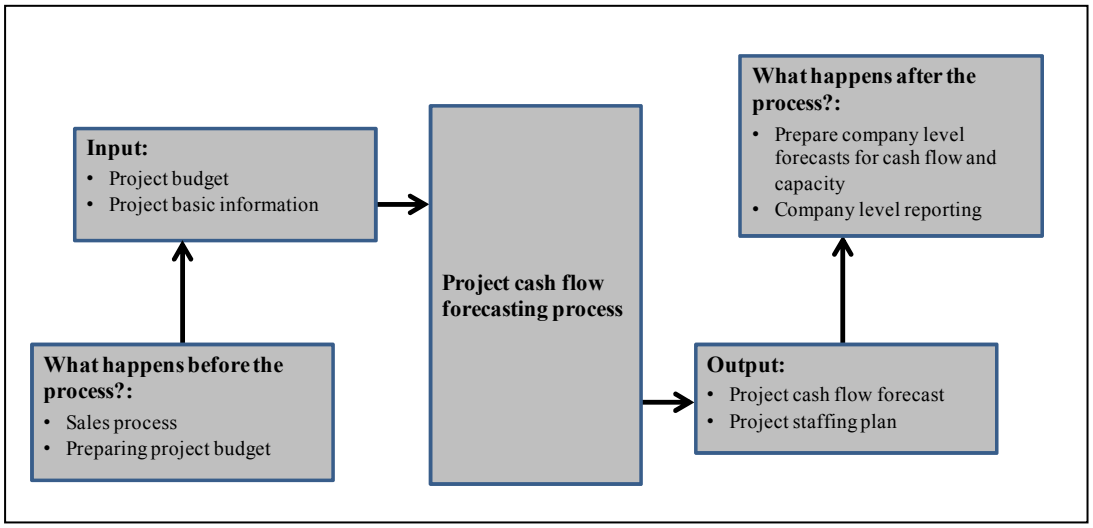


Figure 25: The definition of the project cash flow forecasting process.

6.2.4 Description of process

The first step of the process description is to decide the description level. The project cash flow forecasting process description is done mainly for learning and familiarization purposes. That is why the description has to be more detailed than it would be only for management level needs. When the level of the description is decided on, the process modeling will start by describing the as-is process.

Different description methods have been used in this research. All these methods are not necessary for all cases. Table 3 contains various descriptions for both as-is and to-be processes.

Table 3. Various descriptions for as-is and to-be project cash flow forecasting processes.

Description of the process	As-is process	To-be process
Process basic information form	Appendix 1	Appendix 1
Process steps	Appendix 2	Appendix 3
Flowchart	Appendix 5	Appendix 6
Written description	Paragraph 6.2.4 – Current stage of project cash flow process	Paragraph 6.2.5 – New process for project cash flow
Workflow	-	Appendix 7

The basic information form of the process has already been completed in the process definition phase. Because it contains general information about the process, it can be used for both processes. The next phase is to list process steps and functions that are carried out during the steps. They are in chronological order. According to the process, the list of different steps is the best to start by drawing out a flowchart. The process steps list can be more detailed than the flowchart. The process steps list does not have to be included in the final description, it is only a tool for making flowcharts. A written description supports the flow chart, and it is included in the final description. Workflow is more detailed and it describes the project cash flow forecasting process from the cost controller´s perspective.

Current stage of project cash flow process

As-is process flow for project cash flow forecasting is shown in appendix 5. At the initiation phase of the project, cost controller opens the project number and the cost structure for the project in the project number opening system, after which the data transfers to the project cost management system. The budget information is received from the estimation department. The estimation department creates the budget for the given project and sends it to the project control department. The budget includes both costs and income of the project, and also the timing for both of them. The budget is laid out in an excel-file, and the cost controller uploads it manually to the project cost management system.

The project cost management system includes both project costs and income. There is a budget, a forecast and actual for all cost code and cost type combinations, and also for the income. Timing is defined for both costs and income, and it is done on a monthly basis.

At the execution phase of the project, the procurement department enters purchase orders to the procurement system. Purchase orders with amounts and installments transfer automatically to the project cost management system. Actual payments, purchase invoices, pay premiums, and travel expenses, transfer automatically, too, from the payment transfers system to the project cost management system, including actual hours from the time management system. Data of the actual hours transfer to the project cost management system once a week, other data transfers from separate systems to the project cost management system on a daily basis. Invoice department, under the finance function, takes care of sales invoicing of the project. They send an updated invoicing schedule (an excel-file) to cost controllers who, manually, update this income information to the project cost management system. In the project execution phase, the forecast of the project cost will be changed. These changes are recorded by change requests, which the project team have entered. Change requests are excel-files and data from these

excel-files are transferred manually to the project cost management system by cost controllers.

The updating of the project cost management system means that cost forecast, amounts and timing, have to be updated according to actual costs, purchase orders, and change requests. The updating work requires a lot of manual work. Every cost code and cost type combination and amounts and timing have to be checked and updated. There can be approximately 200 cost codes in one project. One cost code has 3–5 cost types on average. About 1 000 lines are divided to the duration of the project. The duration of one project is normally two years. A cost controller updates a project for approximately one working day every month. When all amounts and timing under cost code structure have been updated, the project cash flow information is ready and it can be run from the system.

New process for project cash flow

Project cost management; procurement and accounting systems, and purchase invoices will be replaced by the new ERP-system in the future. There are two different working phases in future cash flow forecasting. The first phase is to generate basic information of cash flow and the second is to produce the cash flow. The first phase refers to an ERP-system that creates a project, uploads the budget for that, updates current budget, and forecast changes for the project. At the same time, other functions have their own tasks in the system. The second phase refers to gathering all necessary data and putting it together in an excel-file, which is uploaded to the project forecast system.

To-be process flow for the project cash flow forecasting is shown in appendix 6. At the initiation phase of the project, the project cost controller opens project numbers in a project number opening system. This data transfers directly to the ERP-system. Cost structure, cost codes, and cost type combinations for the project have already been defined in the estimation department. Project budget data,

including the cost structure, will be received as an excel-file from the estimation and cost controller who uploads it to the ERP-system.

At the execution phase of the project, the procurement department enters purchase orders directly to the ERP-system, and the information of orders is immediately at the use of other functions. The invoice department enters income data, amounts, and dates for payments to the ERP-system. This information is also usable straight away. Actual payments, purchase invoices, pay premiums, and travel expenses transfer automatically from the payment transfers system to the ERP-system – as well as actual hours from the time management system. Human resource maintains employee data in the ERP-system. Change requests for forecast changes are in excel-files and this information is updated manually to the ERP-system by a cost controller.

A new reporting tool with an ERP-system will also be implemented. A reporting tool is integrated into the ERP-system and all data, which is in the ERP-system, is intended for the use of this reporting tool. There is also a possibility to run different reports from the ERP-system, but these reports have to be designed and defined into the system by the system supplier. The reports from the reporting tool can be designed and defined by users. The reporting tool gives lots of possibilities and flexibility to draw out different reports for different purposes.

In the second phase, the cost controller will create a project cash flow forecast. Within a budget, which the estimating department gives to project control, is a separate excel-file, which includes a cost code structure with budgeted amounts and timing. Project manpower will be monitored by a staffing plan. Budgeted hours by cost codes with timing will also be received from estimation.

For the current budget and forecasts, the cost controller runs different reports from the reporting tool. Purchase order data includes open order amounts and payment dates for them. Open unpaid vouchers mean vouchers, which have been received and booked to the system but not paid yet. Open unpaid vouchers have released

the commitment of purchase orders. Paid vouchers have been paid and they have also released the commitment of purchase orders. The third report from the reporting tool is an actual cost and hours report. It contains paid pay premiums, travel expenses and the cost of hours, as well as the quantity of hours. This same report is used in addition to a staffing plan. Project income contains the client's payments and their timing.

The current budget and forecast changes report is used both for the staffing plan and the project cash flow forecast file. The cost controller creates this report. The project scheduler supplies earned value information – this is not needed for project cash flow forecast, but the finance department uses it in their forecasting reports and, therefore, it will need to download the forecast system. All files are in excel-format.

All these different reports will be updated to the project cash flow forecast file, which is also an excel file. The cash flow graph is received from the project cash flow file. That is needed for project management reporting. Example of a cash flow graph is seen in figure 18. After that project cash flow forecast is ready for project control purposes. There is still one step in the process. Project cash flow forecast file is uploaded to the project forecast system by the cost controller.

The real project cost forecasting and cash flow forecasting take place in excel files before they are uploaded to the project forecast system. The project forecast system is where cash flows of all projects are found within the same system. This data is needed for the cash flow of the whole company and its planning, monitoring, and forecasting. This will especially aid the work of the finance function, which is responsible for company level cash flow. Today, the company level cash flow is done manually, by gathering all necessary data onto the excel-files. The parent company uses this project forecast system, as well. Different reports are requested by the parent company and, often, these reports are needed very quick. In the future, these reports can be run immediately because the data is in same format and system that they are using.

Actual payments data will transfer directly to the project forecast system from the ERP-system. This allows us to check detailed actual payments from the project forecasting system – whereas, through a project cash flow forecast excel file, it would be only a lump sum.

6.2.5 Test and alignment process

The first thing in the testing phase is to go through the process. The test group can form a couple of project cost controllers, who make the project cash flow forecasting. Before the test, the process is introduced to them by using the to-be process flowchart and after that they go through the process. The process can still improve in accordance with the tester's opinion and improvement ideas. After the test, the new project cash flow forecasting process is introduced to the all employees of the project control department by using the to-be process flowchart. They can give their views on the process performance and the possible improvement ideas. The process can go through the whole department employees, at least the cost controllers, because they make the project cash flow forecast. The process owner, the director of the project control department will also check the compatibility of the new process to other processes. The ERP project team also tests and aligns the new project cash flow forecasting process to the overall process map.

6.3 Project cash flow forecasting process measurement

Project control department's goals for the project cash flow forecasting process are cost savings and reliable information. Cost savings can be achieved by increasing efficiency and this requires that cycle time of the process may be shortened. The outputs of the process, cash flow and staffing plan, must be reliable and this means that produced outputs are based on high quality information. Measures for the process measurement are relating to the time, cost, and quality. The actual measurement of cycle time with the clock could not be done, because the old systems were no longer in use. That is why the

measurement data is based on interviews, conducted with project control department employees. Interviews are based on questions, which are shown in appendix 8.

6.3.1 Project cash flow forecasting - time

An average example project is drawn up to indicate cash flow forecasting cycle time measurement – the basic information is as follows:

- 200 cost codes
- one cost code has about 5 cost types
- total 1000 lines
- the duration of the project is two years
- updated 1000 lines monthly per two years

The cycle time measurement concentrates on normal monthly updating work. It does not include the establishment of the project and budget downloading work.

As-is process

The as-is process of project cash flow forecasting begins when a cost controller starts to update project costs and income forecasts in a project cost management system. The figure 26, marked with a red, indicates the point of the process, during which updating takes place. The process ends when the cash flow forecast is complete. One cost controller needs one working day for updating one project. One working day is 7.5 hours. This requires intensive work input all day, (normal breaks, 2 coffee and 1 lunch breaks are taken into account). This does not include time to analyze the costs, only hard work. There is a view of the cost management system in figure 27. Estimate column is the point, which is updated according to actual and ordered columns. Cash flow information is created according to the estimate column.

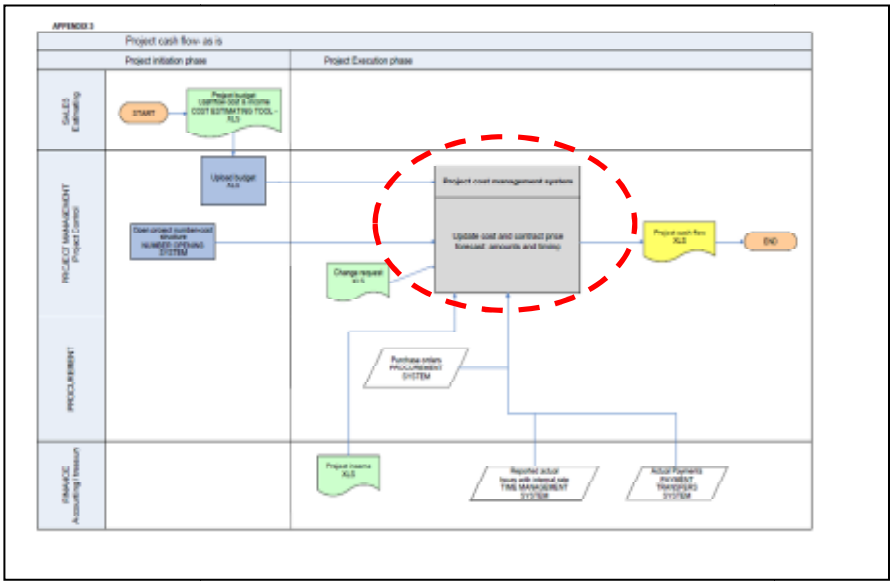
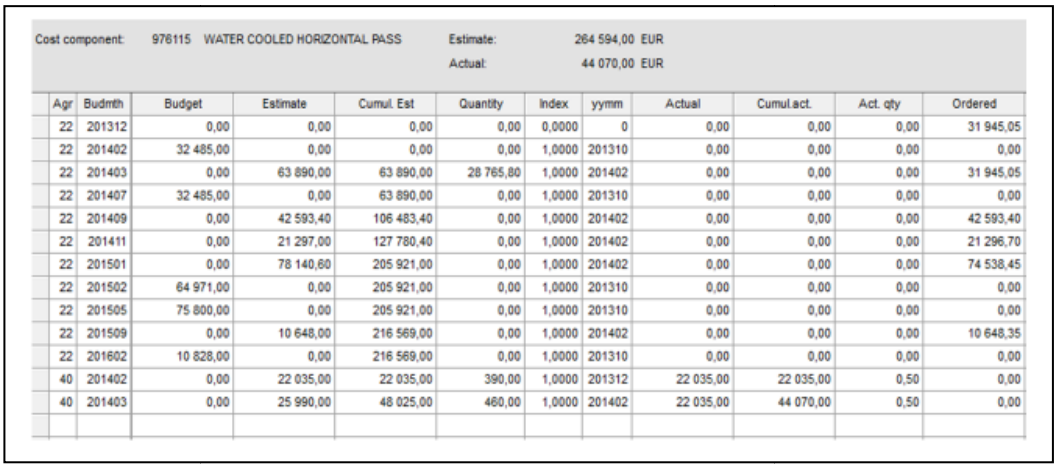


Figure 26: The point of the project cash flow process during which the updating work is done in the as-is process. (Appendix 5. Flowchart for as-is cash flow process.)



Cost component: 976115 WATER COOLED HORIZONTAL PASS Estimate: 264 594,00 EUR
Actual: 44 070,00 EUR

Agr	Budmth	Budget	Estimate	Cumul. Est	Quantity	Index	yymm	Actual	Cumul.act.	Act. qty	Ordered
22	201312	0,00	0,00	0,00	0,00	0,0000	0	0,00	0,00	0,00	31 945,05
22	201402	32 485,00	0,00	0,00	0,00	1,0000	201310	0,00	0,00	0,00	0,00
22	201403	0,00	63 890,00	63 890,00	28 765,80	1,0000	201402	0,00	0,00	0,00	31 945,05
22	201407	32 485,00	0,00	63 890,00	0,00	1,0000	201310	0,00	0,00	0,00	0,00
22	201409	0,00	42 593,40	106 483,40	0,00	1,0000	201402	0,00	0,00	0,00	42 593,40
22	201411	0,00	21 297,00	127 780,40	0,00	1,0000	201402	0,00	0,00	0,00	21 296,70
22	201501	0,00	78 140,60	205 921,00	0,00	1,0000	201402	0,00	0,00	0,00	74 538,45
22	201502	64 971,00	0,00	205 921,00	0,00	1,0000	201310	0,00	0,00	0,00	0,00
22	201505	75 800,00	0,00	205 921,00	0,00	1,0000	201310	0,00	0,00	0,00	0,00
22	201509	0,00	10 648,00	216 569,00	0,00	1,0000	201402	0,00	0,00	0,00	10 648,35
22	201602	10 828,00	0,00	216 569,00	0,00	1,0000	201310	0,00	0,00	0,00	0,00
40	201402	0,00	22 035,00	22 035,00	390,00	1,0000	201312	22 035,00	22 035,00	0,50	0,00
40	201403	0,00	25 990,00	48 025,00	460,00	1,0000	201402	22 035,00	44 070,00	0,50	0,00

Figure 27: The view of the cost management system.

To-be process

The to-be process of the project cash flow forecasting begins with the collecting of reports and it ends when the cash flow forecast is complete. This takes about an hour of the cost controller's working time. After that, it is time for cost analysis. The figure 28, marked with red, indicates the point of the process during which updating takes place in the to-be process.

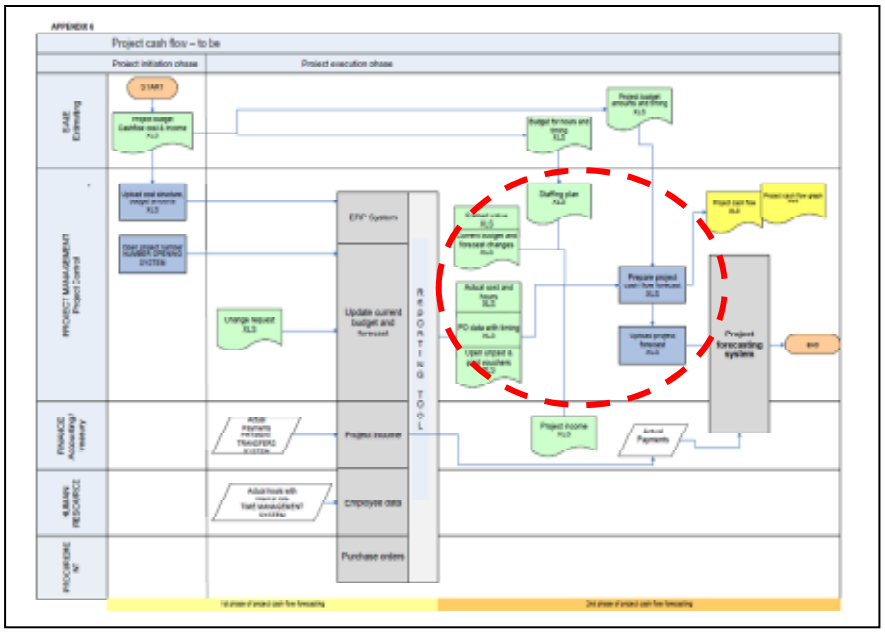


Figure 28: The point of the project cash flow process during which the updating work is done in the to-be process. (Appendix 6. Flowchart for to-be cash flow process.)

6.3.2 Project cash flow forecasting - cost

Project control employees concentrate mainly on delivery projects and their work deals with project costs. That is why costs can be calculated from the project point of view. A project buys necessary resources from the departments by using a liquidation rate. The resource costs within the company's various departments are determined by liquidation, not according to real wage costs. The liquidation rate for project control department is 71 euros per hour. The costs can be calculated by multiplying the hourly rate by hours. The time and costs for as-is and to-be processes are shown in table 4.

Table 4. The time and cost for as-is and to-be processes.

Measures	As-is process	To-be process
Time	7,5 h	1 h
Cost	71 euro * 7,5 h =532,5 euro	71 euro * 1 h = 71 euro

6.3.3 Project cash flow forecasting - quality

As-is process

The cash flow data from the as-is process is very detailed and accurate. It is easy to trace single and detailed information. On the other hand, the information can be viewed as too detailed, and such accuracy in data, cost code, and cost type level is not required by cash flow. Updating work increases when the information is too detailed. Project cost management system is a separate system and there is always time-lag between different systems. In addition, uncertainty within interfaces may cause downtime in data transmission. These affect the quality of the cash flow data. Behind the project cost management system has its own settings and calculations. For example, the system does not take into account the real payment terms of purchase orders or sales invoices. They are always 30 days net. This misrepresents the cash flow data.

To-be process

There is an ERP-system behind the cash flow data in the to-be process. Therefore, the cash flow data is in real-time. The negative point about this is that the data does not transfer directly from the system - it must be dealt with in separate excel-files, and this is manual work. The possibility of errors increases when dealing with excel-files with formulas that are drawn up between files. Human errors are common in manual work, when a step is forgotten or a report has not been filed. These things degrade the quality of the cash flow data. Respectively, positive aspects of the excel-files are that they are visual and it is very easy to handle and edit the files. It is easy to understand how the figures come to cash flow and make analysis based on them. There is a view from the cost management system in figure 27. Ordered –column shows only one number, no other information. From excel-files is seen all order details, for example, the name of supplier, amounts, payment terms, and the description of the items. The cash flow data is based on the real payment terms of the purchase orders and sale invoices and this can be done by formulas in excel-files. The cash flow data of the to-be process is on a

higher level than that of the as-is process. The cost data is bundled into cost types. The project control management decided that is enough for cash flow. If there is need to track down a single cost, problems may arise and therefore more work is needed.

6.3.4 Project staffing plan

As-is process

Project staffing plan is a separate process at the current stage. A double amount of work is needed to update the project staffing plan and the same information again to the project cost management system. A double amount of work is inefficient and increases costs - manual work increases the possibility of errors. Because they are separate tasks and processes, the data is not necessarily uniform. There are many different ways to maintain a staffing plan among the project control department. That is why it is difficult to determine how long the maintaining and updating of the project staffing plan will take time.

To-be process

The by-product of the to-be process is the project staffing plan. While the cash flow forecasting was developed, a staffing plan was under development. In the future, these two processes are combined and the same information is found within the staffing plan and cash flow forecast. In addition, the staffing plan is very quick to maintain and update. The general opinion is that the working time is halved compared to the former process. One positive aspect is also that the way to maintain and update the staffing plan is uniform.

Based on the interviews collected the positive and negative sides for both processes are shown in table 5.

Table 5. The positive and negative sides for as-is and to-be processes.

As-is process			To-be process	
	Positive	**Negative**	**Positive**	**Negative**
Time	Direct from system	Updating requires lots of work, time-consuming	Very quick to update	No direct from system, manual work
	Receive some level of cash flow although would not do anything.	Boring work	Meaningful work	Always requires work
		The form from system-> inflexible	Easy to handle	
		Staffing plan-> separate file and work	Staffing plan-> by-product	
		Double work: staffing plan – cash flow		
		Updating of staffing plan time-consuming	Staffing plan quick to update.	
		Different ways to maintain and update staffing plan	Uniform way to maintain and update staffing plan.	
Quality	Detailed and accurate information	Too detailed information. Cost code level information not needed.	Higher-level information. Cost type level information is enough.	Higher-level information.
		Separate system-> time lag, uncertainty in interfaces.	ERP-system	
		Data with delay.	Real-time data.	
		Does not take into account real payment terms.	Take into account the real payment terms.	
		System has its own settings and calculations.	Easy to understand the figures -> excel files	Excel-files, formulas -> possibility for errors
			Easy to find information from excel-files.	Human errors -> inaccurate data
			Visual	
			Same data in cash flow and staffing plan.	
			Development can be done continuously.	

6.4 Effects of process change

Currently, as-is project cash flow forecasting process requires a lot of time when updating project forecasts in the project cost management system. Added to this, the updating work is very dull. In the to-be process, only the costs and quantity changes are updated in the ERP-system. It is very quick to gather data and put it together for a project forecast excel-file. Creation of excel-files and definition of formulas are a key factor, ensuring that this work phase does not take lot of time and that it gives reliable information. Project cash flow forecast data from the new process requires work, always, because it is done manually in excel. The as-is process provides a part of cash flow data, the actual costs and the purchase order information direct and automatically from the system: it forecasts changes in timing and amounts required manual work. This new process performs faster and it releases the cost controller's working time for analyzing costs. Besides, updating work in excel is more pleasant and project time lines are easier to perceive in the new system. Working time is more time-efficient in maintaining the staffing plan, too. The previously time-consuming process is now integrated into the cash flow process and, at the same time, its maintenance and updating work have been improved.

The nature of a project cost controller's work changes when the project cash flow forecasting process changes. Boring routines become work that demand more analysis and know-how. When work becomes more meaningful, job satisfaction and well-being are improved. The major effect of process change, relating to the work of the cost controller, is that their work time will be released for something else.

When the cycle time of the process is shortened, the work cost decreases. The main objective in the project business is to reduce costs and thus make the project more profitable. When the project succeeds, there business does so, also. The remaining time can be used for more efficient work, and this way the costs in another section can be reduced.

Also, the quality of the cash flow data improves. The cash flow data is truthful because it takes into account the real payment terms. The data is real-time and uniform, because it comes from a single ERP-system and it is used in cash flow and in staffing plan. The project cash flow forecast is based on excel-files and it is easy to examine what they consist of. However, excel-sheets need manual work and the possibility for errors increase. As mentioned previously, creation of excel-files and definition of formulas are a key factor, ensuring that excel-sheets give reliable information.

The changes are an integral part of the project business. Change management does not mean correcting errors, but the proactive management of the changes. In practice, it refers to evaluating changes and preventing their negative effects. This requires the earliest possible information and the ability to react quickly. Quickly obtained and high-quality data helps us to react quickly to predicted changes and this way it is possible to achieve cost savings in the project. The process change brings benefits also seen from this point of view, also.

As-is process gives the same information, but it is difficult to change and improve cash flow processes according to changing requirements. Working with excel-sheets in to-be process is flexible and continuous improvement and development is easier to execute. This also improves client, for example company management, satisfaction while their demands can be reacted quickly and in a flexible way. The harmonization of the working methods makes it easy to substitute in when an employee is absent.

6.5 Future research

The company worked on a very large ERP-project, and it has affected the processes of various functions. This master's thesis succeeds very well in showing how big an effect a single process change can have on a business. The process change reduced working hours, used in this single process. In addition, the work

time savings were also obtained by combining two separate processes. In order to take the best advantage of achieved work time savings, further research should be done on all the main processes of the project control department. Based on this research, it would be possible to redesign the department resources and their responsibilities.

Another subject for further research could be related to delivery projects processes. Associated with the delivery project processes, one could investigate whether there is potential for similar work time savings – thus gaining the possibility to achieve cost savings and to improve the profitability of the project.

7 CONCLUSION

Question number one is the main research problem of this thesis. The research problem makes it easier to find answers to the sub-questions, numbers 2-4. As a conclusion, this section of the thesis gives answers to these four research questions.

1. How is the project cash flow forecast made after the system change?

There was an ERP-project within the case company. This means that both the parent company and its subsidiary companies will use the same system in the future. The main functions of the case company have their own separate systems and now they are all working in the common system and old systems will disappear. The project cash flow forecasting process has been changed totally. The change is essential because the old system disappeared – a new way had to be developed to make project cash flow forecasts. Before the ERP-system, project cash flow forecasting was done in the project cost management system. Now, after the implementation of the ERP-system, the cash flow data is collected from various excel-reports from the ERP-system and other excel-reports, which are supplied by other functions. The real project cost forecasting and cash flow forecasting take place in excel files. That is manual work, but when the cash flow forecast file is well designed and created with formulas, the work does not take much time. The project cash flow forecasting to-be process is shown in appendix 6. The workflow for cost controller's tasks in project cash flow forecasting is shown in appendix 7. To-be process steps for cash flow are listed in appendix 3. That is used to help to make the flowchart, appendix 6. The basic information form of the process, appendix 1, contains the basic information of the cash flow forecasting process. Project staffing plan was a separate process before the system change, now it is a by-product from the to-be process. The project staffing plan is also shown in appendix 6.

2. How does the process change affect the project control department's workload and required resources?

Project cash flow forecast is the responsibility of the project control department. Project cost controller creates and maintains the project cash flow forecast. The updating work of cash flow for the average project took one workday's worth of a cost controller's time before the process change. After the process change the updating work takes only an hour. The work time for the cash flow information is shortened noticeably. The cost controller has more time to analyze costs or do something useful. The maintenance and updating work of the project's staffing plan released the cost controller's working time, too. The staffing plan process has been integrated to the cash flow process and the staffing plan template has been developed so that its updating is very quick to do. The staffing plan updating time is difficult to measure, because it was done differently in the past. The cost controllers' general opinion is that the current working time for a staffing plan is half of the previous updating time. The major effect of this process change is that the cost controller's work time will be released to do something else, which is related to a specific project - or one cost controller can manage several projects at the same time.

3. How should the process change be taken into account in the project control department's operations?

The nature of the cost controller's work is changing. The time-consuming and boring work of before now needs now more knowledge, and dull and deadly work steps are left out. When the working time is shortened, the costs are reduced and the efficiency is improved. But in order to maintain the achieved efficiency, released work time should be allocated to something work-related. In addition to ensuring the effectiveness and quality of the cash flow information, cost controller should know what is happening within the project. Communication with the project team and participation in project-related meetings are very important. It is guaranteed that the information flows from the decisions to the cash flow forecast.

Project control manager, who works more intensively with project team, has more information about the project. The data flow is interrupted at this point, the project control manager knows the project issues but the cost controller maintains and updates the project cash flow forecast. The re-designing of the department roles and responsibilities should be done in order for the effects of the process changes to be utilized in the best possible way. Meaningful work tasks increase job satisfaction and wellbeing at work and that is also one very important point when considering the re-design of roles.

The re-design of the department roles is a huge issue and it cannot work with only one process in mind. If there is a target to maximize business performance, it must be considered from the perspective of all processes in the department. Looking at a single process is really just the beginning. But this one process change proves how much a single change may lead to improvement activities. It would be good to go through all the main processes of the department and after that it to rethink the necessary roles and their responsibilities.

4. How can the process description be utilized in the future?

The process description is a good tool to teach and also to familiarize new employees. It helps us to outline the whole process and understand everyone's role in order to achieve goals. Good design and well-described process description show relationships between different items and functions and this way improves co-operation with other functions. On the basis of the finished process description, it is easier to start describing other processes. Describing processes helps us to find unnecessary work phases and remove them, which may enhance work efficiency. The process descriptions are a good tool to support decisions to develop and redesign processes. ERP-project will continue in other units of the case company. The process description is very useful for them. It saves their time and, most importantly, helps to harmonize the operation in various units.

8 SUMMARY

A business process is a collection of related and structured activities or tasks that produce a specific service or product for a client. A business process begins with a mission objective and ends with achievement of the business objective. Business processes are designed to add value for the client and should not include unnecessary activities. The outcome of a well-designed business process will show as increased effectiveness, value for client, increased efficiency, and less costs for the company. Business process modeling is the activity of representing processes of a company. Business processes can be modeled through a large number of methods and techniques, by utilizing technology - but this is not a requirement. A flowchart is one way to visualize processes. Business process modeling results in an improvement in the way tasks are performed by the business. They can pick up errors or cons about the way processes are currently being performed and model an improved way of carrying out these processes. Business process management uses modeling data to analyze and improve the current processes. This way, the efficiency and quality of processes can be improved.

There is a software change happening within the case company and this is the reason for the process change. The process change influences, mainly, the work of the project cost controller. Today, they use lot of time updating project cost forecasts into the current system. In the future, cost management will be handled in a new ERP-system and project cost forecast in excel-files. This will release working time and allow cost controllers to do something else. Also, the nature of cost controllers' work will be changed so that they have to be more intensive on project life and know what is happening there. To strengthen the operation of project control department and make it more cost effective, redefined job descriptions of different roles have to be carried out. One process can not yet give an accurate picture of the whole activity and that is why it should go through all the main processes of the department, and to find the potential problem areas and develop and improve them. After that, the redefinition of roles and their

responsibilities are based on all processes, not only one process. For the department that thoroughly understands workflow, information flow, and decision points for targeted business processes, it is easier to improve efficiency and flexibility simultaneously, in addition to delivering high performance in the eyes of the process's clients.

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Appendix 1.

Process basic information form

1	The name of process	Project cash flow forecasting process.
2	The product or service of the process	Project cash flow forecast, description of process.
3	The by-product or by-service of the process	Project staffing plan.
4	The clients of the process	Project control department, project manager, and project team.
5	The purpose of the process	Resourcing, familiarization, reporting, controlling.
6	The goals of the process clients	Learning, cost savings, reliable information.
7	The success factors of the process	The process description is realistic, logical and understandable. Communication channel.
8	Measures of the process	Cycle time, cost, quality.
9	The starting point of the process	Sale process ->Project has been sold. Estimation process -> Project budget has been prepared.
10	The end point of the process	Project cash flow forecast and staffing plan have been done and other processes can use them -> Company level forecasting and reporting processes.
11	Key resources of the process	The employees of project control department.
12	Process owner	Director of project control department.
13	The version number	
14	Process modeler and modeling date	
15	The author of the description and date	
16	The approver of the description and the date of approval	

APPENDIX 2

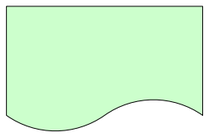
	Process steps: As-is process	SALE Estimation	PROJECT MANAGEMENT Project control	FINANCE Accounting / treasury	HUMAN RESOURCE	PROCUREMENT
1.	Prepare a project budget for costs and contract price and timing for them.	x				
2.	Transfer a project budget to project team.	x				
3.	Opens a project number and cost structure.		x			
4.	Upload project budget amounts, costs and income, and timing for them.		x			
5.	Make a purchase orders for the project.					x
6.	Actual costs: purchase invoices, travel expenses.			x		
7.	Actual hours for project.			x		
8.	Update cost changes to project estimate and timing for them.		x			
9.	Update client changes and timing for them (additional sales) to current budget of project.		x			
10.	Update project income milestones and timing for them.		x			
11.	Run the project cash flow forecast report from the cost management system.		x			
12.	Add project cash flow forecast report to the project report.		x			

APPENDIX 3

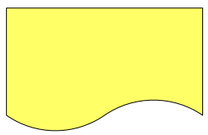
	Process steps: To-be process	SALE Estimation	PROJECT MANAGEMENT Project control	FINANCE Accounting / treasury	HUMAN RESOURCE	PROCUREMENT
1.	Prepare a project budget for costs and contract price and timing for them.	x				
2.	Transfer a project budget to project team.	x				
3.	Opens a project number.		x			
4.	Upload project cost structure and budget amounts.		x			
5.	Prepare a project staffing plan.		x			
6.	Prepare a cash flow forecast excel sheet.		x			
7.	Add employee data to the system.				x	
8.	Add project income milestones to the system.			x		
9.	Make a purchase orders for the project.					x
10.	Actual costs: purchase invoices, travel expenses.			x		
11.	Actual hours for project.				x	
12.	Update cost changes to project estimate.		x			
13.	Update client changes (additional sales) to current budget of project.		x			
14.	Update project income milestones.		x	x		
15.	Run different reports from the reporting tool for cash flow.		x			
16.	Upload reports to the cash flow forecast excel sheet.		x			
17.	Upload actual hours and estimate changes to the staffing plan.		x			
18.	Check the project cash flow.		x			
19.	Add project cash flow graph to the project report.		x			
20.	Upload project cash flow to the project cash flow forecasting system.		x			

APPENDIX 4

The meaning of the symbols:

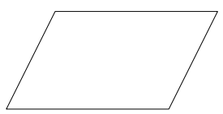


Input



Output

Process task



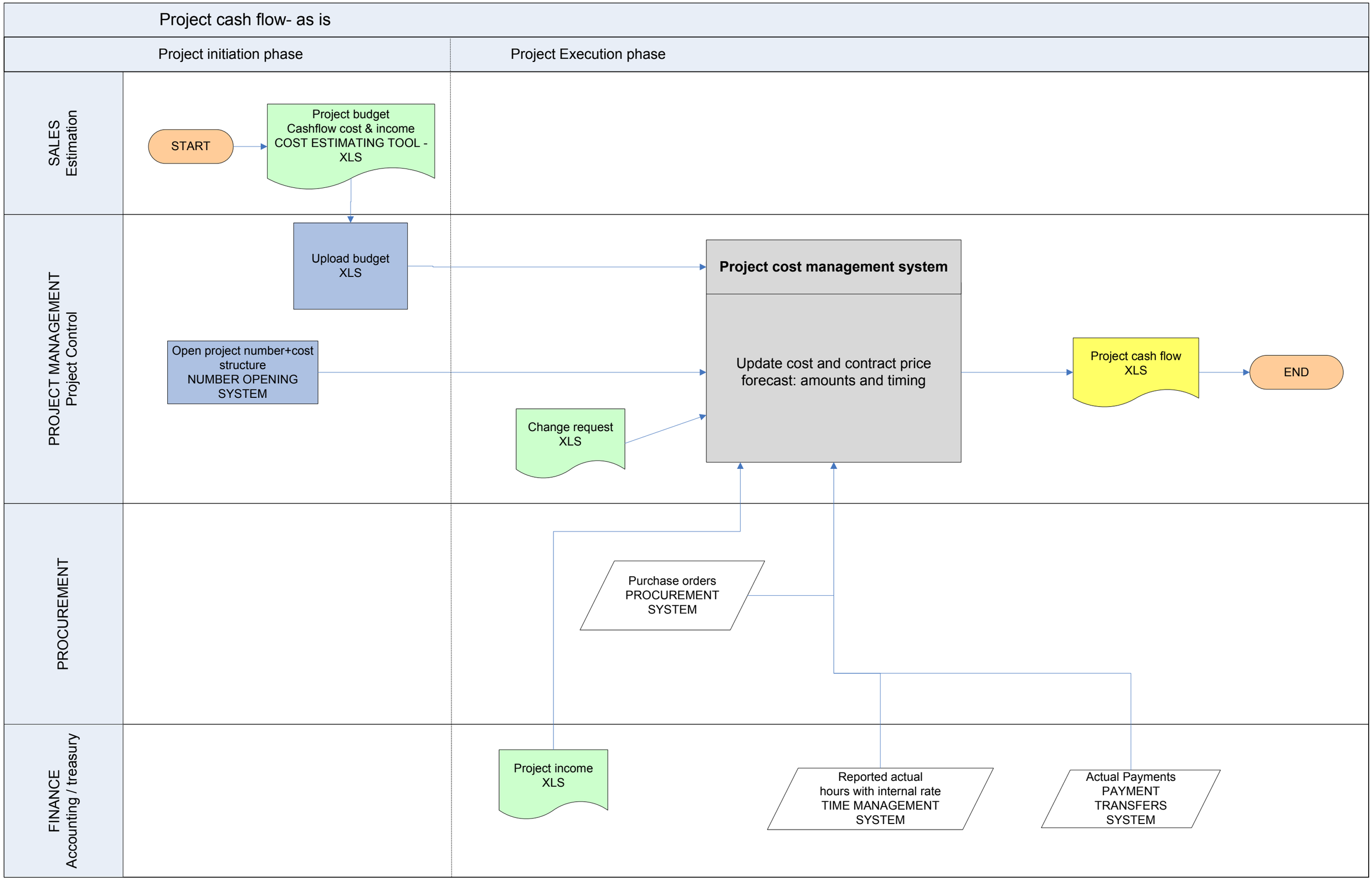
Separate system, data transfers automacally

Start / end

Main system

APPENDIX 5

Project cash flow- as is



APPENDIX 6

Project cash flow – to be

Project initiation phase | Project execution phase

SALE Estimation

START

Project budget Cashflow cost & income XLS

Budget for hours and timing XLS

Project budget amounts and timing XLS

PROJECT MANAGEMENT Project Control

Upload cost structure, budget amounts XLS

Open project number NUMBER OPENING SYSTEM

Change request XLS

ERP System

Update current budget and forecast

REPORTING TOOL

Actual cost and hours XLS

PO data with timing XLS

Open unpaid & paid vouchers XLS

Project income XLS

Earned value XLS

Staffing plan XLS

Current budget and forecast changes XLS

Prepare project cash flow forecast XLS

Upload project forecast XLS

Project cash flow XLS

Project cash flow graph XLS

Project forecasting system

END

FINANCE Accounting / treasury

Actual Payments PAYMENT TRANSFERS SYSTEM

Project income

Actual Payments

HUMAN RESOURCE

Actual hours with internal rate TIME MANAGEMENT SYSTEM

Employee data

PROCUREMENT

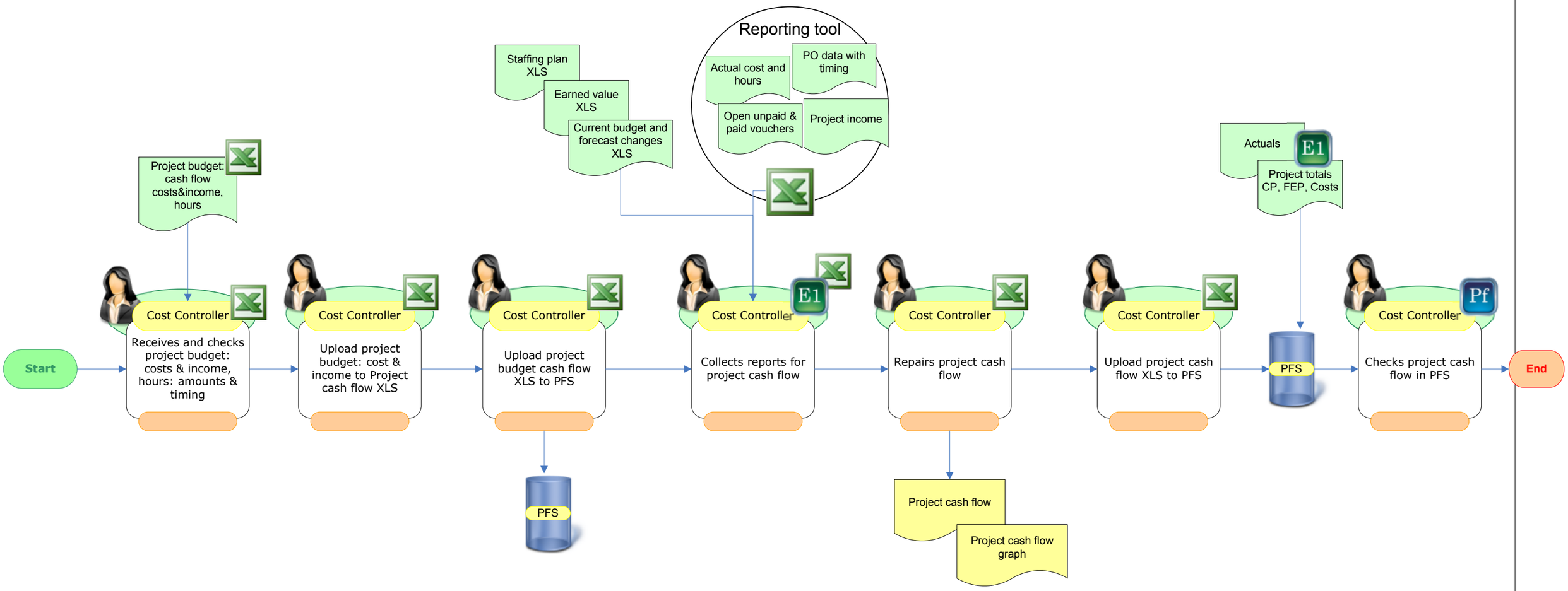
Purchase orders

1st phase of project cash flow forecasting

2nd phase of project cash flow forecasting

APPENDIX 7

Workflow for project cash flow forecast



Excel-file

Pf Project forecasting system

PFS Project forecasting system

E1 ERP system

CP Contract price

FEP Final estimated profit

APPENDIX 8

Questions for interviews

As-is process:

1. What pros and cons were there in the previous process / system?
2. How long did it take to make a project cash flow forecast?
3. What kind of was project cash flow forecast – qualitatively speaking?
4. How long did it take to make the project staffing plan?
5. What kind of was project staffing plan – qualitatively speaking?

To-be process:

1. What pros and cons are there in the current process / system?
2. How long it take to make a project cash flow forecast?
3. What kind of is project cash flow forecast – qualitatively speaking?
4. How long it take to make the project staffing plan?
5. What kind of is project staffing plan – qualitatively speaking?