SAVONIA

MASTER'S THESIS
TECHNOLOGY, COMMUNICATION AND TRANSPORT

PROJECT MANAGEMENT IN NEW PRODUCT INTRO-DUCTION PROJECTS OF A COMPANY

AUTHOR: Ilkka Joenaho

SAVONIA UNIVERSITY OF APPLIED SCIENCES

THESIS
Abstract

Field of Study Technology, Communication and Transport			
Degree Programme Degree Programme in Industrial Engineering and Management			
Author(s) Ilkka Joenaho			
Title of Thesis Project Management in New Product Introduction Projects of a Company			
Date	11.1.2016	Pages/Appendices	34
Supervisor(s) Päivi Korpivaara			
Client Organization /Partners Componenta Oyj			

Abstract

The success of projects is highly correlated to the way projects are managed. Project management is simply just an application of skills, tools, techniques and knowledge to project activities in a formal and systematic way. The company's New Product Introduction projects have grown more complex over time and it has become necessary to evaluate current project management practices.

The aim of this thesis was to study and evaluate the current state of New Product Introduction project management practices in different business units of the company and on basis of evaluations make some proposals for improvement actions. The current state was studied by conducting an open interview study. As the base model for the evaluation was chosen the bible of project management, technical standard ANSI/PMI 99-001-2004 - PMBOK Guide: A Guide to the Project Management Body of Knowledge – third edition.

As a result of this thesis the current state, the evaluation and the proposals for improvement actions were documented for further use in the company. Improvement is needed most in fields of project organization, the schedule management tool and the formal documented project management system.

Keywords
Project Management, New Product Introduction

CONTENTS

1 INTRODUCTION

Because of the company's history of growing by acquisitions, company has currently multiple different practices for new product introduction (later NPI) and project management in different business units. In addition, the company's supply chains and product processes have become more complex than earlier. Because of the mentioned change there is a need to reach effective shared NPI project management practices to boost the efficiency of NPI projects, thus improving customer service performance. Direct beneficiaries are company and company's customers.

To start the effort of developing practices, current state must be mapped first. The second step will be evaluating practices from project management's point of view. The final step is forming development proposals to enhance company's NPI project management system in the future.

The purpose of the thesis was mapping the current state of local project practices in Finland and then creating development proposals. Concrete output is a written report about the findings of current state in perspective of project management theory and written development proposals.

Current state was studied by conducting an interview study with open questions. Interviews were conducted with people connected to NPI projects in each business unit in Finland. A list of preselected questions was made to support the interviews. Interviews were made mostly by audio conferencing with Microsoft Lync.

2 PROJECT MANAGEMENT THEORY

2.1 Definition of a project

According to PMBOK Guide (2004, 5): *A project is a temporary endeavor undertaken to create unique product, service or result*.

Guidance on project management (2012, 3) gives a longer definition for a project: *A project consists of a unique set of processes consisting of coordinated and controlled activities with start and end dates, performend to achieve project objectives. Achievement of the project objectives requires the provision of deliverables conforming to specific requirements.*

Both descriptions highlight the three most defining features of a project. Firstly, a project is a temporary, not ongoing effort with definite start and end dates. Secondly, projects are unique, not repetitive. Thirdly, a project is an effort to achieve predefined objectives by providing deliverables which meet specific requirements.

Projects are undertaken on all levels of organizations and they can involve people from a few to many thousands. Projects can also involve many different organizations. Typical projects are for example: developing a new product or service, running a campaign for political office, effecting a change in structure, staffing, or style of an organization and building a water system for a community. (PMBOK Guide 2004, 7)

2.1.1 Temporariness as a feature

Temporariness of projects means that a project always has a definite beginning and a definite end. The project ends when objectives are reached or when the project is terminated for some reason. Reason for termination could be for example that it becomes clear that objectives can't be met. Although projects are temporary by nature it doesn't usually mean that they are short in duration: many projects last for several years and some even decades. Temporariness doesn't generally apply to product, service or result which is delivered by the project. Usually project outcomes are longlasting. Temporariness also means that a project team seldom outlives the project. The team created for the project is typically scattered when the project ends. Nonetheless in some cases the team lives from project to project. (PMBOK Guide 2004, 5)

2.1.2 Uniqueness as a feature

Uniqueness of projects means than even if projects may be similar, differences always occur somewhere. Projects may be different for example in the following: deliverables provided, stakeholders influencing, resources used, constraints limiting and the way that processes are tailored to provide deliverables. (Guidance on project management 2012, 3)

Let's consider a building project of an apartment house. Buildings might look all the same but each individual facility is unique. Facilities differ in ownership, design, location, contractors and so on. Prevailing repetitive elements don't change uniqueness of a project. (PMBOK Guide 2004, 5)

Unique deliverables created by the project are eiher products, services or results. A deliverable is always a measureable and verifiable work product. Deliverable may be for example a specification, a report, a detailed design document or a work prototype. Some deliverables are there for project management purposes while others are there for the project's end product. Product or artifact produced as deliverable is always quantifiable and can be either an end item or a component of an end item. Deliverable can also be a result or capability to perform a service. Result can be for example document or outcome. (PMBOK Guide 2004, 7, 22)

2.1.3 Progressive elaboration

As said, a project is an effort to achieve predefined objectives by providing deliverables meeting specific requirements. Although objectives and requirements are typically predefined it doesn't mean that they are static. Third typical feature of a project is progressive elaboration. It means that e.g. a project scope is broadly described in the beginning and then it becomes step by step more explicit and detailed when the project team develops their understanding of the project's deliverables and objectives. Progressive elaboration must not be mixed with scope creep. Scope creep means uncontrolled changes in a project (lack of change control). Progressive elaboration of a project's specifications must be carefully coordinated especially when working under contract. The project's scope should be controlled after each step of progressive elaboration of a project's or product's specifications. (PMBOK Guide 2004, 6)

Good example of a progressive elaboration is building up a chemical processing plant which first begins with process engineering to define characteristics of the process. Deliverables of process engineering are the characteristics of the process. With this information one can start designing the major processing units. The deliverables from previous stage are needed for performing each phases work. In this case next phase is engineering design, after that is fabrication and construction design and so on until there's finally the testing and turnover. Deliverables of the previous phase work as a basis for the next phase. (PMBOK Guide 2004, 6)

2.1.4 Difference between projects and operations

Organizations carry out work to reach a set of objectives. Projects and operations share many common characteristics and they are sometimes overlapping each other. They both are performed by people, constrained by limited resources and planned, executed and controlled. Although projects and operations have many similarities there is a one fundamental difference: operations are ongoing and repetitive while projects are temporary and unique. The objectives of operations and projects have fundamental differences. Purpose of a project is to reach its objective and then terminate but

the objective of an ongoing operation is to sustain the business and continue. (PMBOK Guide 2004, 6-7)

2.1.5 Project constraints

A project is always limited by at least some constraints which could be the following:

- the duration or target date for the project
- the availability of the project budget
- the availability of resources such as material, people, facilities, equipment, infrastructure, tools and all other resources needed to carry out activities related to the requirements of the project
- factors related to health and safety
- the level of acceptable risk exposure
- the potential social or ecological impact
- laws, rules and other legislative requirements.

Constraints are independent and it is typically a project manager's challenge to balance different constraints against each other. (Guidance on project management 2012, 8)

2.2 Project life-cycle and project phases

Project life-cycle is a selected set of project phases that connect the beginning of a project to its end. Organizations may identify specific set of life-cycles to be used on all of their projects. Alternatively, they may give a project management team more freedom and let the team choose most appropriate life-cycle for the team's project. Many project life-cycles have similar phase names with similar deliverables but life-cycles are rarely identical. Some of them may have only four phases but others may have nine or more. There are great differences even within single application area. Projects are divided into phases typically by governance and control needs. There are decision points between phases which facilitate projet governance. (PMBOK Guide 2004, 19-22), (Guidance on project management 2012, 8), (Pelin 2011, 97)

Project phases are typically sequential but they can also sometimes overlap each other. Typically previous phase's deliverables are acting as an input for next phase. That's one reason why transition from one to another phase in project's life-cycle typically involves some type of technical transfer or a handover where the deliverables are reviewed for completeness and accuracy before next phase's work starts. That's important because the cost of changes and correcting errors generally increase as the project proceeds. In contrast, the stakeholder's ability to influence the features of project's product or final cost is highest at the beginning but then gets gradually lower as the project proceeds. Cost of changes and stakeholder's ability to influence over time is presented in figure next page (FIGURE 1). Phase-end reviews are also called kill points, phase gates or phase exits. (PMBOK Guide 2004, 19-24), (Kezner 2006, 72)

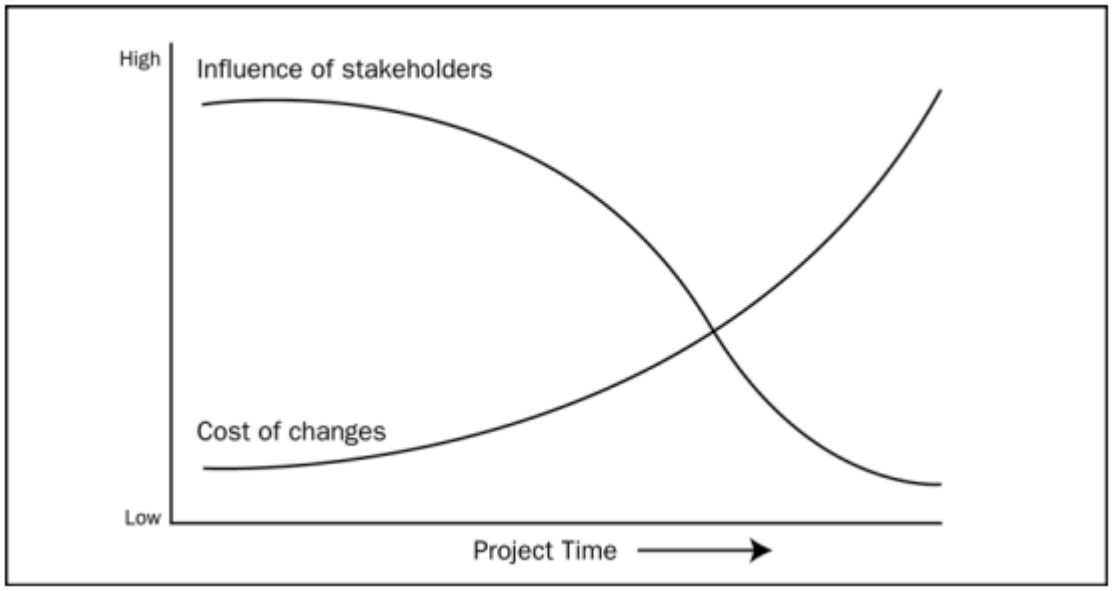

FIGURE 1. Cost of change and stakeholder's influence over time (PMBOK Guide 2004, 21)

Project's life-cycle generally defines the following things:

- what technical work is done in each project phase
- what is delivered by each phase and how deliverables are reviewed, verified and validated
- who is involved in phases
- how each phase is controlled and then finally approved.

Project life-cycle descriptions vary from very detailed ones to very general ones. Highly detailed ones might include forms, charts and checklists to provide more control and structure. Project life-cycle definition must also identify which transitional actions are included and which are not when a project is to be linked to the ongoing operations of a performing organization. Project life-cycle should not be confused with product life-cycle. The figure below presents the relationship between product and project life-cycles (FIGURE 2). (PMBOK Guide 2004, 20-24)

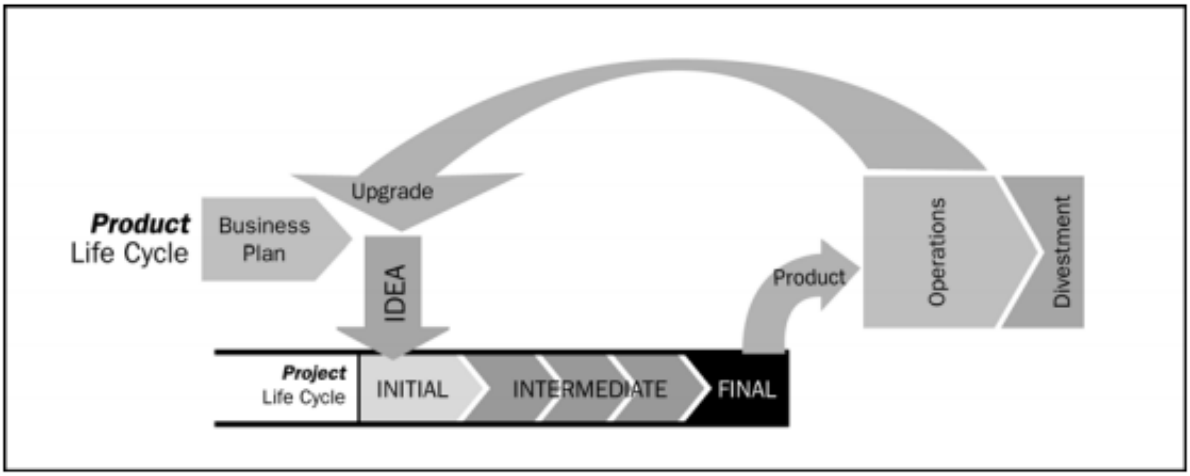

FIGURE 2. Relationship between the product and the project life-cycles (PMBOK Guide 2004, 24)

A project phase is chararacterized by completion and approval of one or more deliverables. A project phase might be divided furher into subphases for many reasons such as size, complexity, level of risk and cash flow constraints. (PMBOK Guide 2004, 22)

2.3 Project management process groups

Project management is performed through processes. A process is a set of actions and activities that are interrelated. Processes are performed to achieve prespecified set of results, services or products. Processes going on in projects can be divided into three categories which are project management processes, delivery processes and support processes. (PMBOK Guide 2004, 38), (Guidance on project management 2012, 8-9)

Project management processes are specific to project management. These processes are common to most projects most of the time. They determine how the activities selected for the project are managed. (PMBOK Guide 2004, 38), (Guidance on project management 2012, 8-9)

Delivery processes (alternatively called product oriented processes) vary typically by application area and are defined by project life-cycle. Delivery processes result in the specification and provision of a particular result, service or product. Delivery processes vary depending on the particular project deliverable. (PMBOK Guide 2004, 38), (Guidance on project management 2012, 8-9)

Support processes are processes that can't be settled to either of the already mentioned categories, but they provide valuable support for other two process categories. Support processes are typically in disciplines like finance, logistics, accounting and safety. Despite of falling into three categories, delivery, support and project management processes might overlap and interact throughout a project. (PMBOK Guide 2004, 38), (Guidance on project management 2012, 8-9)

Project management processes can be divided into five groups which are by Guidance on project management 2012:

- Initiating Process Group
- Planning Process Group
- Implementing Process Group (alternatively called Executing Process Group)
- Controlling Process Group (alternatively called Monitoring and Controlling Process Group)
- Closing Process Group.

Note that PMBOK Guide 2004 has otherwise similar process groups but Implementing process group is named Executing Process Group and Controlling process group is named Monitoring and Controlling Process Group.

These five process groups are required for any project and they are performed in the same sequence in each project. These process groups have clear dependencies and they are not dependent on application area or industry focus. Some process groups or some single processes in the groups

may have to be iterated before completing the project. For example planning process group may have to be re-visited after some implementing processes. (PMBOK Guide 2004, 40)

Project management processes can be viewed from other perspective as Subject Groups (alternatively called Knowledge Area Process groups). Project management processes are categorized into Subject groups and Process groups in table below (TABLE 1). (PMBOK Guide 2004, 38), (Guidance on project management 2012, 9-10)

TABLE 1. Project management processes mapped into Process and Subject groups. (Guidance on project management 2012, 10)

Subject groups	Process groups				
	Initiating	Planning	Implementing	Controlling	Closing
Integration	4.3.2 Develop project charter	4.3.3 Develop project plans	4.3.4 Direct project work	4.3.5 Control project work 4.3.6 Control changes	4.3.7 Close project phase or project 4.3.8 Collect lessons learned
Stakeholder	4.3.9 Identify stakeholders		4.3.10 Manage stakeholders		
Scope		4.3.11 Define scope 4.3.12 Create work breakdown structure 4.3.13 Define activities		4.3.14 Control scope	
Resource	4.3.15 Establish project team	4.3.16 Estimate resources 4.3.17 Define project organization	4.3.18 Develop project team	4.3.19 Control resources 4.3.20 Manage project team	
Time		4.3.21 Sequence activities 4.3.22 Estimate activity durations 4.3.23 Develop schedule		4.3.24 Control schedule	
Cost		4.3.25 Estimate costs 4.3.26 Develop budget		4.3.27 Control costs	
Risk		4.3.28 Identify risks 4.3.29 Assess risks	4.3.30 Treat risks	4.3.31 Control risks	
Quality		4.3.32 Plan quality	4.3.33 Perform quality assurance	4.3.34 Perform quality control	
Procurement		4.3.35 Plan procurements	4.3.36 Select suppliers	4.3.37 Administer procurements	
Communication		4.3.38 Plan communications	4.3.39 Distribute information	4.3.40 Manage communications	

NOTE The purpose of this table is not to specify a chronological order for carrying out the activities. Its purpose is to map subject groups and process groups.

Not all processes mentioned in the table above (TABLE 1) need to be applied on all projects or on all project phases. In addition, it's generally recognized that there is more than one way to effectively manage a project. That's why project manager's great responsibility is the tailoring of the management processes for each project or phase to apply them as appropriate to the project and organization needs. Tailoring is done by determining appropriate processes for each project phase and determining degree of strictness to be applied to each process. Because project management is an integrative undertaking (progressive elaboration) and process interactions often require tradeoffs among project requirements and objectives, some of the processes have to be iterated even several times during a project phase to define and meet stakeholder requirements and to reach agreement on the project outcome. (PMBOK Guide 2004, 38), (Guidance on project management 2012, 9-10)

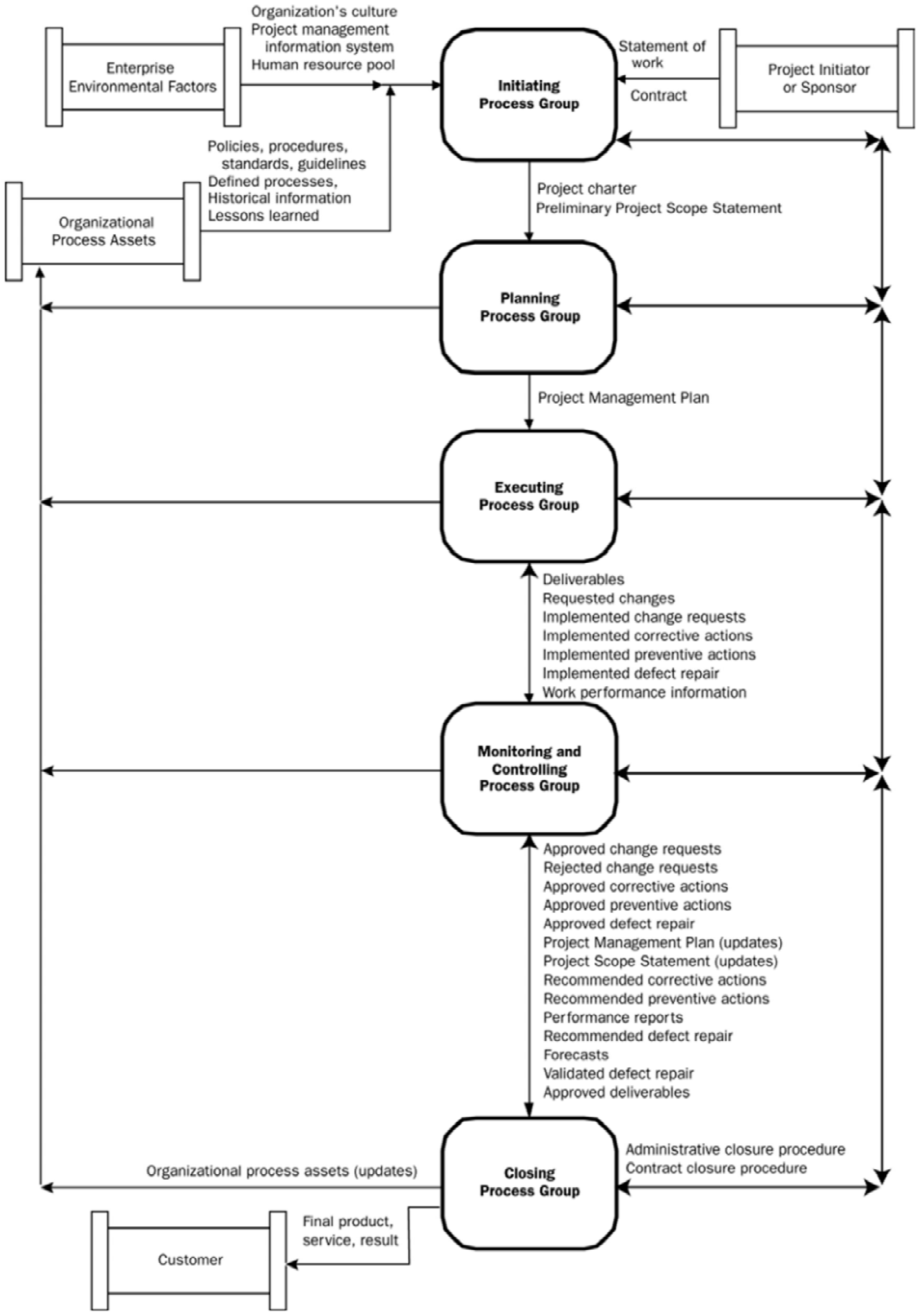

FIGURE 3. High level summary of interactions between process groups. (PMBOK Guide 2004, 42)

2.3.1 Initiating process group

Set of Initiating processes are like giving a birth to a project. Initiating processes always starts the project or project phase. They define project or phase objectives and give the project manager the authority needed to proceed with the project work. If not done already, project manager must be nominated here. Most important document created here is the project charter. Project charter is

formal justification for the project where business, project, and task objectives are documented. Projects charter gives the project manager formal authority for conducting the project. Usually also high-level scope definition, requirements and acceptance criteria are documented to give the project clear limits. All important project stakeholders should be recognized and documented for later purposes. Some basic process group interactions including Initiating process group are illustrated in the figure above (FIGURE 3). (PMBOK Guide 2004, 43-45), (Guidance on project management 2012, 11)

2.3.2 Planning process group

Planning processes develop detailed planning. Objectives are defined and refined and course of action is planned to attain the objectives and scope that the project was initiated for. Planning should be detailed enough to establish baselines against which project implementation can be managed and project performance can be measured and controlled. Significant changes later during the project life-cycle trigger a need to re-visit planning processes. Project team should involve all appropriate stekeholders depending upon their influence on the project to leverage their skills and knowledge to plans that they are developing. Planning processes may include but are not limited to:

- defining scope
- creating work breakdown structure
- defining activities
- estimating resources
- defining project organization
- sequencing activities
- estimating activity durations
- developing schedule
- estimating cost
- developing budget
- identifying risks
- assessing risk
- planning quality
- planning procurements
- planning communications

Project team should consider all these processes and decide which of them need to be done in the project in question and by whom. Planning processes are listed by subject group in the table page 12 (TABLE 1). (PMBOK Guide 2004, 44-53), (Guidance on project management 2012, 10-11)

2.3.3 Implementing process group

Impemenenting processes are all about putting earlier made plans into action. These processes are used to perfom the project activities defined in project management plan. Processes in question are

integrating people and other resources to carry out the project management plan and to provide the project's deliverables. Implementing processes may include but are not limited to:

- directing project work
- managing stakeholders
- developing project team
- treating risks
- performing quality assurance
- selecting suppliers
- distributing information

Project management team should consider which of these processes should be applied on their project. Implementing processes are listed by subject group in the table on page 13 (TABLE 1). (PMBOK Guide 2004, 53-56), (Guidance on project management 2012, 11)

2.3.4 Controlling process group

Project activities should be actively monitored and controlled to ensure project success. These processes are used to regularly monitor, measure and control project progress and performance against plan and identify possible variances. Corrective and preventive actions are taken when variances to project plan are identified in order to meet project objectives. Process group includes also process for controlling changes to ensure that only approved changes are implemented. For example, a missed activity finish date may require some change to staffing plan and therefore has an effect on budget and schedule objectives. Processes in this group are including but not limited to:

- controlling project work
- controlling changes
- controlling scope
- controlling resources
- managing project team
- controlling schedule
- controlling cost
- controlling risks
- performing quality control
- administering procurements
- managing communications

Project management team must consider which of these processes should be applied on their project. Some Controlling process group interactions are illustrated in figure on page 13 (FIGURE 3). (PMBOK Guide 2004, 41), (Guidance on project management 2012, 11)

FIGURE 4. Close Project or Phase: Inputs, Tools, Techiques, and Outputs (PMBOK Guide 2008, 100)

2.3.5 Closing process group

Threre are two different ways for a project to come to an end. Either the objectives are met or alternatively the project is cancelled before that happens. In case of first option, deliverables should be validated against requirements documented in the beginning of the project or the phase. Closing processes formally accept the deliverables of the project or phase and brings project or phase into an orderly end. If the decision to cancel the project is made before objectives are met without validating deliverables then all ongoing processes are just simply formally ended. Lessons learned should be collected and documented to be used as support for future projects. Some Closing process group interactions are illustrated in figure on page 13 (FIGURE 3). Inputs, tools, techniques and outputs for closing are illustrated in figure above (FIGURE 4). (PMBOK Guide 2004, 66), (Guidance on project management 2012, 11), (Pelin 2011, 345-346)

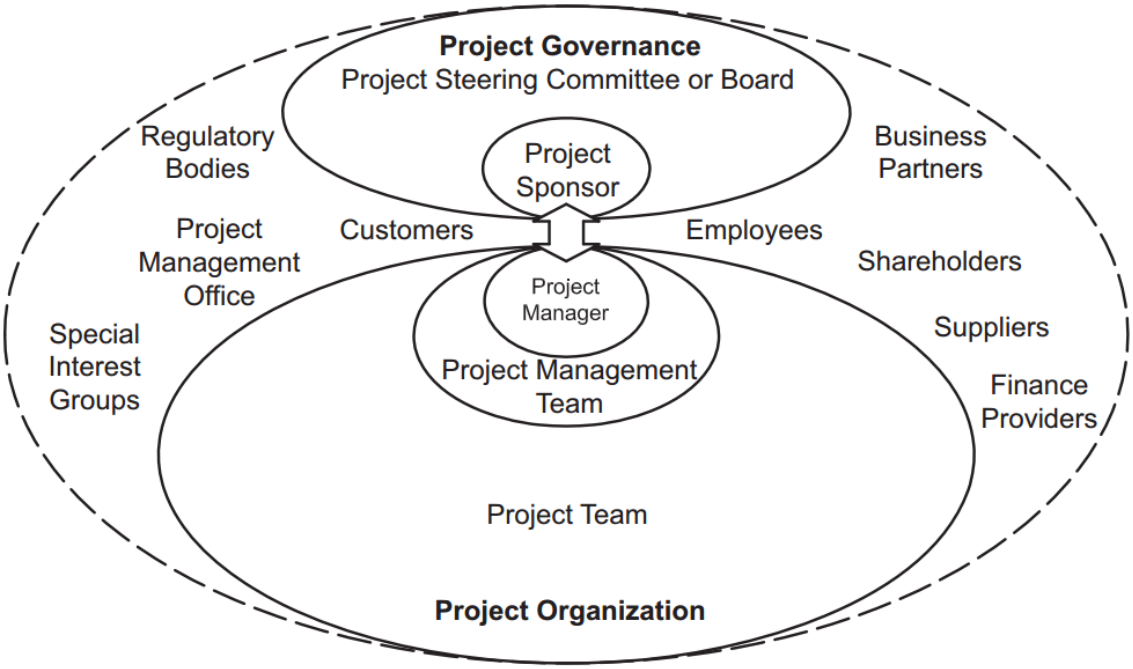

FIGURE 5. The relationship between different stakeholders in a project (Guidance on project management 2012, 7)

2.4 Project stakeholders

Project stakeholders are either individuals or organizations that are involved actively in the project or alternatively whose interests may be affected by project execution or project completion. It's an important part of managing a project to identify the influential stakeholders with their requirements and expectations. After first identifying the stakeholders, their influence in relation to the requirements should then be managed to the best possible extent to safeguard a succesfull project. The figure on the last page illustrates the relationship between different stakeholders in a project (FIGURE 5). (PMBOK Guide 2004, 24), (Guidance on project management 2012, 6-7)

Stakeholders can be divided into two goups by their influence on a project. Positive stakeholders are those who are going to benefit from a succesfull outcome of the project. Negative stakeholders are the opposite, they see negative outcomes from project's success. The example of negative stakeholder is an environmental group, which sees a mining project as a threat to environment and therefore fights against the project by making complaints about environmental permits. Identification of all important stakeholders is not always easy and sometimes a non-identified stakeholder leads to failure of the whole project. Stakeholders have varying levels of authority and responsibility in a project and these can change during project's life-cycle. Stakeholders who ignore their responsibility can have bad impact on the project objectives. Similarly, project managers who underestimate or ignore stakeholders or fail in identifying them can expect a damaging impact on project outcomes. (PMBOK Guide 2004, 26), (Guidance on project management 2012, 6-7)

Key stakeholders on every project are listed in the table on the following page (TABLE 2). In addition to the key stakeholders, there are numerous other different names and categories for project stakeholders. The naming and grouping of stakeholders is primarily an aid to identifying which organizations or persons view themselves as stakeholders. Roles and responsibilities of stakeholders can sometimes overlap. Roles and responsibilities should be defined and communicated based on the project objectives to avoid misunderstandings and to ensure project success. Many times project stakeholders have very different or conflicting objectives for a project. Project manager must carefully manage stakeholder's expectations, especially when objectives are conflicting. (PMBOK Guide 2004, 26), (Guidance on project management 2012, 6-7)

TABLE 2. Key stakeholders and their roles in the project (Adapted from PMBOK Guide 2004, 26)

KEY STAKEHOLDER	ROLES IN THE PROJECT
Project manager	The person who leads and manages project activities and is accountable for project completion
Customer	The customer is contributing to the project by specifying project requirements and accepting the project deliverables.
User	The person or organization that will use the project's product. Sometimes same as customer. There may be multiple layers of customers/users
Performing organization	The enterprise or other organization whose employees are most directly involved in doing work of the project
Project team members	Group that is performing the work of the project
Project management team	The members of the project team that are directly involved in project management activities and who are so for supporting the project manager
Sponsor	The group or person that authorizes the project, provides the financial resouces in cash or a kind and makes excecutive decisions
Influencer	People or groups who are not oherwise related to project work or outcome, but have ability to influence the course of the project positively or negatively
PMO	Project Management Office. If it exists in the performing organization, PMO can have direct or indirect responsibility for the outcome of the project and due to become a stakeholder.

2.5 Project organization

Projects are usually part of an organization that is larger than the project itself and this specific organization is always influencing the project in many aspects which include at least the maturity of the organization with respect to its project management system, style and culture. Also organizational structure of performing organization has significant influence on a project. Examples of different performing organizations include government agencies, corporations, professional associations and healthcare institutions. Performing organization may or may not have management systems in place to support project needs effectively and efficiently and this lack usually makes project management more difficult, thus influencing the project success. (PMBOK Guide 2004, 27)

Most organizations have developed unique and describable organization cultures which usually have direct influence on the project. These cultures are reflected in many ways including at least: values, norms, beliefs and expectations, procedures and policies, view of authority relationships, work ethic and working hours. For example a team proposing a high-risk approach is more likely to get approved in an entrepreneunial or some other way aggressive organization. (PMBOK Guide 2004, 27)

The organizational structure of a performing organization is typically affecting strongly the availability of project resouces. The table on the following page (TABLE 3) is showing project-related characteristics of five major types of organizational structures. The classic functional organization on the left in TABLE 3 is a hierarchy where every employee has one clear superior. Employees are grouped at the top level by specialty such as engineering, marketing, production and accounting. Each category may be furher subdivided into functional organizations. Functional organizations may have projects, but scope

TABLE 3. Organizational influences on projects (PMBOK Guide 2004, 28)

Organization Structure / Project Characteristics	*Functional*	*Matrix*			*Projectized*
		Weak Matrix	**Balanced Matrix**	**Strong Matrix**	
Project Manager's Authority	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Resource Availability	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Who controls the project budget	Functional Manager	Functional Manager	Mixed	Project Manager	Project Manager
Project Manager's Role	Part-time	Part-time	Full-time	Full-time	Full-time
Project Management Administrative Staff	Part-time	Part-time	Part-time	Full-time	Full-time

is usually limited to the boundaries of function. All communication between different functions is going through functional managers. The classic functional organization is illustrated in the figure below (FIGURE 6). (PMBOK Guide 2004, 28-29)

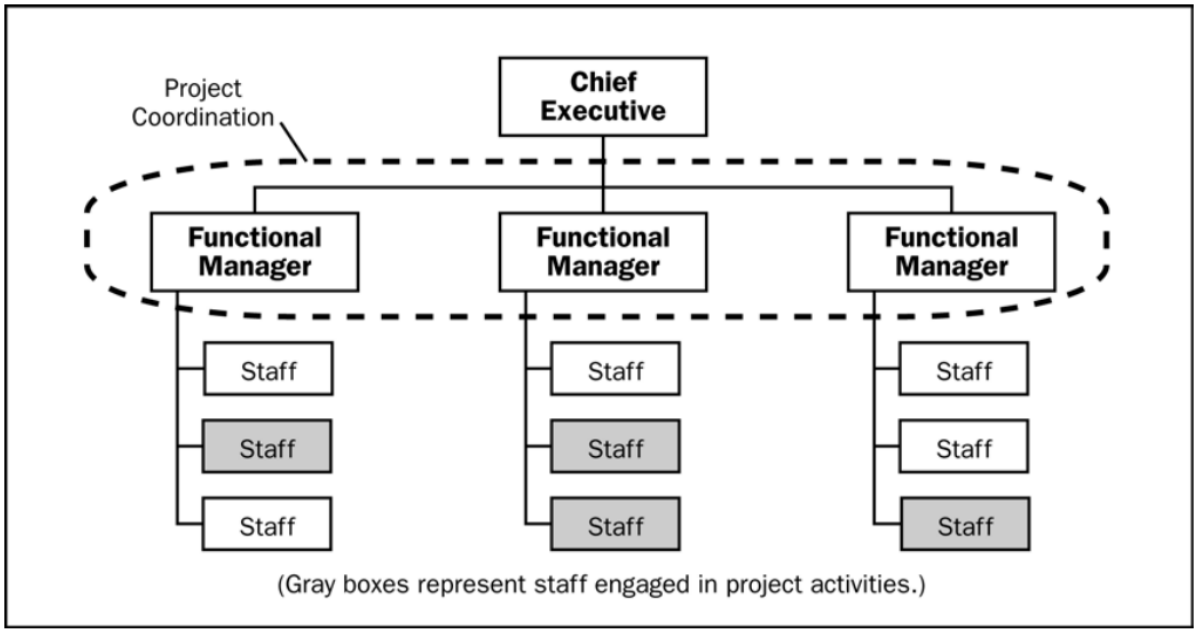

FIGURE 6. The classic functional organization (PMBOK Guide 2004, 29)

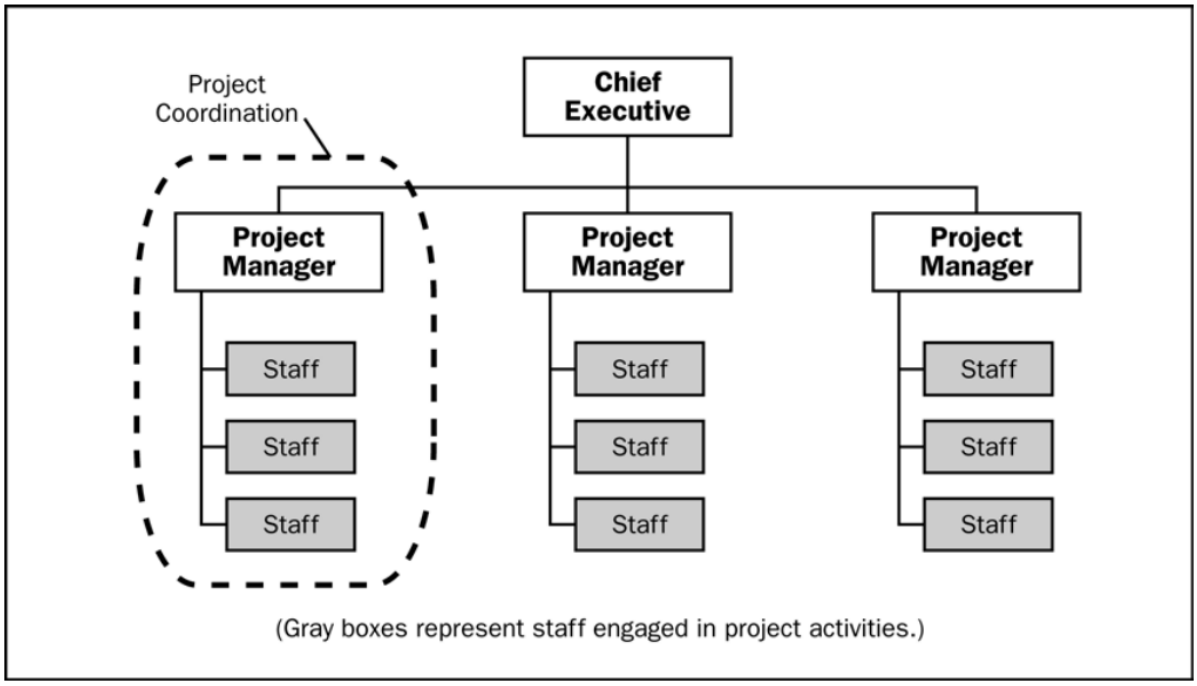

FIGURE 7. Projectized organization (PMBOK Guide 2004, 29)

Completely opposite to the classic functional organization is projectized organization whose characteristics can be found from rightmost column in TABLE 3. Organizational influences on projects (PMBOK Guide 2004, 28). Projectized organization is illustrated in figure above (FIGURE 7). In projected organization team members are often collocated to the same physical location to ensure as effective communication as possible inside the project team. Project managers have typically great deal of independency and almost total authority. (PMBOK Guide 2004, 28-29)

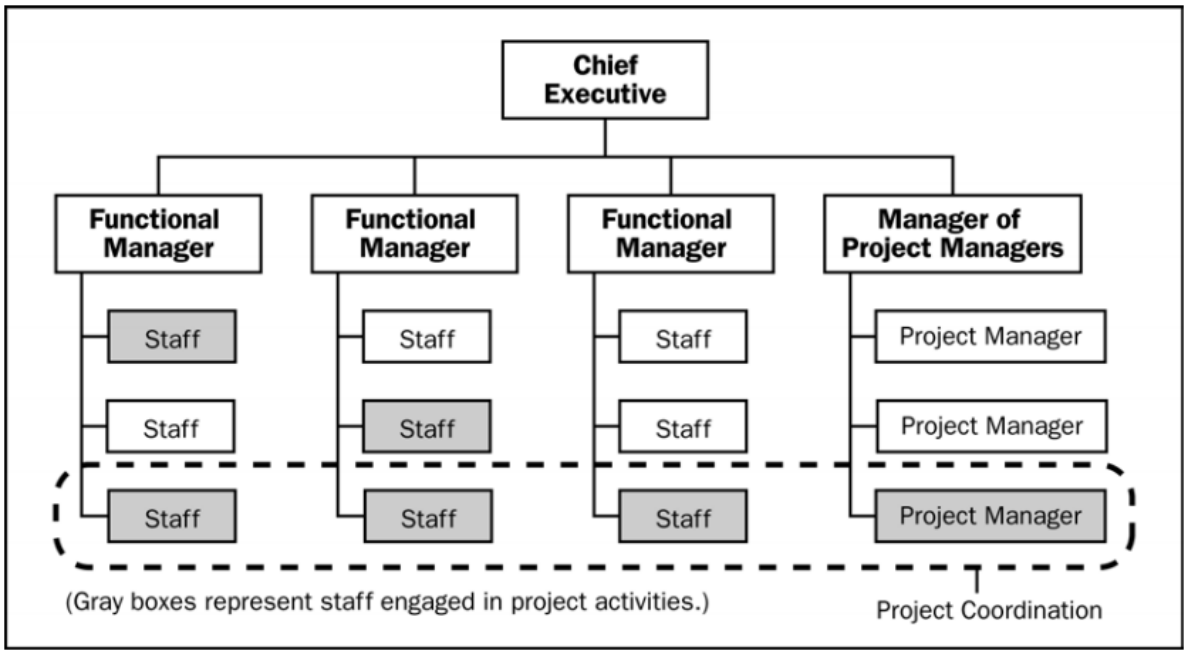

FIGURE 8. Strong matrix organization (PMBOK Guide 2004, 31)

Positioned between the functional organizations and the projectized orhanizations are the matrix organizations the characteristics of which are covered in center columns of TABLE 3. Matrix organizations are furher divided into three classes depending on project manager's role and authority. Three classes are Weak matrix, Balanced matrix and Strong matrix. Strong matrix organization is illustrated in the figure on previous page (FIGURE 8). (PMBOK Guide 2004, 30-31), (Kezner 2006, 113)

Performing organizations are utilizing predefined project management systems to help the project manager to guide the project effectively to the completion. Project management system is a set of tools, techniques, resources, methodologies and procedures that are used to manage the project. The system is a set of processes with related control functions that are combined into a functioning body. The project management system content varies depending on application area, complexity of the project, organizational influence and availability of existing systems. The organizational influences are shaping the project management system for executing projects within that specific organization. The system will adjust or adapt to accommodate influence of the performing organization. The project management plan describes how the project management system will be utilized. (PMBOK Guide 2004, 33)

2.6 Definition of Project Management

Guidance on project management (2012, 4) gives the following definition: *Project management is the application of methods, tools, techniques and competencies to a project. Project management includes the integration of various phases of the project life-cycle. Project management is performed through processes. The processes selected for performing a project should be aligned in a systematic view. Each phase of the project life-cycle should have specific deliverables. These deliverables should be regularly reviewed during the project to meet the requirements of the sponsor, customers and other stakeholders.*

The definition of the PMBOK Guide (2004, 8) is slightly different: *Project management is the application of knowledge, skills, tools and techniques to project activities to meet projects requirements. Project management is accomplished through the application and integration of the project management processes of initiation, planning, executing, monitoring and controlling, and closing. The project manager is the person responsible for accomplishing the project objectives.*

Managing a project includes following activities: identifying project and/or product requirements, establishing clear and achievable objectives, balancing the competing demands and adapting the specifications, plans and approach to the different expectations of various stakeholders. One part of project management is also managing projects in respect of uncertainty. Project risk is a condition or an uncertain event that has a positive or a negative effect on projects objectives if occurring. (PMBOK Guide 2004, 8)

Project scope, time and project cost form together a triangle of competing demands in project management. They are highly affected by each other and balancing these three successfully delivers a high quality project. Also lack in one of these three factors means poor project quality. These three competing demands are often referred to as "triple constraint" and the relationship is generally illustrated with a balanced triangle presented in figure below (FIGURE 9). PMBOK Guide (2004, 8), (Salford Business School Blog 2014-08-14)

Because of the progressive elaboration, many of the project management processes are iterative. It means that when the project management team learns more about the project, the team can manage greater level of detail. (PMBOK Guide 2004, 8)

2.6.1 Nature of the project activities and process group interactions

The project management processes are earlier here presented as discrete objects with interfaces well defined. In practice they overlap and interact in ways that can't be completely detailed. Besides, there's always more than one way to manage a project successfully. Process groups with their

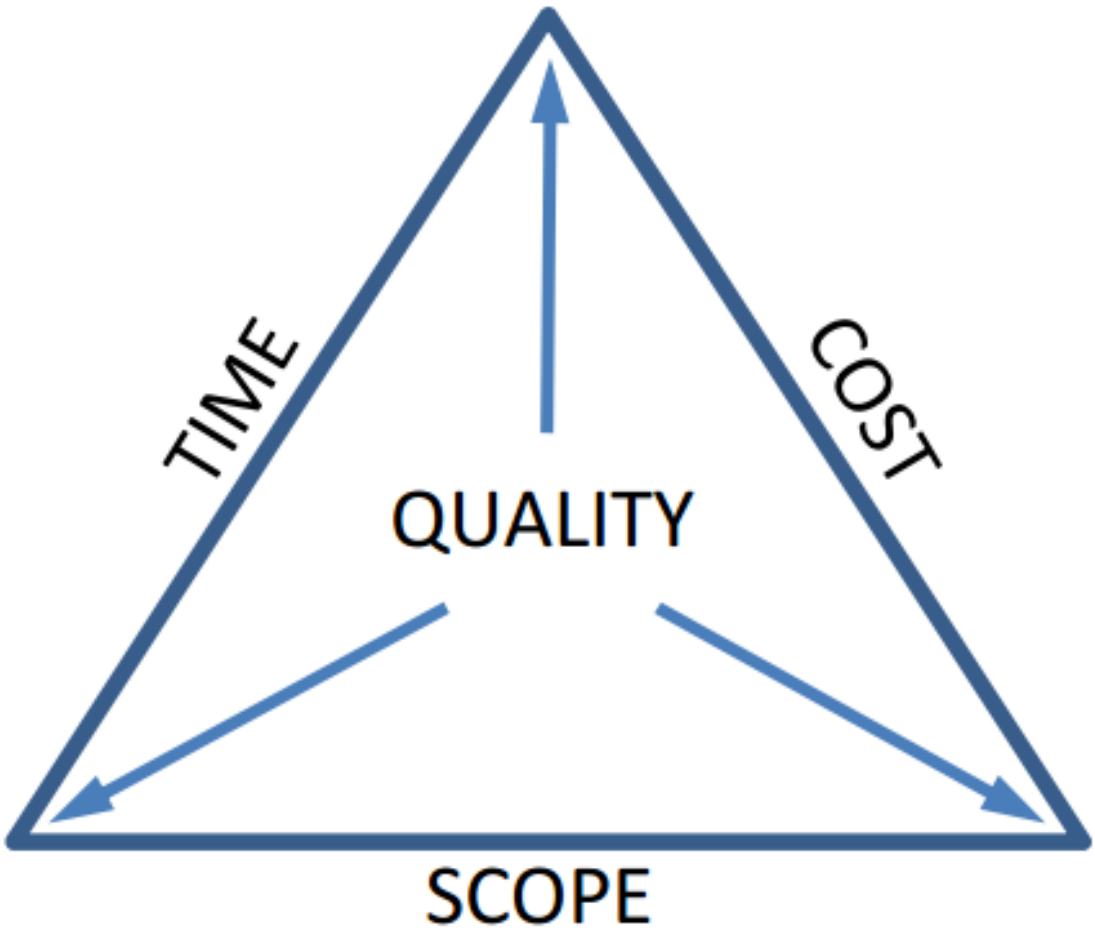

FIGURE 9. Balanced triangle (Salford Business School Blog 2014-08-14)

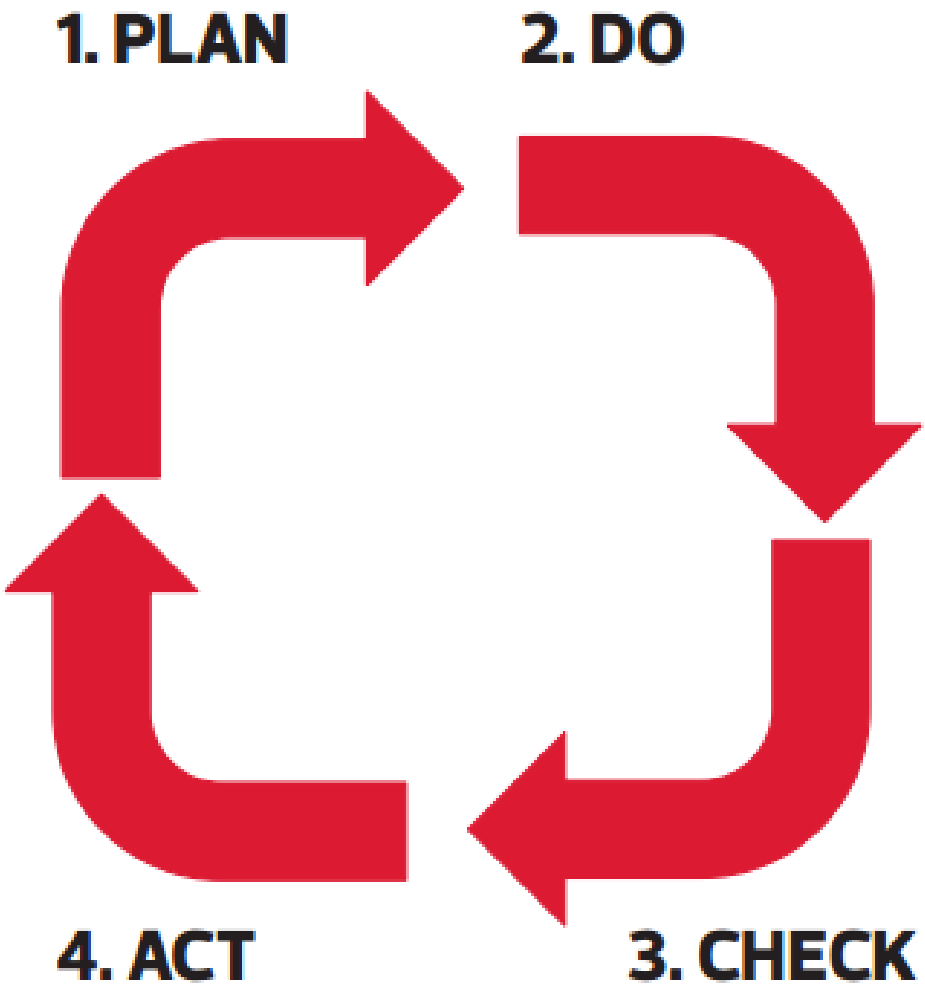

FIGURE 10. The Plan-Do-Check-Act cycle

processes earlier mentioned are working as guides to apply appropriate project management knowledge during the project. The project team with the project manager is responsible for choosing what processes from the process group will be employed. Application of the project management processes is an iterative undertaking and many processes have to be repeated during the project. (PMBOK Guide 2004, 39-40)

An underlying cocsept for the interactions between project management processes is PDCA. PDCA comes from the words Plan-Do-Check-Act and it's a fundamental philosophy of quality management (Consept of W. Edwards Deming). PDCA is a cycle where chain of actions is constantly repeated until desired outcome is reached. PDCA cycle is illustrated in figure above (FIGURE 10). The cycle is linked by results: the result from one part becomes the input to another. The integration of the process groups is not as simple as the basic PDCA cycle. That's why there has been a need for enhanced PDCA cycle where interrelationships with and among process groups are illustrated more specifically. The integrative nature of project activities requires the Controlling process group to interact with every other process group. Enhanced PDCA cycle is illustrated in the figure on the following page (FIGURE 11). Note that Guidance on project management (2012) process group names Controlling and Initiating differs from PMBOK Guide (2004) names process group Monitoring and controlling and process group Executing. (PMBOK Guide 2004, 39-40)

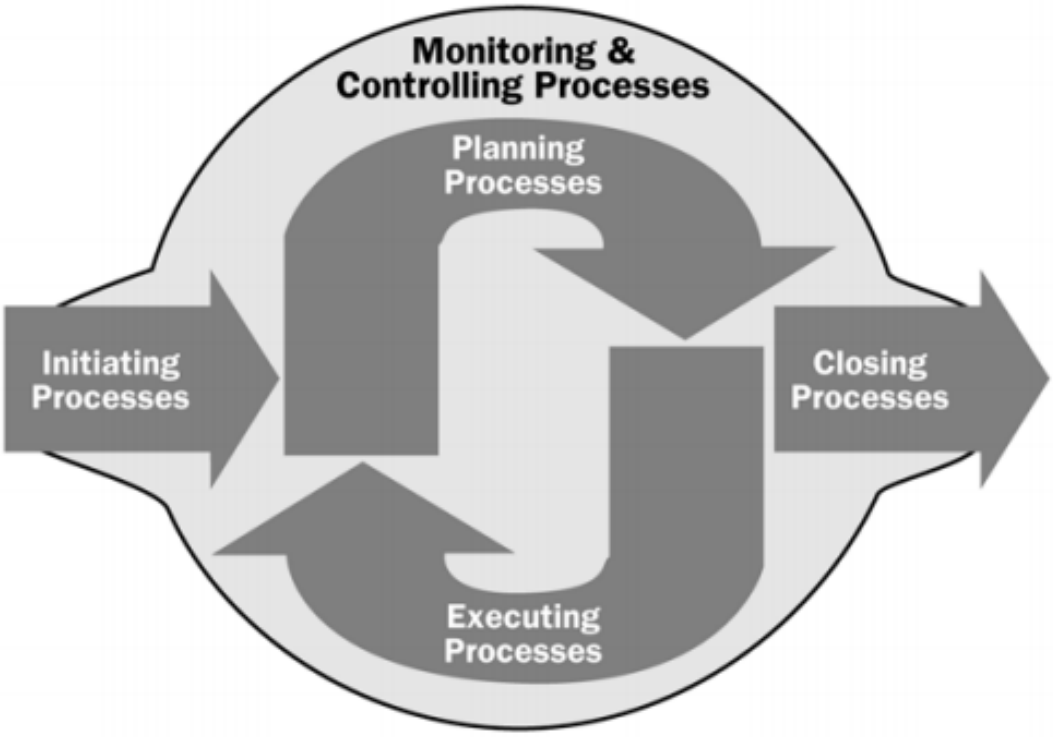

FIGURE 11. Enhanced PDCA cycle for process group interactions (PMBOK Guide 2004, 40)

When the project is divided into phases, process groups are typically repeated in and after each phase during the project life-cycle. Relationship between the project, phases and process groups is illustrated in figure below (FIGURE 12).

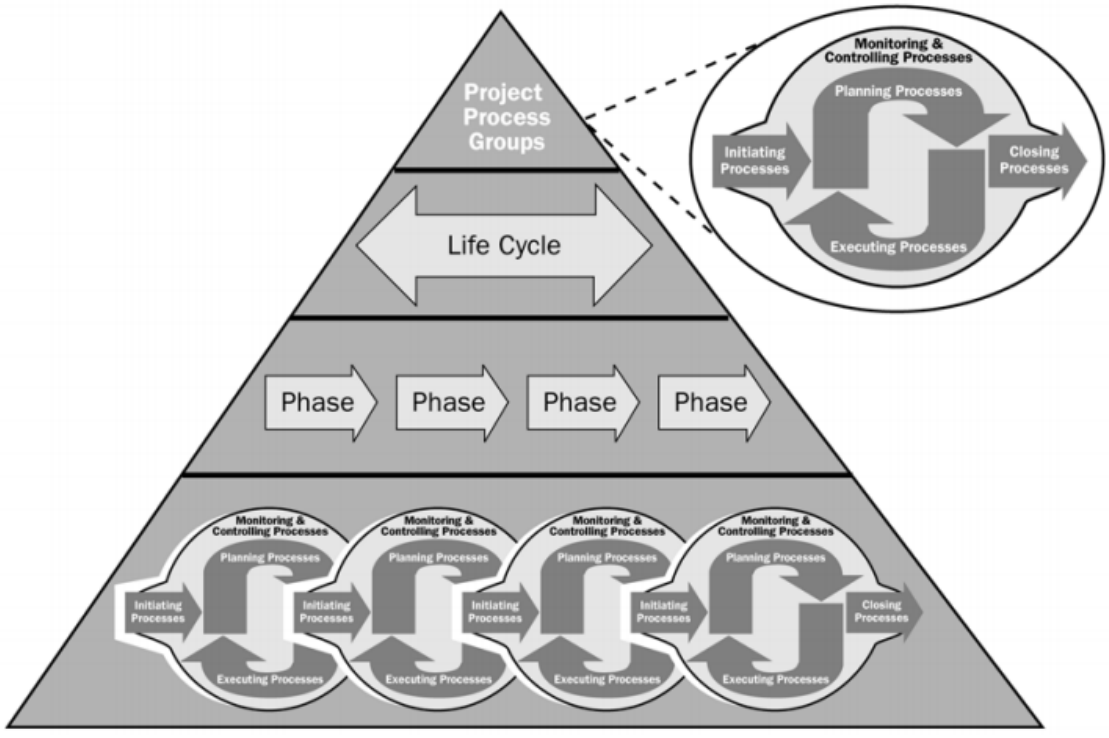

FIGURE 12. Relationship between the project, phases and process groups. (PMBOK Guide 2004, 69)

3 COMPANY NPI PROCESS – AN INTRODUCTION

The company manufactures small and medium series of components for machine building industry. The company is using the NPI process to introduce a new product to its production. NPI process begins from a customer need and ends with an approved production process. Because of uniqueness of every customer, every component and every schedule, every single introduction is considered as a project (NPI project). The complex nature of components makes data management an important part of a NPI project.

The NPI starts from a customer need which is typically indicated by a written request for quotation. After receiving all data needed for quotation, the company makes preliminary production process engineering, a cost calculation and a preliminary planning for the NPI project. After these actions the offer to the customer can be made. These actions as a whole are called a request for quotation process (later RFQ process). The RFQ process is working as an initiating phase for NPI project. A NPI project's place in the company's overall business chain is illustrated in figure below (FIGURE 13).

If the customer is not happy with the offer they might ask for another, more detailed offer. However, there is no justification to continue the project without customer commitment.

If the customer takes the deal and places a purchase order, then the NPI project starts in full extent. Order Acceptance Meeting is held and the NPI project continues with a planning phase and then moves to the execution phase where most of the product related work is done. Product related processes are introduced in the figure next page (FIGURE 14). After all these processes the output of the project can be finally approved and the project can be closed.

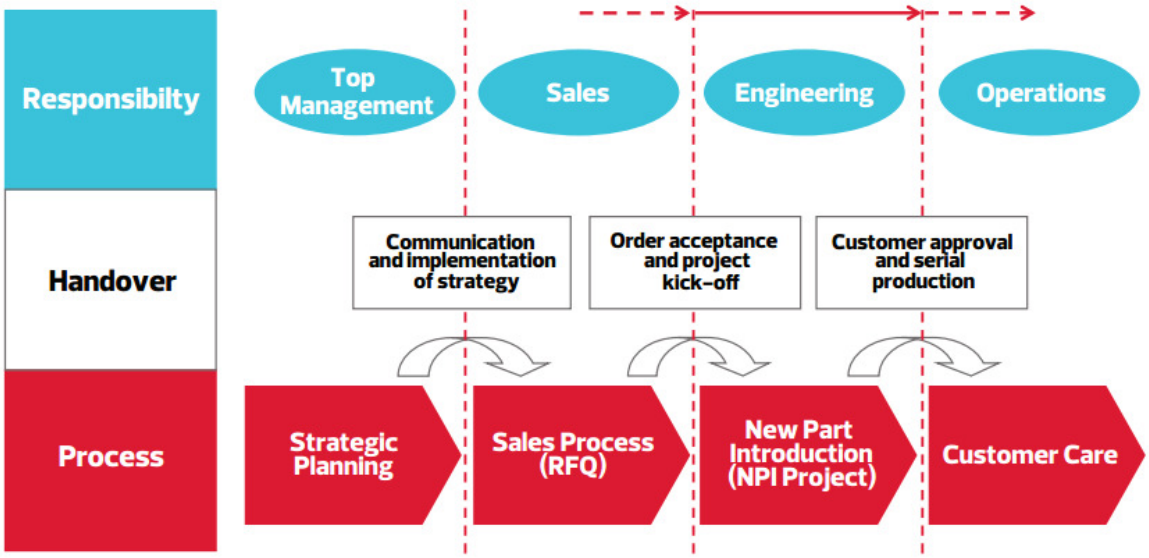

FIGURE 13. A NPI Project placed to the companys overall business chain

NPI projects are never done isolated from surrounding business environment. They are always part of company's customer's delivery project. Thus, the better the company's NPI project can be managed, the better it will fit with the customer's project. Any delays in NPI project will most likely have a negative impact on the customer's project. It is also important to notice that after the company has made the delivery, the contact with the customer project is not cut: support for use is needed as well as possible internal post-project tasks. Therefore company cannot just forget all after project delivery, since the relationship with the customer does not end. With professional handling of projects, a good fit of NPI project into the customer's project can be achieved. This leads to good customer satisfaction, which can bring more future projects and business together.

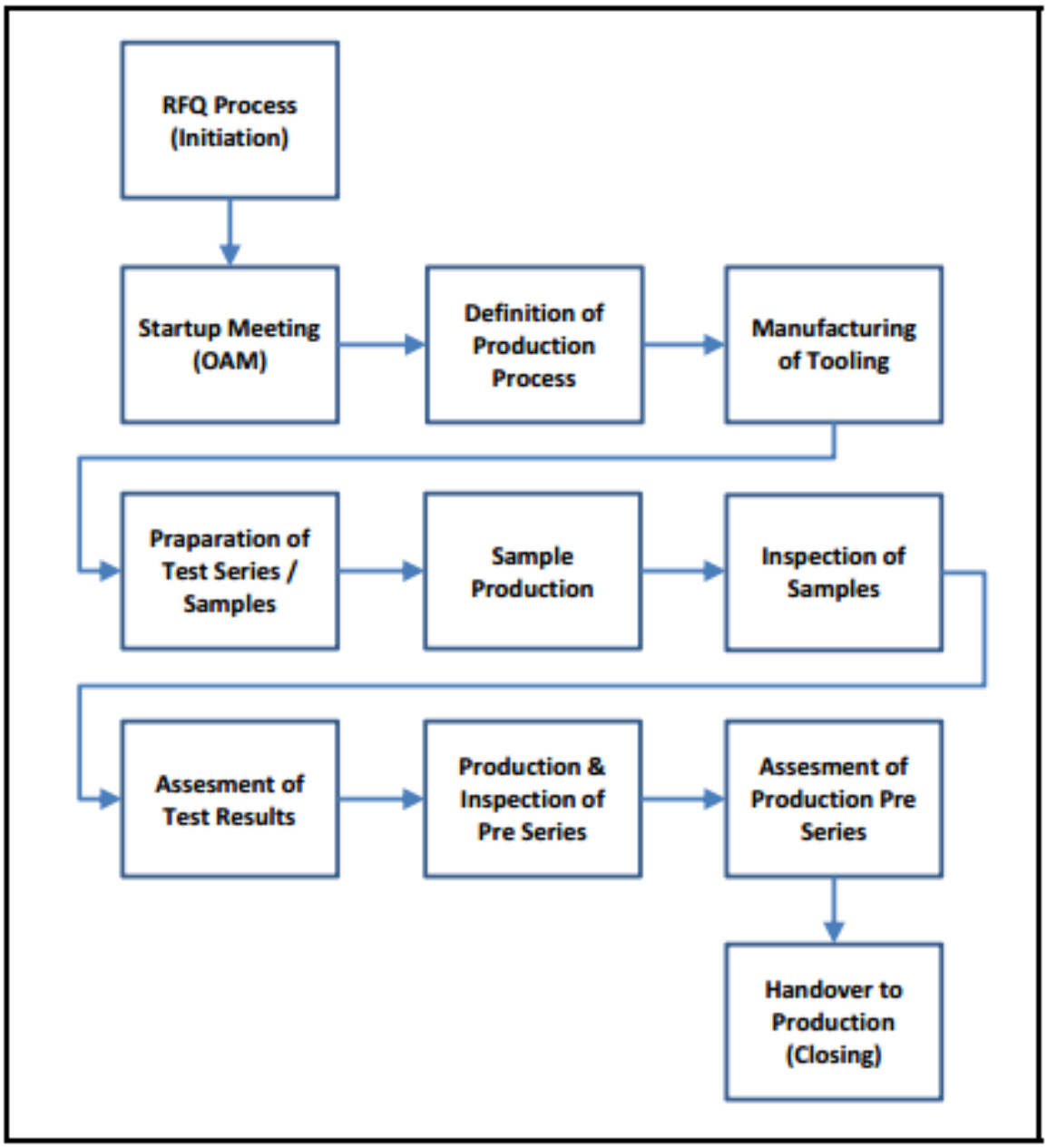

FIGURE 14. Product related processes in the NPI work flow. (Adapted from the source: NPI Process Description 2015, the company internal material)

4 THE FINDINGS OF THE CURRENT STATE STUDY

4.1 The research method

Current state was studied by conducting an open interview with eight different people in different business units with various professions all participating closely in NPI projects. Fourty-five very open questions were asked to encourage interviewees tell openly about their ideas and experiences about project management in NPI projects and respective development needs.

4.2 Findings and remarks

The findings were made on the basis of the interviews and they are presented in the following chapters.

4.2.1 Project requirements and documentation

Many interviewees raised up an issue with documentation of critical requirements of project product especially in the beginning of the project at the RFQ phase. There were several experiences where requirements were not documented thoroughly at the RFQ phase for next projects phases. This has led to losing some requirements during the project causing nonconforming product and losing completely the project schedule and the budget.

It was found out that there are several different procedures for documentation of the critical requirements for the product in different business units.

4.2.2 Project scheduling

It was found out that in most of the projects scheduling is done in the beginning, but follow up and updating of the schedule varies much project by project. Schedules are communicated to the project team and sometimes to the customer. Different ways are used to create and follow up scheduling. At least Prios, Excel and Share Point software are used to create and manage Gant charts for scheduling.

An issue was raised that there's a lack of generic overview for top management prioritazion and resource management. All the ongoing projects can't be seen as a complete overview so overall situation can't be monitored. This is really hindering at the times when there are many complex projects going on at the same time.

4.2.3 Project life-cycle

All of the NPI projects are going trough quite similar set of phases, but project life-cycles are not well defined from project management's viewpoint. All formal phase gates with gate decisions are missing with one exception: Order Acceptance Meeting is working as a gate to next phase securing project and product quality.

The author finds the Order Acceptance Meeting as a good procedure representing project management's purposes. Order Acceptance Meeting is a clear decision making point in NPI project. There are elements like expert judgement and acceptance of deliverables which are serving project's quality management purposes. Many times also the project sponsors (sales and business unit directors) are participating in the meeting. Order Acceptance meeting can be seen acting as phase gate to next project phases.

Project handover to production and closing of the NPI projects were found out not to be well developed. NPI projects typically just fade away. The last step of formal NPI process is always so far away in the future that people tend to forget the whole project before closing. That's probably why lessons learned are not typically collected nor the success of the project is evaluated.

4.2.4 Project organization

It was found out that the company is working mostly with functional matrix organization in the NPI projects. There are quite many people participating in a single project but authority and responsibility of these people seems to be quite low. The project manager is not always formally assigned and rarely fully empowered. The project sponsor is seldom assigned or highlighted. Project team is not always assigned. Some interviewees found that project organisations are sometimes confusing. Roles and responsibilities are not always clear for everyone.

Clear sign embodying the functional matrix organization is that many interviewees found NPI projects falling short to daily operations.

4.2.5 Project communication

Projects are not very well communicated for different stakeholders. Sometimes there's lack of communication also inside project teams. Some interviewees found it difficult to monitor project's progress. Tools utilized in communication are email, Share Point, Prios and Excel software. Communication is mostly done in various project meetings with various levels of participation. Most of the meetings where communication takes place are serving only product related processes.

In some units communication of the NPI projects is done also in the general bulletin board and in some operational meetings.

Customer participation in NPI projects was found to vary much depending on the customer and the project. All the interviewees found that there would be mutual gains if customer could increase its participation in the projects especially in the beginning of the projects at RFQ phase.

5 IMPROVEMENT PROPOSALS TO ENHANCE NPI PROJECT MANAGEMENT SYSTEM

5.1 Project requirements and documentation

Although company has some procedures to communicate project and product requirements from first project phase (RFQ), company should develop a unified procedure to safeguard documentation and communication of critical requirements. Documentation of critical requirements should be accepted by expert judgment before proceeding to the next project phase and then communicated thoroughly to the project team.

5.2 Project scheduling

The scheduling should be always made in the one unified software. The software should feature monitoring of the general overview to enable top management priorization of the projects and resources. Schedules should be reviewed and updated every time when the project is proceeding to the next project phase.

5.3 Project life-cycle

In addition to different NPI process steps the company should divide NPI projects to 3-4 main projects phases for serving project management's purposes only. Then there should be formal phase gates between the phases. In the phase gates there should be a meeting where the deliverables from the last phase should be accepted with expert judgement before moving to the next phase. Updating the project schedule and project communication activities could be done formally at these phase gates. If there's for example schedule problems, phase gate review should start sufficient escalation process with project sponsors to react accordingly. This procedure would enhance the project's quality management, project communications and schedule management.

Order Acceptance Meeting could be the gate number one between RFQ phase and next project phases. Order Acceptance Meeting should however be still developed and highlighted to serve as a good formal phase gate. Second gate could be for example before manufacturing of the tooling and it could serve the NPI process action "acceptance of the tooling plan".

Because the handover to production and closing of the NPI projects are not considered as well developed, the company should re-engineer the last phase of NPI projects. Either last NPI process steps should be moved out of the NPI project scope or alternatively last process phases should be speeded up some way. Not depending on the choice closing of the NPI projects should be done with higher formality. A meeting should be held to accept all deliverables with expert judgement. All lessons learned about project and also about project should be collected and then communicated in a formal way to be utilized in coming future projects. Also communicating the ending of the project to

all stakeholders is important. Closing of the NPI project should be developed to be the last phase gate before ending the NPI project.

When all final deliverables are accepted and the NPI project can be finally ended, ending of the project should be celebrated in some way at least in minor scale. Small celebration is a good way to highlight ending of something and it makes it easier to start something new later on. Of course bigger NPI projects need bigger celebration. Suitable celebration for typical NPI projects could be some kind of a coffee party on Friday afternoon.

5.4 Project organization

Although the number of people needed for NPI process activities could not be easily decreased, the company shoud streamline and empower the core project team in NPI projects. The project team should be highly committed having only limited amount of projects at the same time. The project manager should always be formally nominated, given sufficient authorithy and responsibility on the project. On the other hand, the company should train adequate number of good, technically competent and strong project managers to take over the most complex projects.

The company should make a strategic decision to move towards Strong matrix organization in NPI projects when the project coordination would come outside the operational organization. This would highlight the role of the NPI projects in the middle of the daily operations. This action needs also adequate number of trained project managers.

The project sponsors names and roles should also be highlighted. Sponsors should be involved in most important phase gate decisions safeguarding the project success.

5.5 Project communication

The decided phase gates should be utilized as points of project communication. All NPI projects should be communicated to all stakeholders in the beginning and in the end. Practical ways for communication of ongoing projects for operational organization are for example bulletin boards and operational meetings. For top management the NPI projects should be communicated by project meetings and alternatively by project schedule management software. Project pipeline view where every project is monitored in one view would enhace visibility of the projects.

The customer should be considered to be communicated when passing each phase gate.

The company should encourage the customer participation at the early phases of NPI projects (RFQ phase). This has been recognized to create mutual gains like cost down both sides, better casting,

better and more effective communication, deeper cooperation in future projects and more strategic relationship. The customer should be encouraged with for example cost and schedule gains.

Successful projects should be raised up in for example in the company personnel magazine. Recognition from a successful project will raise the spirit inside project team and for other teams too.

5.6 Summary

The company should develop and document a NPI projet management system joined with NPI process actions to serve project management purposes. The system should formally divide NPI projects into manageable phases. After each phase there should be a phase gate with relevant project management actions.

The company should include some formal project management action in to this NPI project management system like formal documentation of requirements and collection of lessons learned.

The company needs scheduling software where the overall status of all projects could be monitored in one view.

The company should change its approach to NPI project teams and project organization. Project teams should be streamlined but empowered and organization should change towards Strong matrix organization.

The NPI project communication needs some small improvements and customer participation in the early project phases should be encouraged.

6 CONCLUSIONS

The aim of this thesis was to study and evaluate the current state of NPI project management practices in different business units of the company and then finally make some proposals for improvement actions. As the base model for the evaluation were chosen to be technical standards ANSI/PMI 99-001-2004 - PMBOK Guide: A Guide to the Project Management Body of Knowledge and ISO 21500:2012 – Guidance on Project Management.

The current state of project management in the company's NPI projects was studied by conducting an open interview study. The current state was evaluated against selected project management literature and standards. Proposals for improvement actions were made on the basis of findings.

The company has lots of improvement potential in the field of project management. With quite small actions the NPI project management could be raised to a whole new level. The company should put some emphasis on building up a formal NPI project management system, empowering the project teams and shaping up project organization, and also finding a scheduling a tool where overall status of all projects can be monitored in one view.

SOURCES AND REFERENCES

COMPONENTA OYj 2015, NPI Process Description, The company's internal material.

GUIDANCE ON PROJECT MANAGEMENT 2012. ISO 21500:2012. ISO/TC258: Project, programme and portfolio management.

KEZNER, Harold 2006. Project Management. Hoboken, New Jersey: John Wiley & Sons, Inc.

PELIN, Risto 2011. Projektihallinnan Käsikirja. Helsinki: Projektijohtaminen Risto Pelin.

PMBOK GUIDE 2004. A Guide to the Project Management Body of Knowledge – third edition. ANSI/PMI 99-001-2004. An American National Standard. Pennsylvania: Project Management Institute, Inc.

PMBOK GUIDE 2008. A Guide to the Project Management Body of Knowledge – fourth edition. ANSI/PMI 99-001-2008. An American National Standard. Pennsylvania: Project Management Institute, Inc.

SALFORD BUSINESS SCHOOL BLOG. 2014-08-14. Running a Successful Family Business [webpage]. [Referred 2015-10-01] Available at: http://blogs.salford.ac.uk/business-school/running-successful-family-business/.