TAMPERE UNIVERSITY
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IMPROVING PREDICTABILITY IN INTERNATIONAL PROJECTS

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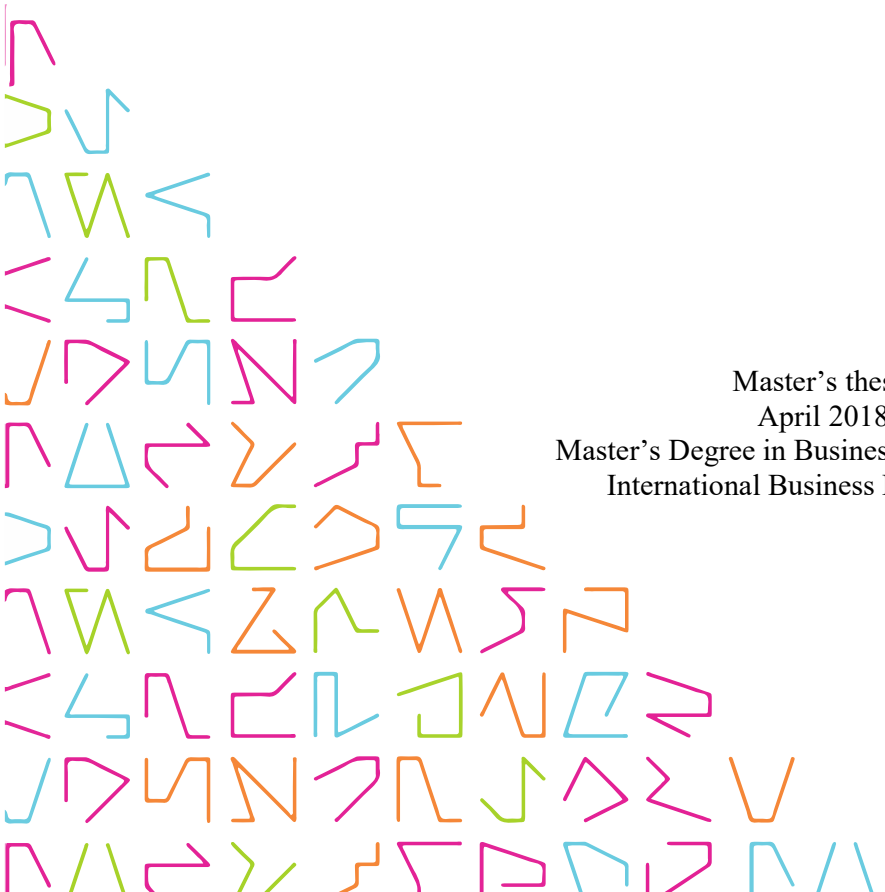

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ABSTRACT

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This is a report of the research where factors to preferable predictability in the context of project management were studied. Research analysis was performed for an international project management system in a defined Finnish organization, related to power plant and pulp industry business projects. Research analysis was expanded to cover also organizations globally and from other business segments. All company-detailed information are classified, therefore data and analysis were handled in a specific way by still allowing readers to understand fundamental substance of the results.

Presented and analyzed projects are typical in global industrial delivery operation used in the power plant and pulp industry. Presented findings and anomalies were from real operational business process operations. Presented findings and solutions can be used for industrial project business operation planning.

Nowadays tendency of key theory dimensions for project operation was also covered in the report. Theoretical model was formed and presented based on the available literature. The author has several years of working experience with different kinds of projects and organizations. The author's personal knowledge is included in the research, in addition to available academic analysis and theories of the project management for the theoretical model. The author's own view and notices were emphasized in the research.

In this report, the theoretical model was examined with the results of the research. Research indicates that lack of planning, certain competences, suitable processes and management can be seen as some general reasons for project failures. Importance of project management competence management, together with business process suitability, resource management and project person selection were found to be basis of predictable project implementation.

This analysis gives topics to companies' business management and project management organizations to discuss and moreover to study, analyze and improve related areas.

Key words: project management, project predictability, project planning, project success

CONTENTS

1 INTRODUCTION

This thesis describes research where the main aim was to study predictability factors of international project implementation. Analysis is based on theory, available academic researches, implemented research and on the author's own experiences and knowledge.

Implemented research was done for identifying main issues of ongoing sample projects which are having unpredictable and predictable impact for the business. The target of the thesis was to cover project implementation process generally from sales to delivery projects.

The research was shaped to have elements of *'action orientated research'* because the work was implemented with involved project managers in cooperation and partnership to solve problems and facilitate long-term change and learning. (Eriksson & Kovalainen, 2008, 193) This was found to be the most useful approach for the research.

True phenomenon with an impact on example projects reality was described by the implemented research. These findings were scaled to a wider global frame and compared based on several project professionals' experience. Existing, specially selected academic research findings were identified and compared with the implemented research. Theory from the literature research was used as background information for the presented theoretical model of the predictable project implementation theory.

Importance of this thesis for any project business is real because of

- the general existence of negative profit projects and project failures,
- continuous business needs for operational performance improvement and
- increasing competition in every business area meaning the need to be more predictable and effective.

This thesis gives understanding, support, views and possible options for the way of working to project managers, personnel and high-level management to be used with any business processes. The target of this supported research review for project management techniques and methods was to give angles and views for discussion to business management.

This thesis serves an idea basis to develop operation practices for the variation of used project management systems.

General questions for the research were to identify reasons and root causes by way of the literary review and the research. Main question was to identify elements for predictability in project management. While project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements. (PMBOK 2017)

For the research, available related literature was reviewed and showed that it was covered by the research scope. (Saunders 2009, 64) In this research a project was handled according to its' general definition: *a project is a temporary endeavor undertaken to create a unique product, service or result.* (PMBOK 2017, 4) Therefore relations with different project types were not necessarily raised, instead observation and notices were handled in a way of common features to all projects.

2 THEORETICAL FRAMEWORK

2.1 Literature review

The main purpose of the literature review was to study existent publications and academic researches for the research scope and for forming the theoretical model. This was the first phase of the research determining direction for implemented research.

At present, there are several organizations which are supporting guides and standards for project management. These kinds of organizations are, for example Project Management Institute (PMI) from the U.S and International Project Management Association in Europe (IPMA).

PMI has released a project management book called Project Management Body of Knowledge (PMBOK, 2017). It is also known as a global standard for project management. The book (PMBOK 2017, 23) describes project life cycle with main phases, as process groups:

- Initiation
- Planning
- Execution
- Control and Monitor
- Closing.

The PMBOK describes processes which can be used generally in any projects and ensures that the project progresses efficiently throughout its existence, including the tools and techniques involved in the application of skills and capabilities that are described in the areas of knowledge. (Sánchez, Gaya & Peréz 2013)

According to PMBOK, project manager is the person responsible for accomplishing the project objectives. PMBOK describes project management knowledge areas for integration, scope, time, cost, quality, resources, communication, risks and procurement management. Crawford has found by research (2000) that project manager competence is a clearly vital factor in project success, while it remains quality that is difficult to quantify.

In addition to project manager skills, the project team needs to have certain level of supportive skills, such as application area knowledge, interpersonal management, understanding project environment and management. (PMBOK, 2017)

It can be summarized that personal skills in addition to appropriate team building with adequate processes are in a fundamental role when implementing project business. In this research, general assumption was that predictability will lead to project success because it gives awareness of the uncertain items. In the following chapters the factors in regard to project failure and predictability to manage project uncertainty are identified and discussed.

2.1.1 Definition of a successful project

2.1.1.1. General

It is generally acknowledged that a high-quality project delivers the required product, service or result within scope, on time, and within budget. Traditional parameters for measuring project success or failure are time, performance and cost, also known as a 'triple constraint'. (Lock 2013, 19) However, terminology sometimes alters for performance to be called quality or specification. Some versions identify also factor of people. (Lock, 2013, 24-25) Later in some contexts, this definition has been enhanced by considering stakeholder satisfaction and the strategic aspect of the client (Blaskovics 2016). Specially, the triple constraint should be used when monitoring and controlling whether the project is deviating from its baseline (Cavarec 2012).

According to Sánchez et al. (2013), predictive project management defines a project as a *"unique set of activities needed to produce a predefined result in a certain date range and a specific assignment of resources".* Considering that a project has been successfully developed when the intended purposes are achieved with the assigned budget and on the dates, have been estimated previously. (Sánchez et al. 2013)

When taking a closer look for project failure, it is fundamental to understand that projects are managed in response to uncertainty. This management phase will take place in the project delivery phase, after project is authorized and engaged. It is crucial to notice that

project definition is the time in project's life history when the foundations for success or failure are laid. (Lock 2013, 19)

Mr. Martin Barnes who was the president in APM (Association of Project Management) between years 2003 and 2012 has stated that *"At its most fundamental, project management is about people getting things done"*. (http://www.apm.org.uk/WhatIsPM, Read 4 Dec 2017) In other words it might be interpreted that project shall *"make it happen"*, where "it" means the project object. In reality, situation with projects might be that project implementations are lacking the best required competences. This might lead in the situations where project personnel do not ask the right questions. Cavarec has identified (2012) the paradoxical phenomenon of project managers as follows:

> *When project managers can have needed action, they don't know it is needed, and when they realize to know it, it's already too late for it.*

One fundamental aspect is to understand that ignoring project politics can lead to difficulties in managing projects. This basically means that the definition of success depends also on the point of view, so it is a challenge to gather people around a common purpose. Agreement of adequate common success criteria will shape the project team commitment and put all stakeholders around the table for common commitment to follow. (Cavarec 2012)

Lately a general agreement has been shaped that schedule and budget performance alone are considered inadequate as measures of project success. However, those need to be considered fundamental components of the project implementation. Technical performance, specifications and achievement of functional objectives form project quality criteria that will be most subject to variation in perception by multiple project stakeholders. (Crawford 2000)

One approach for a project might be like Cavarec (2012) explains that project success and failure have nothing to do with scope, time and cost. In many projects, these variables define what is the project baseline delivery, and very often it is changed during the project. Basically, when changing those variables, it is more a question about change management of the baseline than project success. (Cavarec 2012)

In reality, business objectives are very often used as success measurements, which are generally known as financial indicators. Use of financial indicators as the solution to drive projects will serve only a short-term stakeholder value. Business criteria should be considered for sustainable business planning, although success and failure are basically a matter of stakeholder, such as employees, suppliers, customers and the environment, appreciation. (Cavarec 2012)

2.1.1.2. Failure factors in relation to the initial project definition

Elements of the project success are given already in the previous phase prior to actual delivery project implementation. Very often these elements are created by organization sales with strict customer demand. This phase can be called project initialization phase.

Lock defines (2013, 19-21) that any of the following shortcomings during the project initialization phase, before any work begins, can condemn a project to almost certain failure:

- the project scope is not clearly stated and understood
- the technical requirements are too vague
- estimates of cost, timescale or benefits are too optimistic
- risk assessment is incomplete or flawed
- the intended project strategy is inappropriate
- insufficient regard is paid to cash flows and the provision of funds
- the interest and concerns of stakeholders are not taken into account
- undue regard is paid to the motivation and behavior of the people who will execute the project
- particularly in management change projects, insufficient thought is given to how all the managers and people affected by the project will adapt to the changes expected of them
- approval to proceed with the project is given for political, personal or intuitive reasons without due consideration of the business plan.

These areas seem to be close to project management knowledge areas as identified in PMBOK (2017, 23-25), which are:

- Integration management

    - Project charter
    - Project management plan
- Scope management
    - Requirements
    - Scope definition
    - Work Breakdown Structure (WBS)
    - Scope control and validation
- Schedule management
- Cost management
- Quality management
- Staffing management
- Communication management
- Risk management
- Procure management
- Stakeholder management.

Project charter is used to authorize the project formally. Scope defintion identifies what work is to be accomplished and which deliverables need to be produced. Project management plan describes how the work will be performed. (PMBOK 2017) Same areas are also identified in the Project business book (Artto, Martinsuo & Kujala 2011) where the aim is to adopt a long-term perspective focused on customer relationship management and on the strategic management of the broader aspects of project business. Artto et al. outline (2011) that it is necessary to go beyond a focus on single projects being planned well and implemented successfully. It is vital to ensure that the right choices are made prior to the start of any single project. Based on the Project business book a professional project business requires that a broad view be taken on the benefits that a project brings to both the consumer and the business entity or entities involved. (Artto et al. 2011)

2.1.1.3. Failure factors during the project execution phase

One example of a successful project is from Finland, where between years 2014 and 2017 Metsä Group was implementing their new bioproduct mill in Äänekoski area. The project was involving over 1000 subcontractors with 13 500 employees. Project director Timo

Merikallio assumed that the key element to project success was created by his team. During the project, his head steering group worked in the same location having frequent situational awareness and communication available. Merikallio identifies that he did not follow any specific project management methodology, but instead he focused the project team on the delivery scope at the same time when having means and capabilities to decision making. In addition, they created their own quality system for the project which they analyzed frequently. (Alkio 2017, 12)

An example of a failed project is from Finland, where the nuclear powerplant Olkiluoto-3 project is still ongoing in 2017. The construction work of the Olkiluoto-3 nuclear power plant started in 2005 and was originally planned to be in operation during year 2009. The construction of the nuclear power plant is still ongoing, and the estimated completion time at the end of 2018 is nine years late, after the initial deadline. Immediately when they began the project, the discussion about plant safety started in public. It was said that the project was missing the fundamental safety study of the product. During the manufacturing several quality deviations were noticed. Based on Finnish inspection authority, lack of project quality management with several disciplines were causing these issues. (Vuorio 2017) In 2009 the New York Times made the Olkiluoto-3 nuclear power plant site a warning example around the world. The magazine announced Olkiluoto-3 as a warning to those countries who believe too much about the promises of reactor manufacturers. (Kanter 2009) There were several delays and extensions to the project schedule. During 2009 the main supplier of the plant told that they will re-design the nuclear safety systems according to the regulations in Finland, France and Britain. This was one of the main reasons for the delays. Project director Jouni Silvennoinen says that the main reason has been the need to begin work with unfinished design and solutions. (Vuorio 2017)

Examples of unknown requirements or lack of knowledge when identifying requirements were also resulting poor performance, bad reputation, extra costs and schedule delays in the VR Group Oy ticket system project in 2011 and the Danske Bank system upgrade in 2008. In both cases one of the main issues was poorly evaluated system capacity. (Vanhala 2012)

Lock has identified (2013, 21) following areas to be important for the good project management and helpful to ensure project success:

- good project definition and business case

- appropriate choice of project strategy
- strong support for the project and its manager from higher management
- availability of sufficient funds and other resources
- firm control of changes to the authorized project
- technical competence
- a strong quality culture throughout the organization
- a suitable organization structure
- appropriate regard for the health and safety of everyone connected with the project
- good project communications
- well-motivated staff
- quick and fair resolution of conflict.

As it is known there are significant amounts of information and knowledge available for successful project management, and yet most projects are not managed with these principles in mind (Alami 2016). Reality serves a generally acknowledged brutal fact where projects keep failing. According to Alami research (2016), there is no consensus about how project failure and success should be defined. It is either subjectively defined or left to assumptions and interpretations. In any cases it shall be noticed that failures are opportunities to learn and improve. Each failure should be investigated and lessons drawn for future projects' executions. Knowledge about failure will strengthen an organization's project management execution and practice. (Alami 2016)

Alami states (2016) that beyond a phenomenological description of project management as a process, the discipline should firstly be defined as the endeavour to produce deliverables in a complex project environment dominated by a) frequent changes in scope, b) uncertainty, c) unknowns, and d) complexity. These dimensions should be properly managed with any kind of project management processes to protect operation against possible failures.

2.1.1.4. Critical success factors of a project

Baccarini (1999) has identified two distinct components of project success: project management and product success. Product success correlates with project deliverable or service, and project management with related project implementation. Project success can

be improved with better scope management. According to research (2013) done by Mirza, Pourzolfaghar and Shahnazari, a major contribution to unsuccessful projects is the lack of understanding or defining project and product scope at the start of the project. A properly defined and managed scope leads to delivering a quality product, in agreed cost and within specified schedules to the stake-holders. (Mirza et al. 2013)

In the research (Pinto & Slevin 1987) implemented by Jeffrey Pinto and Dennis Slevin in the University of Pittsburgh they identified the critical success factors of a project. However, in the research they did not measure the strength of factors relationship with project success. The following factors were identified:

- project mission
- top management support
- project schedule/plan
- client consultation
- personnel selection and training
- technical tasks
- client acceptance.

The project mission is nothing but the project goal or objective. Definitely communication needs to be at a good level in the project organization. Access to all relevant information should be arranged to the project team. Team members should have common understanding on the project mission. Project success criteria must be set out at the beginning of the project. This should be identified with measurable and clear units. Otherwise, different individual team members can proceed in different directions during the project implementation. (Baccarini 1999)

Research carried out in the Corvinus University Budapest (Blaskovics 2016) identifies following project critical success factors:

- the project manager's project management attitude on project success
- the interrelationship between the project manager's personal characteristics and project management attitude and leadership style.

According to Blaskovics (2016), project manager features should be carefully analyzed prior to the team building to prevent risk of low success. Based on the research findings project managers have a considerable impact on projects and a key role in achieving project success.

The contribution of all project personnel is significant for the project performance. For this reason, attention should be paid to the project personnel management during the project. Research carried out in the Jönköping University (Vara & Bogdanzaliev 2014) found interpretation by the empirical data of the positive emotions. Corporate entrepreneurs' positive emotions during project failure and the effect that these positive emotions play a role for corporate entrepreneurs in decision-making. Based on the research practitioners were recommend to consider the fact that project failure within the corporate environment could generate as an output not only negative but also positive emotions, which in turn can be used by managers to improve the decision-making and the motivation of their employees, who are involved in entrepreneurial projects.

A study carried out by Ermias Tesfaye in 2016 was showing an analysis on statistical correlation between planning input factors and planning processes, and between planning processes and project success. He found that time, cost and risk factors have a strong relationship with the project success. The result obtained from the research indicates that the human factors have nothing to do with the above mentioned vital project activities (Time, Cost and Risk). According to Tesfaye it means that the project manager and team experiences, the planning effort and the commitment do not affect the vital activities. He concluded that the project manager must give attention to the input factors such as Technical Factor, Management Factor and Organizational Factor. (Tesfaye 2016)

Mr. Sudhakar from the Institute of Chartered Financial Analysts of India has identified in his research that people need to concentrate on quality angle of the projects to make them successful. For the success of the project, organizations should concentrate on team, organization, project management, product, environment, resources and related technical factors (Sudhakar 2016). Also, it needs to be noticed that a link between project team members and project mission needs to exist to ensure project progress direction in the desired way (Pinto & Slevin 1987). The presence of project success factors such as criteria, measures, metrics and evaluations for project increases the probability of success of the project. (Lech 2016; Sudhakar 2016) Mr. Sudhakar has identified in his research that a good project plan should have a valid and realistic time scale with accurate cost estimates. Moreover, he has expressed that project management has traditionally viewed success or failure based on following three metrics: on time, on the budget, and meets specifications. (Sudhakar 2016)

The significance of methodology used in the project plan was expressed in the research implemented by Joshin and Müller (2016), where they support understanding that there is a positive relationship between project methodology elements and the characteristics of project success. In addition, they pointed out that project governance influences the use and effectiveness of a project methodology and its elements with a resulting impact on the characteristics of project success. This should be considered when preparing the project. The used methods must support the implementation of the project and in particular must be applicable to the implementation.

Mr. Sudhakar identified already earlier in 2012 a conceptual model of critical success factors for software development projects. Software project can be seen here as an example of a complex project, where project work is highly complicated and involves many stakeholders, also high technology knowledge is needed in addition to project management knowledge. Project management, product, team and communication factors are identified as important categories of success factors for software projects. Sudhakar identifies (2012) following critical success factors

- Top management support
- communication in the project
- clear project goal
- user involvement
- team work
- reliability of output
- project planning.

According to Sudhakar, the importance of the project plan, teamwork and team coordination in project teams is as critical as well as communication in the project team.

The suitability of the project team's competencies for project implementation has been found to be important. In a research carried out in the International Burch University, Sarajevo, Bosnia and Herzegovina was found out an important role of a project's structural capital (process) in exploiting its human (team) and relational (customer) capital for realizing project success. The empirical results support the proposition that project-specific intellectual capital has a positive impact on project success, and thus may be a good indicator of future projects' performance. (Handzic, Durmic & Kraljic 2016)

Varajão (2016) proposes in his study that the success management of the project management should be considered as a new project management area of knowledge, in addition to areas identified by PMBOK. The processes identified for the area of success management include planning how to manage it, identify the factors, define the success criteria, and how to evaluate, validate and report it. The formalization of the success evaluation needs to be implemented together with the various stakeholders in the project. (Varajão 2016)

Customer success and delivering customer success contribution is adopted to be one of the favorite business world goals used by companies. It is important to ensure that the link exists between business strategy and personnel personal goals. Medina has pointed out (2014) that there shall be an alignment between the performance of individuals with the strategic goals of the organization. However, it appears as though the project manager is disconnected from the long-term goals. Medina presented that project managers are currently involved in competence management practices but their degree of involvement is low. Companies have people working on projects but the project managers are not part of the appraisal, career planning and competence development of the project team members. (Medina 2014)

The significance of project manager leadership performance has been identified by research of Nixon, Harrington and Parker (2012). Project managers need to prioritize training in leadership skills and the need for continuous professional improvement to enhance leadership outcomes. Leadership style is an effective tool used by project managers to influence a project outcome. The lack of leadership performance monitoring can be directly associated with project failure. Project success criteria should be identified and measured. The project manager should hold certain leadership skills to manage project progress according to the criteria. (Nixon et al. 2012)

2.1.2 Project management methods to increase predictability

Project profitable operation and financial success can be reached when the scope, risk, team and communication variables are well performed during project initiation and planning phases (Chen, Chen, Liu, Wei, 2013). However, uncertain events which play a significant role with the project will have an impact to those. In some researches the term

uncertainty is used instead of predictability. Basically, this means that the more uncertainty in the projects, the less predictable the project's outcomes are. The project objectives are employed as indices of predictability to indicate deviation from the planned objectives. (Alhomadi, Dehghan & Ruwanpura 2011)

The management of uncertainty and predictability will depend on project manager skills and competencies. The IPMA organization has created a project management concept called International Competence Baseline (ICB) for the project manager competence elements. The set of skills needed by the project manager, competences, are represented by the three competence areas: People, Practice and Perspective. (IPMA-ICB 2015)

Lopes, Albergaria, Qualharini (2016) present that an organization that aims to perform with competitiveness and accuracy in forecasting processes should address project management as a core competence of the organization. This should be developed by the creation of the concept where psychological contract between employees and organization is part of project management organizational competence plan. The organization should develop human resource allocation plan. This can be used to research the competences of organizations, studying the correlation and causal relations between competences and performance indexes and indicators. (Lopes et al. 2016)

Various traditional explanations of project failures can generally be decreased through risk management. Experiences from previous projects helps in predicting the risks. Quality of forecasts comes from improving data quality and comparing historical information across projects. (Cavarec 2012) Experience from previous projects and operation is generally known beneficial to use with upcoming projects, practice *"lessons learned"* is basically based on that. With lessons learned practices generalizations based on evaluation experiences with operation are created. Main target of practice is to highlight strengths or weaknesses in preparation, design, and implementation that affect performance, outcome, and impact. (OECD – DAC 2002)

Important relation is to understand business authorization to projects. Brioso (2015) explains significance of business justification in projects by business case. The purpose of a business case is to justify the expenses of the project by identifying the benefits. The case explains the reasons why the project should be started, the existing business options,

expected costs, risks (threats and opportunities), benefits, possible wastes, terms, and projected investment. (Brioso 2015)

As described in the previous chapter, project success can be managed by focusing to critical success factors and proper planning. Johanssen (2015, 191-193) describes in his doctoral thesis findings relating to project uncertainty management in practice. The methods are used for estimating expected cost and time and for finding the uncertainty factors that could affect the project objectives in a positive way by opportunities or in a negative way by threats. Five characteristics of uncertainty and four characteristics of opportunities were developed. (Johanssen 2015)

Summary of the characteristics by Johanssen (2015) are as follows:
Threats

1. Project control
    a. Projects are fundamentally seen as uncertain, where cost and time planning need to be considered at the level of best guesses.
    b. Uncertainty will increase according to the uniqueness and complexity of the project.
2. Deviations and changes
    a. Changes will have impact on projects, and proper project adaptation needs to take place during the project.
3. Over specified planning
    a. Preparing zero uncertainty might lead to high buffers with project planning
4. Value of uncertainty management
    a. Project might balance uncertainty management and have impact to cost, schedule or some project benefit.
5. Realistic start-up plan followed by tight implementation
    a. Low level of uncertainty in the initialization phase with avoidance of any changes during the project will have impact to the uncertainty level at the project completion phase.

Opportunities

1. Focus on opportunities during project start-up planning
    a. Proper planning and finding useful opportunities in the project initialization phase.

2. Identification of true benefits which will to lead to opportunity
    a. True opportunity will give benefits to the project or to its stakeholders.
3. Investment for opportunity
    a. Project needs to be adaptable for opportunities.
4. Investment nature consideration
    a. Opportunity evaluation needs to be implemented to find out the value for the project.

2.2 Synthesis of theories

2.2.1 General

It can be noticed that several aspects can be raised while identifying project success and related factors. Predictable operation has clear relation to project success, while definition for it remains relatively complex.

The Äänekoski bioproduct project was a good example where an authoritative project leader was the key element to reach success by building a team with correct competencies, keeping good communication level, monitoring activity, implementing corrections and getting people focused on right things (Alkio 2017, 12). As for the Olkiluoto-3 project is a good example where uncommunicated and unknown requirement can lead the project to a true disaster (Vuorio 2013). It is studied that a better appreciation of the distinction between project and product scope can bring a higher possibility of project success. (Mirza et al. 2013)

However, in the context of project management, irrespective of the single references a project always needs to be planned before it can be managed. A good project plan should have a valid and realistic time scale with accurate cost estimates to focus the project delivery to occur on time, on the budget, and meet the specification. (Sudhakar 2016) Project shall have capability for managing the unknown and uncertainty within project environment which is capable to handle certain challenges and changes. (Alami 2016; Johanssen 2015) Also it is crucial to notice that the plan needs to be adequately communicated for all stakeholders (Sudhakar 2012). This activity needs to be started already in the initialization phase to prevent certain failures of the project (Lock 2013, 19-21). In other

words, several fundamental elements should be prepared already in the preceding phase prior the actual project begins with project management tasks.

Mirza et al. (2013) describe the main steps for the project success.

1. Identification of the factors involved when starting a project.
2. Clear definition of the objectives.
3. Identifying measures of performance.

Project manager skills are identified by many researches, when focusing on project implementation. There are several characteristics which might have impact on project success. In addition to technical management skills, personal attitude and emotions are having influence. In other words, there should be certain considerations when a project manager is being nominated.

One substantial notice is that in addition to planning, where it is very important to give emphasis to time, cost and risk among the other planning activities to achieve better project success, the project manager should pay attention to technical, management and organizational factors (Tesfaye 2016). Also project-specific intellectual capital should be at the desired level (Handzic et al. 2016).

Project manager knowledge and involvement should be used when actions for company's competence development are made. Also lessons learned were found in reference contexts (Alami 2016; Vara & Bogdanzaliev 2014) to be very useful to increase knowledge and prevent failures. The probability of the project success can be increased with identification and action of success criteria, measures, metrics and evaluations. (Lech 2016; Sudhakar 2016; Lopes et al. 2016)

2.2.2 Theoretical model

Based on the available and selected literature the following three main areas to factors as predictability predecessors were formed.

- Area#1: Project Management methods and techniques
    - Alhomadi at al. 2011
    - Artto et al. 2011

    - Chen et al. 2013
    - Johanssen 2015
    - Joshin & Muller 2016
    - Lock 2013
    - PMBOK 2017
    - Pinto & Slevin 1987
    - Sánchez et al. 2013
    - Sudhakar 2016
    - Tesfaye 2016
- Area#2: Personal skills
    - Artto at al. 2011
    - Crawford 2000
    - Handzic et al. 2016
    - IPMA-ICB 2015
    - Johanssen 2015
    - Lock 2013
    - Medina 2014
    - Mirza 2013
    - Nixon et al. 2012
    - Pinto & Slevin 1987
    - PMBOK 2017
    - Vara & Bogdanzaliev 2014
- Area#3: Business factors
    - Alami 2016
    - Artto et al. 2011
    - Brioso 2015
    - Cavarec 2012
    - Baccarini 1999
    - Blaskovics 2016
    - Joshin & Muller 2016
    - Lech 2016
    - Lopes et al. 2016
    - Medina 2014
    - OECD – DAC 2002
    - Pinto & Slevin 1987

- Sudhakar 2016
- Tesfaye 2016
- Vanhala 2012
- Varajão 2016

Theoretical model of this thesis is shown in figure 1.

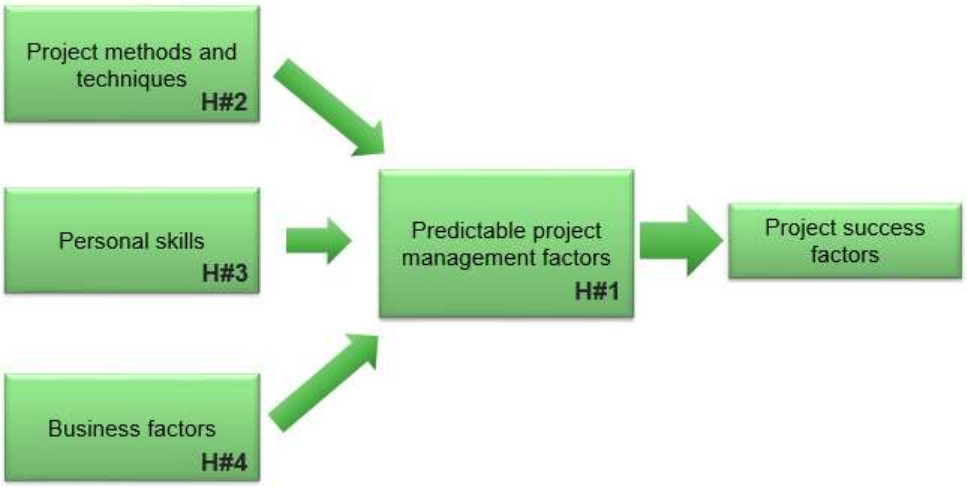

FIGURE 1. Theoretical model

Based on the literature review, project management is a set of tools, techniques, characteristics and business enablement, and needs to be applied in a certain and tailored way. Therefore, the main hypothesis (H#1) of this research is compiled as follows:

> *"Predictable project management activity will lead to project successful implementation."*

A basic prerequisite of effective project management is that resources have certain knowledge and skills. That leads to the second hypothesis (H#2), which is:

> *"Application of the project management methods leads to predictable project management."*

and the third (H#3), which is:

> *"Project manager competency leads to predictable project management."*

Business environment needs to enable and support success of the projects at an adequate level. The fourth hypothesis (H#4) of the research is:

> *"The organization's project business expertise leads to predictable project management."*

3 METHODOLOGY

3.1 General

The objective of this thesis was to evaluate the implementation of project management by selected research approaches, and to identify elements of unpredictability and predictability continuing to desired or non-desired results for the business.

The research was based on real sales and delivery projects and it was implemented based on

- theoretical framework
- example projects by interviews
- collection of global project professionals' knowledge by a questionnaire.

The implemented research was carried out in a qualitative and quantitative way. Qualitative data was collected with interviews and a questionnaire, and also quantitative data with an e-form questionnaire.

The qualitative data was collected from the selected projects of a company operating globally in the power plant and pulp industry. Example projects were selected based on the gross margin and sales value and implemented changes during the project:

- example projects with a high and low gross margin and
- example projects with a high and low sales value.

Questions of questionnaire were formed to cover the project management system in business generally, by the examples raised by respondents.

In chapter 4, Research results, the results from the interviews and questionnaires are presented. This chapter also includes interpretation and compartment.

The case projects and project managers of the study were selected from a company that is operating internationally in the business area of distribution for power plants and pulp mill industry. During the interview in year 2017 the company had an annual turnover of

over 3 billion EUR and more than 10,000 employees working globally in almost 50 countries worldwide. The basic working process and instructions of the company were not studied but the focus was to concentrate on the observations, opinions and views of the project personnel. General project standards and guides were compared only in the way of included in answers.

Example project cases were used to identify project implementation reality in a true international environment and to identify the nature of real technology unit projects.

The specific question areas for the interview were created based on general project management theories and the theoretical model of the research defined in the previous chapter. After interview completion, questions were formalized in free and open form questionnaire. This was distributed more globally via email invitations to cover also organizations globally and from other business segments in addition to interviewed personnel.

In the interviews, all answers were given and discussions were held with project personnel from Finland implementing projects in an international environment. The questionnaire answers were divided into working areas in Europe (54%, 13 persons), Americas (29%, 7 persons) and Asia (17%, 4 persons), as shown in figure 2 below.

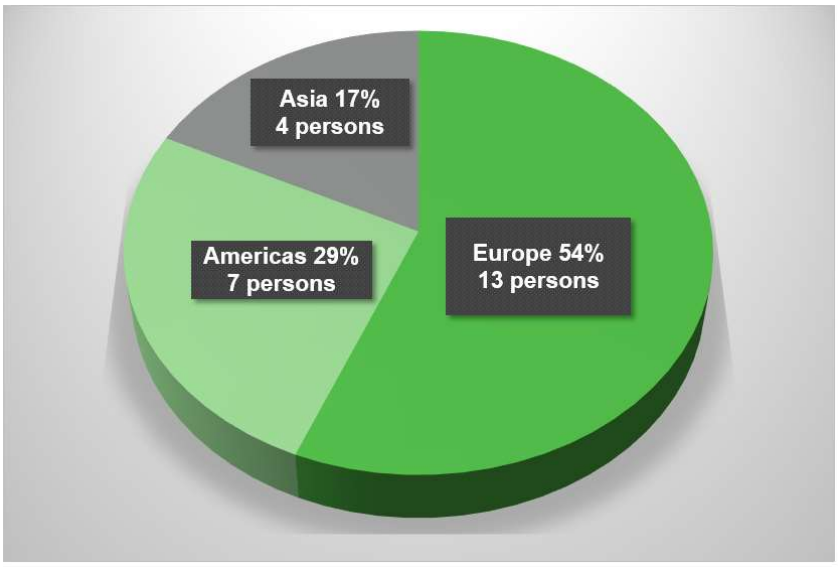

FIGURE 2. Locations related to questionnaire answers

Total number of separate answers were received as follows:

- eight persons had a separate and individual interview and

- 24 answers were given by the questionnaire.

The questionnaire was distributed to 108 persons, which means that direct answer rate was 22%. Indirect answer rate might be lower because an additional possibility to answer the questionnaire questions was given to the members of the following discussion groups in LinkedIn (www.linkedin.com):

- The Project Manager Network
- IPMA Family - International Project Management Association
- Earned Value Management Institute®, EVMI® LINKED (www.evmi.com)
- PMP - Prince 2 - Project Management Gurus
- Performance Measurement
- Lean Business System.

3.2 Research theory

The research philosophy and approach were formed based on nature of combined research. This means that there are deductive and inductive approaches and takes the form of action orientated research. (Saunders 2009, 127) This means that research was having iterative nature of the process of diagnosing, planning, acting and evaluating (Saunders 2009, 147). This research can be called cross-sectional, due to the particular time of interviews and questionnaire. However, the literature review was adding a longitudinal factor to complete research due to wide range of it. (Saunders 2009, 155)

Basically, this research was originally planned to have a qualitative data collection with an inductive approach. This was executed by interviewing project managers selected from international delivery projects implemented from Finland, with both successful and failed projects. The theory was formulated based on the data from the literature analysis. As a research extension, the qualitative and quantitative data collection was added to a wider distribution than implemented with the interview and with the global distribution. The extension was carried out to get a more international perspective for the research and to increase the reliability of the implemented research. The questionnaire was mainly generated with open questions and relatively low answer rate which lead mainly to qualitative data collection.

Finally, the deductive approach of the research, hypothesis creation and comparison were based on combined results from the literature research and implemented research. The data collection questionnaire and interviews were based on the hypothesis, formalized questions areas and literature research presented in this document.

The interviews were performed by one-to-one meetings face-to-face. As followed by the literature research, the interviews had a structured predetermined set of question areas. However, it was found more beneficial that actual interviews were executed in a way of qualitative research interview. By this approach the goal of the interview was to see the research topic from the perspective of the interviewee, and to understand how and why they end up having this particular perspective. This was reached with the preponderance of open questions and the focus on specific project situations and action sequences according to the experience of the interviewee instead of abstractions and general opinions. (Cassell 2004, 11)

The questionnaire was implemented in a form of a self-administered questionnaire. It was administered electronically using the internet e-form. This part of the research was intended as the interview extension to cover project managers' knowledge more globally in addition to the interviews implemented to the Finnish project managers. The main purpose was to implement an explanatory research to study more of the project predictability factors. Questions were mostly open questions which was meant to find out what was uppermost in the respondent's mind. The reliability of questionnaire was prepared by the literature research and the interview phase when question areas for the questionnaire were found. (Saunders 2009, 360- 405)

3.3 Research implementation

The research was implemented with the following steps after the planning phase:

1. Data gathering by literature review
2. Data analysis, formalization of theoretical model
3. Data gathering by interviews
4. Data analysis
5. Data gathering by questionnaire

6. Data analysis
7. Action planning
8. Report.

3.4 Interviews planning

Interviews were prepared by using identified example projects or group of example projects. The target was to facilitate discussion to exam the theoretical model identified in chapter two. The interview discussions and specific questions were facilitated to the following areas around the project examples:

a) background information
b) project(s) nature and characteristics
c) performance measurement basics
d) used procedures and tools
e) factors to result
f) proposals for improvements
g) proposals for predictability
h) lessons learned
i) other notices.

3.5 Questionnaire planning

Findings collected from the interview were analyzed and gave the frame to the questionnaire together with the results from the literature review aiming answers for the research theoretical model study. Questions frames were shaped based on PMBOK (2017) knowledge areas with additions founded in literature review. The questionnaire form is shown in the appendix, and questions were planned to cover the following topics:

- The background information, education and experiences
- General understanding of used project management systems, and individual variations with definitions of the project success and failure.
- Respondent's personal views to identify possible improvement areas
- Identify issues with predictability and find out ways to improve predictability

- Identify reasons for project failure and possible ways and methods to prevent and avoid project failures.

4 RESEARCH RESULTS

4.1 Interview discussion and findings

The case projects were selected among rebuilt upgrade projects in the energy, pulp and paper industry. In this context, the definition of 'upgrade' means delivery of the new system or systems to be integrated in existing operational factory environment. Major parts of the system or systems were premanufactured or manufactured in a subcontracted workshop prior to the deliveries. Projects' complexity levels can be seen as relatively high based on several stakeholder communication interfaces and multiple technical disciplines requirements. The average duration of a project was around nine months, and the sales price from one to two million euros.

The success of these projects was instantly measured by a financial indicator, the project profit. The projects' delayed deliveries were having an impact on profit because of extra use of resources, subcontracted rework and contractual penalties. However, long over decades continuation in project business can be interpreted as a reference of adequate products and their suitability for the customers. The growth and continuation of project business can be seen as a partial evidence of successful operation. Nevertheless, the business evolvement pressure to continuous improvement, efficiency and continuous business growth set needs for more predictable operation. Common understanding in business organization gives support to efforts for uncertainty management with global operations.

The highest recognized failures in the example projects were causing several impacts leading to the project failure, these were but not limited to:

- schedule delays or extension to over third of the sales budget
- budget overrun more than three times as planned.

The following reasons were found to cause failure:

- unrealistic as sold budget from the sales phase
- unrealistic delivery time from the sales phase
- wrong or non-accurate pricing used in the sales phase calculation
- engineering errors
- prefabrication errors due to the errors in engineering

- availability of project resources
- unknown requirements or later appearances of requirements
- surprises in the scope
- lack of knowledge with the new product
- missing project management procedures and engineering reviews.

Generally, the problem of unknown or hidden requirements was discussed. Project managers felt that in many cases it is really difficult or even impossible to identify all requirements. Many times, during the sales phase, requirement identification is not at an adequate level and true requirements were found during project engineering or even during implementation. These kinds of changes might be possible to handle with change management practices, but in example cases the possibilities to share impact together with the customer were excluded by contractual definitions and technical specification.

It was quite clear in example projects that the lack of the technical knowledge, oversimplification and misleading data from previous projects were causing unrealistic budgets and schedules. On the other hand, the pressure to get the contract during sales negotiations will keep growing during the negotiations increments. In the other words, the question is about a compromise during the project sales phase. Evaluation of the compromising level will define the upcoming operation success rate.

Communication with the customer was raised to be one significant area where improvements are needed. The importance of common reviews for design and designed solutions was identified. Also, it was pointed out that in many cases internal design reviews were not held or those were held lightly. The concern on project's internal design inspection was real, managed design chain steps from creation via inspection to approval was not exactly followed. Reviews need to be properly prepared and facilitated to reach systematic project implementations.

Typically, project kick-off reviews were indicated to miss some relevant information as well as the risk review from the sales phase. Some project disciplines in the project, specially raised EI&C, meaning Electrification, Instrumentation and Control, were implemented with resources outside of the project. Basically, in those cases design was made by outsourced resources which were never attending project meetings and were not aware

about specific customer tailored requirements. This was causing a lot of errors and mistakes in the engineering. In addition, these outsourced designs were not planned in the way to allow common reviews nor adequate design inspections.

Availability of the resources for project use was a finding which was clearly raised in several interviews. The problem was more like that the nominated resource was unavailable or the liable resource was continuously or effectively changed in a way that was typically impacted with a poor handover.

The variation of resource roles was identified. In addition, a significant variation of competences in organizational roles based on individual performance was found.

The significance of uncertainty management was raised due to “surprising scope changes” during the project. This were founded and deemed to be characteristic for rebuilds where old mill environment is upgraded.

Some products were handled like old products in projects although those were new for the implementing organization. The background for this phenomenon was explained with changes in product responsibilities and knowledge transfer activities inside the organization. Also, totally new product technologies were used at least partially in some projects but without any evidence of any buffer to budget, such as schedule or cost either any contractual tool.

Customer satisfaction was not measured in the projects, but in some cases the customer had been satisfied with the result and the product, and ordered more. There was not any calculation or evidence for negative profit compensation.

The existing tool for project status reporting and cost management is a system where the “as sold” budget can be compared with the present stage of the project. This system does not allow cost status to be shown together with the readiness information. The system was commonly deemed as an old-fashioned system which is serving the needs of project management only at a poor level. It was known that the system will be upgraded to a new system within few years.

One raised question was: “How to find out the correct Work Breakdown Structure (WBS) level, how to identify WBS in a proper way?” Project managers desire to have a WBS which is not at too high level but also not too detailed.

Another need was identified to be “a proper tool for forecast”. The existing system is old and does not suite for the purpose.

Project personnel were having an impression that sales activities are occurring rapidly. Information and solutions are requested with an assumption to get answers almost immediately. It seems that the key knowledge resources from the organization are used without any buffer of schedule, without warning or preparation and with the expectation they can be used for sales as first priority items. The significance of operative resource management can be recognized while delivery projects and sales activities are using the same resources.

4.2 Questionnaire findings

4.2.1 General

Answers for the questionnaire questions were given by respondents who were older than 30 years, with variation where 29% were under 40 years, 42% between 41 and 50 years and 29% older than 51 years.

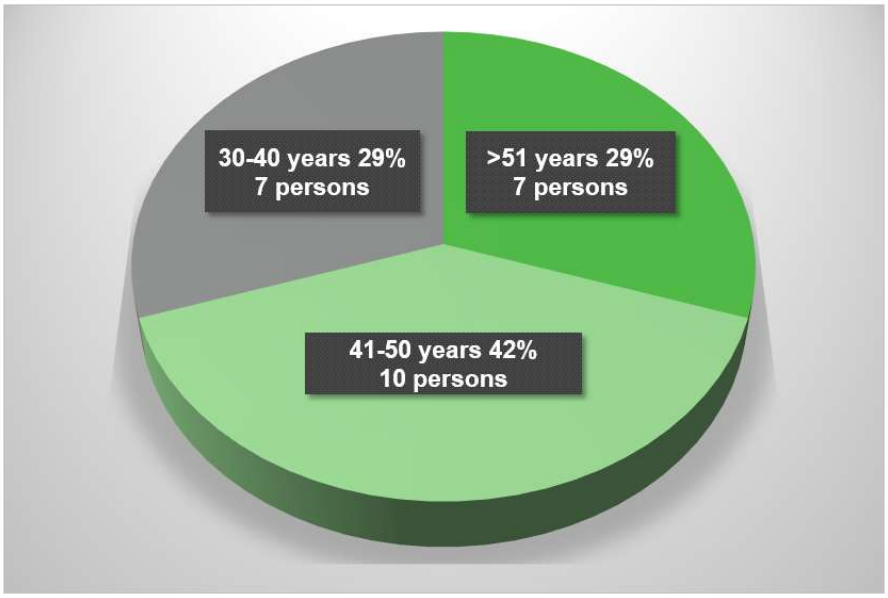

FIGURE 3. Respondents age

For over half of respondents the working area was Europe and the rest of those were divided to Americas and Asia as shown in Figure 2. Most of respondents were having a university level education with Bachelor of Science (38%, 9 persons) or Master of Science degree (46%, 11 persons). As shown in Figure 4, more than half of all were working in a project operating position, such as project manager (67%, 16 persons) or project engineer (13%, 3 persons). Fifth of answers (5 persons) were given by more project supporting positions than implementing it, such as project director, sales manager, business development manager and engineering manager.

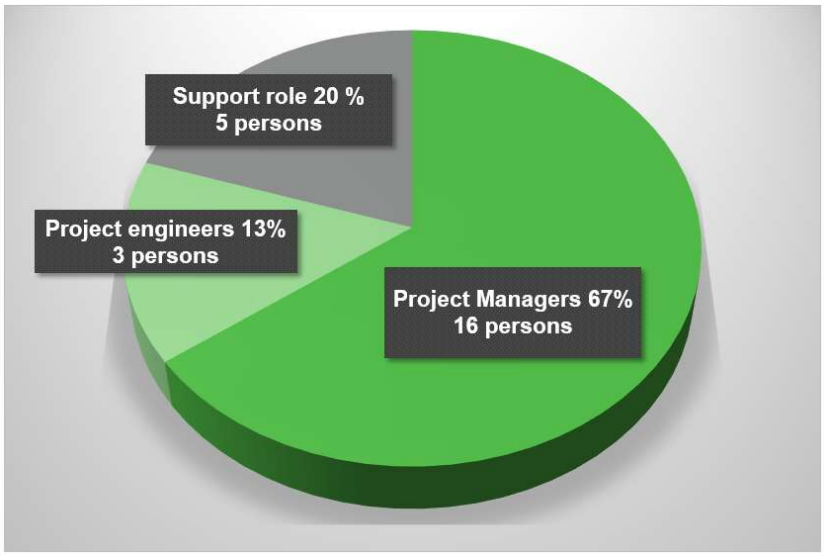

FIGURE 4. Respondents roles

Only a minority (13%, 3 persons) were having experience of working less than three years with project management in an international environment, when a half were having experience over ten years. Almost the same relationship of answers was found also with team leading experience. A half of respondents reported that the majority of experience were from high complex projects where tailored project management skills were needed. Project complexity was identified by the respondents with the following clarification characteristics:

- project and team size
- complexity of technical nature
- many stakeholders and large team size with various locations impacting the project interface
- complex communication
- new product or new environment
- multiple product lines and/or units within the scope of the delivery
- number of changes during execution
- special requirements.

Only a half (54%, 13 persons) reported that they had project management specific trainings. The level of education varied from a few days training to a few years. The most of respondents were using traditional project management methods, such as waterfall, in their projects.

4.2.2 Challenges of a project

When asking the respondents to identify challenges in their projects, the following items were identified:

- unclear sales data with “grey areas”, meaning a vague scope with customer
- low profit from the sales
- short and challenging delivery time from the sales
- lack of resources with the project team
- unprofessional project team
- large project team with vendors and suppliers in various locations.

Also, generally it was identified that project management is an underrated skill. It is generally acknowledged by the answers of the respondents, that it is just something anyone can do without any training. It was proposed that the project theory should always be discussed with the whole team and company, so that everyone understands why something is done in some specific way - or could propose a better way.

Based on answers a very common finding was that the project definition or the project charter was unclear. The scope was unclear, the sales organization and the customer have a different opinion on what is included. When these situations are given to the delivery project, a lot of time is needed to fix these issues. Unrealistic schedules have sometimes been a troublesome issue where there was not enough time to make sure tasks were done at the correct quality level. Starting with a low margin project has also been a challenge, since those projects normally have no reserves anywhere and the sales organization has been over optimistic just to be able to have a margin low enough to get it approved. Also, it was indicated that when using “low-cost” alternatives for sub-contractors, it will typically lead to a significant amount of extra cost and spending time to solve quality and schedule problems with deliveries.

4.2.3 Project planning and forecast

When raising the question about project planning and related methods, some office tools and company processes were identified. Based on the answers it can be noticed that a significant component of planning is based on project manager skills and desire.

Oftentimes the start of engineering and related design is based on the handover from sales. A project schedule is developed with available office tools already during the sales phase and will also often be part of the contract.

Basically, project planning was told to be based on contractual delivery date, magnitude of scope, estimated design and engineering hours and the availability of appropriate design resources. Typically, during the planning, long lead items are identified. Required information from the customer, or other internal units, is requested as early as possible.

Early engineering documents are prioritized. The schedule is adjusted when needed to coordinate with the main and customer schedule.

Project forecasting was identified to be primarily a finance forecast implemented by the company ERP system (Enterprise Resource Planning). The project schedule was not raised nor readiness to be part of forecast, but the project overall status with a common review was identified. The readiness was indicated by comparison of similarities from previous projects.

One example on how the project forecast was made was introduced according to the description below. Basically, project activities are split to parts with a certain work breakdown structure (WBS) and compared to contractual situation.

> *I use Microsoft Office Excel to split project budget on the different activity codes and schedule those events. This will show how much a certain task will cost and when it will happen. When I do the project monthly update I can see if a certain task has cost more or less than planned.*

The project's financial situation was told to be handled as follows.

> *If the task has cost more, I'm forced either to review costs and find any savings or to reduce the margin. If the task cost less, I can either improve the margin or put this money as contingency, for risk management. If the costs have not incurred during the month I planned, then I just transfer this money to the month I think it will happen.*

Basically, this is a simple and systematic way to monitor project costs and status with a suitable time frame. However, this needs to be preceded by the estimation of upcoming costs, because the forecast identified above is basically only follow-up and monitoring more than management of the costs.

Only third of respondents (8 persons) were familiar with EVM methods (Earned Value Management), and 25% (6 persons) were having experience of using and applying them with projects. Respondents had the following understanding of EVM:

- *EVM helps to know if the project is costing more than planned.*

- *EVM is rather cumbersome to use, should be used in large scale projects, not in smaller projects what I'm usually doing.*
- *Difficult to manage in fast projects*
- *EVM made it easier for me to see if certain tasks are costing more than planned. Every month I check actual costs from ERP, and I compare them with the project plan. From the plan, I see estimated costs per activity per month. From this comparison, I know if the project is spending more than planned at a specific time. Main advantage in my point of view is that you can see the picture and identify where project is expending more or less than planned. It helps in taking decision and directs project plans in order to keep the margin.*
- *I like the method. It requires a lot of extra resources, so I think it's more suitable in the larger Projects where you have a lot of labor. Especially in the construction phase of larger Projects.*

4.2.4 Project transfer from the sales

When respondents were asked to give a brief description, how projects are transferred to a delivery project from the sales phase, various answers were given.

> *Each project starts with the hand-over documents from Sales, followed by an internal project kick-off meeting to review the hand-over documents with the assigned project design team members, purchasing, and finance. Schedules are then created with input from engineering and purchasing.*

In many cases the company process is such that the sales manager organizes a project kick-off meeting where the involved sales organization and project organization are participating. In some cases, the nominated project manager will call this turnover meeting, however the purpose and the agenda are the same. The purpose of the kick-off meeting is to transfer the information to the project team from the sales organization with as sold documentation, cost calculation and risk assessments. It was also noticed that a better information transfer can be reached when the project team or parts of it would be involved already during the sale period. During the sales phase and meetings client's requirements and expectations have been discussed a lot. Customer kick-off meeting was said to be arranged together with sales and project representatives.

Following main items for the kick-off meeting structure were identified:

- Meeting targets are known
    - All-important inputs clarified and understood
    - Details of input and scope
- Specific templates are used to identify project information
- Documents are shared prior to meeting for questions about the project
- Meeting structure
    - brief description of the scope
    - sales figures, hours
    - major deliveries deadlines
    - delivery terms
    - all technical details.

Variation of the actual project implementation process used was quite significant. The lack of project start-up meetings was identified to be problem of the above transfer process. In some cases, project personnel or single specialists were asked to start work with the task while the contract was made months ago, without any formal task turnover from the sales organization. Also, it was noticed that kick-off meetings information does not always reach all relevant participants or those were not invited to participate the meeting.

4.2.5 Project process

Creating the project's general structure with planning based on the company's process to follow for implementation was the assumption for business project implementation. The most of respondents told they were having a process with a milestone check-list to follow, and felt it generally good support for the project implementation, while the minority described the use of "*self-studied methods instead of project process"*. They felt that they are not getting any benefits to use any generally known theoretical frames in addition to their own experience and understanding.

Check lists were felt as a good example, where those lists can help to standardize the project work. A negative impact of a detailed process task listing was identified to be that too much additional work on projects was already defined by the process. In addition,

some felt that the existing process is complex and does not support project implementation due to the process structure. Also, cultural suitability differences between geographical areas were identified. For example, it was identified that a project process created in Finland does not perfectly support the business way of working in North America.

The following check list and process templates were identified:

- Project turn-over meeting agenda check list
- Essential sales document check list
- Engineering application, internal review procedure
- Essential project management document check list
- Minutes of review meetings
- MS project schedule template
- Ongoing engineering issues checklist
- Plus/minus items/cost list
- Financial cost details and projections spreadsheet
- Design and engineering resource utilization report
- Reporting template of project status
- Risk and issues report
- Check lists for delivery installation and commissioning
- Engineering programs to analyze performance test data
- Start-up report
- Customer satisfaction survey.

4.2.6 The main role of the project manager and personal skills

The role of the project manager was described to be the driving force of the project team and specially enabling resources to do the project. Based on the answers, a person in this role needs to be able to give the picture to the team and the customer how the final project and its deliverables will look like. The project manager should maintain a positive but firm working climate in the project. Together with team members the project manager ensures project planning and makes sure everyone is aboard on that plan. In all situations the project manager was expected to have a clear picture of the project regarding to the progress, relation, finance and risks, to be communicated with the project team, business

management and with the customer. The project manager was felt to be responsible for all aspects of engineering deliverables in coordination with main project requirements and equipment deliverables to ensure customer satisfaction and expectations.

Based on respondents' answers the project manager is assumed to have experience of project management methodologies, such as knowledge areas described in PMBOK (2017). This person is expected to be a progress orientated management professional with effective communication skills and with the ability to create and manage a clear direction.

The project manager position was described to be a certain managing position, as follows

> *Kind of entrepreneurial attitude is good, and desire to learn new. It is also good to study project management from different angles; theory, and practical tips from peers. It is also useful to like to work with people.*

The need to understand customer requirements and true substance was identified.

> *There is a need to have good knowledge of how customer machinery works and of the process associated with the equipment. The customer expectations are difficult to meet if the project manager does not understand their process and how the project manager can accomplish their goals.*

The following personal skills were identified to be important for a project manager:

- situational awareness and understanding the big picture, ability to be aware of any significant matter in the project, clear vision for the project concept - what do to
- organizational skills
- ability to manage the project scope including needed technical knowhow for technical communication
- financial knowledge
- requirement management skills
- ability to work with customer
- leadership, team management, skills to handle different types of people
- co-ordination skills to ensure co-operation
- planning skills
- good communication skills, verbal and written

- supervision skills
- project management methods knowhow (PM trainings and certification)
- calm personality
- responsible and accountable personality
- delegation skills
- ability to motivate people
- indefatigable, consistent and flexible working style.

4.2.7 Requirements management

In general, requirement management was felt to be continuous work throughout the project with documentation and communication by the team. Office tools with the spreadsheet template and document forms were generally identified to be used for project requirement management.

An updated main specification and sub-specifications for each sub-entity were mentioned to be the basis of requirement management. Review practices according to project process milestones, such as design reviews and control reviews, were used to communicate the project status according to the specifications, and ensure that progress is according to those. It was also noticed that project process review practices always need to be designed for each project to be suitable for it and to be supportive for the implemented project.

The significance to share information to all disciplines of contractual requirements from the beginning of the project was identified as one important task in the project start-up as well as information of the project schedule to identify contractual obligations for deliverables.

In addition to good communication of the contract and specifications, it was indicated that during the projects these specifications need to be clarified together with the customer. Basically, this means frequent communication with the customer that the project has interpreted customer requirements correctly with the design.

4.2.8 Risk management

Specific processes and templates were identified to be used for project risk management. Generally, risk management and the first identification of risks were expected to begin in the sales phase. The data was reviewed and updated typically on a monthly basis to assess all risks and opportunities.

A typical project management risk procedure to cover the whole project life was generally as follows:

1. A possibility for anyone to add risks and opportunities at any time, status is reviewed monthly
2. Risk identification
3. Risk classification based on their probability and impact on the project
4. Mitigation or improvement plan for each risk.

The following risk management analysis methods were mentioned

- DFMEA, Design Failure Mode and Effect Analysis
- FRACAS, failure reporting, analysis, and corrective action system
- TRL, Technology Readiness Level definition
- Risk assessment.

It was recognized that significant amount of risks were involved in project changes, and should be handled in a more strict and uniform way than were handled formerly.

4.2.9 Change management

A process to handle changes in a project was generally in use in respondents' projects. At least a process exists, and it is presented to the team and customer during the project kick-off meeting. However, it is not necessarily followed, or it is followed partly, therefore it was noticed that the project should be more focused on the process to manage it properly. Specially changes for the contractual delivery and originated by the customer should be more formal than respondents are using now.

Typically the change management tool defined by the process is based on a formal documentation which is handled together with customer, but many times just handled by email or meeting memos. It was felt that it is difficult to get the project team to use the formal process for small or quickly implemented changes. Some were using the formal change procedure in project phase where formal deliveries take place.

4.2.10 Communication management and reporting

The formal method for the project communication was described to be a project reporting practice. Typically, a project report was created and updated to indicate the project status monthly from the project start to end. All finance data and information were often managed in the ERP system but also mentioned in the project report.

In many cases, the project reporting practice was that a certain project report is done every month as per scheduled in the company and released by a specific database or tool. Typically, it was started from the first month of the project start till the end of warranty during the whole project life, including finance information in addition to other project data.

It was indicated that this kind of reporting practices were followed with large projects, and a small and fast occurring project might use some special rules. There was not any evidence found that these kinds of special rules were identified for smaller size projects, moreover it seems to be the reason to not follow the process which is not tailored or even suitable for small-scale projects.

Other communication tools and methods were mentioned, such as:

- weekly project meetings
- agile status meetings
- phone, Skype and video meetings
- email
- databases.

The communication process is agreed in the project and planned by the project manager. Principal rules are agreed with the customer during the project kick-off meeting. As well

as communication contacts like who should be in contact for each kinds of issues, e.g. technical issues, payments and contractual.

Project data is typically stored in one location, such as a network drive or database. This arrangement ensures that files do not need to be sent by emails, only links to the documents. Also, it is important that files and information can be found from a commonly known location. The respondents felt that short phone calls and regular meetings are more effective than emails. However, the significance of meeting preparation with the agenda and material distribution prior to the meeting was noticed to be improved.

Generally, communication was an area that respondents felt that should be improved, internally in the project team with projects stakeholders and with the customer.

4.2.11 Meeting and review practice

After a project is handed over from the sales to the delivery project, and related transfer meetings are held internally and with the customer, routine project meeting practices begin. Typically, a project was identified to have the following types of meetings:

- project status meeting, follow-up meeting
- project design meeting, single meeting
- project reviews according to the process
- customer meetings, single meeting.

Basically, the meeting practice is to have regular meetings and meetings when necessary. This depends significantly on the project size, at which state the project is and which kind of status it has. Frequent communication and weekly meetings were felt to be a good practice, even though everyone were not always participating. Communication with a short memo, and always following the same structure of the meeting were considered good way of the meeting practice. Meeting preparation with the agenda was identified to be important to communicate meeting targets to participants prior to the meeting.

Minutes of the meeting were seen to be an important tool for information and decisions communication. Single meetings minutes were created after the meeting and sent to the participants for the review. Also, a more efficient way was identified to prepare, review

and approve the minutes in the meeting. For the follow-up meetings, there were typically unique minutes of the meeting which were reviewed and updated in every meeting. A positive point was that all open items were reviewed and rescheduled, if not concluded. Negative notice was that sometimes closed items were brought back, because someone was not totally satisfied with the conclusion.

4.2.12 Success definition and factors

The respondents were asked to describe briefly, how project success is identified in their organization? What is the criteria? What are critical factors for project success?

In general, the financial result was raised, but also customer satisfaction with good or excellent customer feedback to be characteristic of the project success.

Criteria and factors were identified with the following answers:

1) Actual profit margin compared to original, improved or kept
2) Requirements reached
    a. Customer requirements are reached and fulfilled
    b. Guaranteed product performance is reached
    c. Minimum level of quality issues
3) Customer satisfaction is positive, wishes to buy more, or recommends our company to other potential customers
4) Realistic sales implemented with the project: correct sales calculation and technical clarification, with good project scheduling and planning.

4.2.13 Failure definition and factors

Project failure was identified mostly with financial criteria, but also some other operation and engineering related factors were identified.

Typically, companies never give up on a project what was sold and started. In some circumstances, this might lead to the low project's financial result, in the same time where the final technical solution is delivered. In the project portfolio and short-term review this

kind of a result was typically handled like a failed project. In the long-term, customer satisfaction and the delivered technical solution might lead to another project and longer co-operation.

More serious was the situation where the delivery was not the best suitable solution for the customer. In the short-term project delivery was seen to be successful, but in the long run problems were occurring. This kind of situations were leading to extensive compensations for the customer.

Respondents identified the following criteria to a project failure

- Financial criteria
    - Project profit margin is dropped, decreased or eroded against the plan or estimate
    - Overcoming the budget
    - Financial targets are not met
    - Implementation is too expensive.
- Schedule criteria
    - delays, being late
    - schedule is exceeded.
- Management and engineering criteria
    - performance does not meet customer satisfaction
    - customer also loses confidence in the products
    - negative customer feedback, customer is unsatisfied
    - customer objectives are not achieved, not satisfying client's expectations
    - excessive quality issues
    - contractual obligations not reached, arbitration.

The respondents identified the following factors to a project failure

- *Deviation from RFQ*
- *New designs and ill-defined customer objectives are major contributors to project failures.*
- *Too slow implementation (product is out of date when it gets into the market).*

The following actions were identified for how to prevent a project failure

- Process and operation improvement

  - Lessons learned from previous projects or operation
  - Find out, what is the reason for overcoming
- Good communication
  - Cross checking by colleagues
  - Management engagement when needed
  - Good customer relationships
  - Review practices
  - Better defined customer objectives, combined with better designer knowledge of the processes associated with the equipment they are asked to design.
  - Effective meeting practices.
- Operational planning procedures
  - Active and suitable project management
  - Frequent awareness of the project status
  - Take corrective actions immediately
  - Training for improved working methodologies
  - Keep track of scope changes, approval for changes and evaluate all impacts of change, not only time or immediate cost
  - Improve risk management
  - Risks & opportunities shall be reviewed jointly every month
  - Use more or enough resources to implement the project (resources meaning more designers etc. to be more LEAN)
  - Manage stakeholders more effectively and thus also the requirements
  - Use more intelligent solutions when available, do not think just cost wise
  - Have solutions for possible quality or warranty issues to minimize delays affecting the customer production schedule
  - Ensure that all scope changes and extras have been quoted and accepted by the customer
  - Budget controlling, delivery, equipment quality and good organization during project execution
  - Better information flow and specified data to avoid design mistakes and more skillful people at the site phase
  - Try to find possible risks and not fulfilled issues and mitigate those.

The significance to understand customer needs was raised as one of the important reasons for success. This can be reached by using proper resources.

> *The most obvious is to assure the proper sales process. If the scope is wrong the project will go wrong. Also, organizational resource handling is a key to success. The resources need to have the proper knowledge, time to finalize their tasks, and keeping the same resources until the project is done. Planning and risk mitigations come after those.*

4.2.14 Improving predictability

In general, the respondents identified that the basis to enable proper predictability for project management is simply based on the act where during the project starting phase all necessary and relevant data are available, identified and collected by estimation techniques and expert judgement. If this is done at a proper level then the data is followed on a monthly basis and updated as necessary. Basically, after identification, it is more like a question of scheduling and monitoring. Data collection and management can be part of the risk management system. Depending on the project subject and business area, certain risk identification techniques can be used.

The project should be aware of the uncertain situations and have plans ready for alternative choices. The project management processes identified in PMBOK (2017) were felt to be a suitable basis for predictable project management, e.g. critical path identification. However, PMBOK was seen as a basic knowledge which always needs to be interpreted for the business implementation. Basically, this was explained so that the quality of the project management performance is always subject to how well the substance is understood, does the project have needed knowledge for substance and do the project members have skills to implement proper planning and implementation of it. The project manager should be able to identify and understand the problem scenario, followed by act of the necessary changes and continuously improving execution. Therefore, the project manager experience and knowledge was raised to be fundamental core competence with project implementation.

Project management *hands-on knowhow* was identified to be learned effectively by mentoring practices, where learning is transferred during ongoing growth and with the projects. Knowledge from previous projects was seen important to be identified and achieved for use by operative project management and in up-coming projects. Therefore, the lessons learned process was seen as useful tool when ensuring the proper level of knowledge to the projects for the predictable operation.

> *Some kind of data bank from existing projects, where you can find information quickly and can compare projects. Same people do same kind of projects, so they might remember something from earlier projects.*

In addition to proper and skilled planning for the project forecast, effective support of line organization roles was identified, for example, using a project or business controller to update finance and readiness, and to reviewed forecast. Also getting the local management involved in the project status review to make sure enough focus is set on to the project operation. The project shall keep the level of information and knowledge, and it is not acceptable that resource changes will impact the project performance. Uncertainty can be decreased with a transparent working way at each department in the project and its phases.

> *Manage the schedule as much as possible on both sides of the project. Items and activities occurring with long lead time and all information needs to proceed without delays. Resources need to be maintained according to the schedule in the project plan. Frequent update of financial and labor projections will help to keep understanding for the up-coming situations.*

In some answers also organizational problems were found, mainly caused by improper resource management and noneffective supervision of the work. Basically, this was seen when using the same resources with several directions and projects without priorities. In those situations, single resources were making priority decisions themselves individually without business level instructions.

> *Project predictability is dependent on consistency of effort, information flow, and the level of experience of the project manager. Internal resource availability must be able to meet the demands of the business level.*

4.2.15 Working in a multicultural environment

The project work in a multicultural environment was generally seen as a benefit and being an item to make project implementation more interesting and positive if managed properly.

> *I like to work as a project manager in a multicultural environment. Once I had a team from Finland, China, Poland, U.S and Brazil working in the same project, and it was very educational. Multicultural projects open our mind for managing projects and forces us to exercise skills like motivation, conflict solution, listening and understanding other's needs. Having just local culture is not enough for me.*

It was noticed to bring special challenges to the project with an impact on the project management and implementation in organization, and in project work.

It was clear that multiculturalism makes everything more complicated, but the actual issue can be found from the individual level.

> *Language challenges and multiple time zones are the obvious ones. Cultural issues are often highlighted, but in my experience, there is more difference between individuals than cultures. When all parties understand the customers objectives, it all works out with normal politeness and friendly behavior. When a project is established, it is anyway already decided that these people will work together, unlike when selling new services.*

The project manager's role was seen to make the project team aware of the cultural differences and have everyone working together. Make all work as a one project team, have a common understanding and bring them on board to work towards project set goals within given target. The project manager shall enable the co-operation of people of different cultures working on the project, respect cultural differences and adapt to it. This will demand more additional work from the project manager when compared to the project which is implemented in a single culture area.

> *People from different cultures need to be managed differently because they are having different kinds of working cultures.*

A different culture can bring different ways to operate which could have a positive or negative impact. Open understanding to other people to find out common things regarding to the company policy is needed. However, a global team should follow the same process, tools and techniques in all areas.

> *Multicultural projects can have communication problems related to language.*

Language problems were reported to cause confusion and errors in specifications. How to communicate an issue and how to approach team members and customers, can vary a lot depending on the working culture. Also, time zone differences can cause communication delays. Required travel time can be very long and costly. Specified equipment and suppliers can be more difficult to obtain. Also, cultural suitability differences should be considered. For example, it was identified that a project process created in Finland does not support perfectly the business way of working in North America.

4.2.16 Project ownership and roles

When raising the question about project ownership and decision making, several aspects were found. In general, the project manager was seen in a key role with it, but there were expectations and notices against that. Typically, it was clear who is responsible for decision making, while it was not always easy to get the decision.

The following owners were identified for the projects:

- Product line
- Head of project management
- Business Unit
- Project manager
- Customer.

Primarily the project manager should own the project. However, their ability to control the project is not within their power in the majority of cases. The sales budget is the key element that determines the financial success of the project. The project manager does not play a role in developing the estimate yet the sales group does not take ownership of the project after it is handed over to the project manager. The project manager must define the schedule given a start and finish date, however the actual ability to maintain the schedule is dependent on internal resource availability and priorities which are managed by the line organization. Therefore, the project manager can identify and define the needs of a successful delivery but does not have a direct influence in the major decisions needed to make it happen.

In engineering projects the key role for project execution was seen as the task of the lead or chief engineer role. Typically, this engineer in charge takes the project's technical responsibility, while the project manager has more freedom for other tasks and project administration. Also, this was seen as a resourcing and knowledge problem, for example when a project was implemented without nomination of an engineer in charge. In those cases, the project manager was overloaded because of technical project tasks, in additional to project administration, and requiring certain level of the related substance knowledge.

Also, some answers were found from organizations where roles were not clear, and this was seen a really problematic operational problem.

> *Sometimes I feel, that nobody owns the project! In one project, we might have many project leaders, managers and engineers and roles are not clear at all. In a small project, you know all in the project and can respond to changes fast, if needed. In big projects, where we have many units involved, the distribution of work is often very unclear and some tasks are forgotten.*
>
> *Ownership of the project is not clearly defined to certain positions in my organization.*

In addition, some organizations were using *"own way of working"* beside the official way.

> *We are not following project management instructions carefully. We do not implement the project management review before we decide "go or not to go" with the projects. Decisions are made by management, and management is supporting the project manager when needed.*

Based on the answers the customer is generally the ultimate owner of every project. A well defined objective for the project is the key to a successful project. When objectives are ill defined at the start of a project there are usually numerous changes occurring during the design phase and after that during the remaining project. These items are a fundamental part of uncertainty when not managed in a proper way.

4.2.17 Client satisfaction

Variation with client satisfaction measurement practices was extensive. In general, organizations were having a specific tool or process to collect client satisfaction. However, there was not evidence of proper management of it, e.g. how it was used in the project portfolio or at another business level.

Customer feedback collection was depending mostly on how the project was delivered. Typically specific questionnaires or satisfaction surveys were sent to customers to evaluate the project performance.

In many cases client satisfaction was measured by the project manager throughout the daily interaction with the customer's project team. During the meetings issues were addressed promptly with open communication. In addition, a customer satisfaction survey was delivered at the end of the project.

Sometimes when a project is having problems and corrective actions are needed, customer complains about issues directly. In some cases it can be hard to get answers from the customer, and especially during the meetings the customer might feel uncomfortable to make complaints face to face to the project manager. Also, response rates for questionnaires have been relatively low.

In some organizations, it was reported that performance was not measured for the projects, and client feedback was given during the project meetings or other regular contacts with the customer. Also, annual questionnaires were used to collect general feedback for the company operation.

In some cases, there was not any systematic process or operating culture to measure customer satisfaction, and it was indicated to be implemented randomly or not at all.

4.2.18 Lessons learned

Generally, the respondents were seeing "*lessons learned*" activities as a good practice, where information should be available from both successful and unsuccessful projects. However, there was a huge variation with process existence, usage and attention.

"Lessons learned" procedures were typically reviewed in a meeting during the project closure. This data was collected from all relevant stakeholders' prior to the meeting. The meeting output and minutes were stored in a database of previous projects, where it can be utilized for several purposes. Also, the usage of a specific tool was mentioned for the collection of anomalies from operation. This tool was used to the identification, facilitation, follow-up and analysis of single items, and specially to be a database for the whole company deviations.

> *We have a positive example where the project manager was deeply involved in detailing the work amount during the sales phase. The actual delivery project was a success with technical and finance aspects but also the customer provided a very positive feedback.*

> *Another example which project was problematic, causing customer machine not to start on time after a yearly shutdown. The reason was identified to be poor technical evaluation prior to the project and finally during the project prevented the system to run and caused a major delay. Certain types of technical modification projects do require special substance knowledge. These kinds of projects are challenging when the best knowledge is adapted because the existing system might have invisible features built.*

Some organizations were not using any specific lesson learned process, but knowledge transfer instead, it was a more likely arrangement where experienced project managers give information about the earlier projects. Some organizations who were using an agile approach told to integrate continuous change and learning in the daily operation. People in an agile organization felt that their operation was based on the previous experience and continuous learning, and therefore they were always using the latest and best available knowledge.

Also, a negative impact of lessons learned process was identified. The organization's project process was changed and adapted several times according to the findings from previous projects. This led to the state where process instructions were widely expanded, leading in the situation where the process users felt a decrease with the process usability based on the variety of available guidelines.

It was also reported that typically in the end of the project, when it is time to arrange a lesson learned meeting and formalize the findings, the operation focus is already on other tasks, such as new projects.

> *A process needs improvement, but due to strained resources this always tends to be neglected. Time should be estimated for already in the sales phase, and the project manager should have the feedback meetings as a part of project planning process and in the project schedule.*

Also, it was mentioned that relevant information was not necessarily communicated through the organization well enough.

> *We have a new system for these kinds of feedbacks today, but everybody is not aware of it. For example, information of a design mistake is not distributed to all, to be able to avoid the same mistake next time.*

> *We have feedback meetings in different project phases, but information is not shared with all project people.*

4.2.19 Needed changes and other comments

Two thirds of the respondents (16 persons) were indicating that there are needs to make some changes to the company project management and support organization. The following details for the improvements were identified:

- Project management process
    - Continuous improvement of the project management system
    - Some persons can do the work how they want and when they want, this cannot be acceptable
    - Identification of clear responsibilities
    - Improvement of the risk management, projects should have some contingency to handle risks
    - To have more standardized way of managing projects
    - The project manager should focus more on project administration than on technical issues
    - Clear rules for everybody to be able to act the same way in a project. All people involved in project work in close co-operation.
    - Common schedule functions. The planning needs to be done by the project manager, but the handling of the tool and set up of the base plan could be done with a common support in each location. That would also make the plan and follow up method to be done in the same way everywhere.
- Resources and competence management
    - More project managers
    - The support organization should be strengthened
    - Line organization should have clear resources and responsibilities defined
    - Replace depleted resources
    - Managers that are familiar with our business line, products and way of operation.
    - Ensure of high knowledge and continuity inhouse in all disciplines.
- Organization and operation management
    - Managers must recognize the processes of our past success and support development of those processes, not necessarily change them for the sake of change.

- A general supervision personnel for engineering work is totally missing. There are only design engineers and the next level is "manager".
- Better and up-to date internal organization charts with complete contact information. Contact information is often missing mobile phone info.
- Obsolete tools e.g. ERP. It looks like has features as it was compatible with Windows 95.
- Organization structure does not support the operation
- Need for projectized organization instead of functional organization.

4.3 Synthesis of results

4.3.1 General

Support for presented theoretical model areas and directions can be found from the research findings. A lot of findings for project failure factors were identified during interviews and by the questionnaire. Generally, it seems that getting problems identified is not an issue of knowledge but of corrective action application. Same phenomenon can be recognized with available literature, there is a huge amount of theories and processes available, but still projects keep failing in reality. Lack of planning, management and supportive management can be seen as a general reason for failures.

4.3.2 Hypothesis H#1, reaching predictability for failure prevention

Significant question with all project businesses might be: *"How to prevent project failure?"*. Research findings support theoretical model hypothesis (H#1): Predictable project management activity will lead to project successful implementation. Based on the findings it can be noticed, without the proper project management a project implementation will be unpredictable and lead to uncontrolled situations and uncertainty, which will have an impact on project possible failure factor formalization. Well-structured project management in the project supported by the certain business activities is the key element for the operation success as it is presented by a theoretical model. Predictability will lead to project success because it increases awareness of the uncertain items. It shall be ensured that the project delivery scope is well understood and the project key personnel are having

relevant substance knowledge. In addition, the project shall have skills to implement proper planning and implementation of it.

Simply, certain actions shall be followed and implemented that a proper predictability can be increased to react and prevent prior to the failure. Factors defined with the theoretical model (H#2-H#4) will define the quality of the project management performance, and moreover to be relevant factors of the predictability of the project.

4.3.3 Hypothesis H#2, project management methods and techniques

In general, research findings support the theoretic model hypothesis H#2: Application of the project management methods leads to predictable project management. The project needs to be implemented according to certain management principles to reach the predictability factors. Project predictability factors can be reached with certain methods and techniques for proper project object identification and verification.

The *"surprising scope"* was indicated and moreover seen as a typical characteristic in several project implementations. In quite a lot of cases it was used as an explanation for project failure or partial failure without managing it. The scope management is one important part of a predictable project management.

One fundamental part of the scope management is to manage changes. Changes during the project were found and deemed to be characteristic for rebuild projects where old mill environments are upgraded. However, the change process is not necessarily followed, or it is followed partly, therefore it was noticed that the project should be more focused to manage it properly. Specially changes for the contractual delivery and originated by the customer should be more formal than respondents are using now in addition to product responsibility changes in the organization.

A well defined objective for the project is the key to a predictable project. The most difficult and problematic thing with project implementation can be as simple as lack of requirement management, the absence of this area is having a significant effect to project predictability. When objectives are not at a proper level in the beginning of a project, there will be a high need of changes during the project. There is always a significant risk

of unknown events when the project does not know what is its task. Therefore, requirement management shall be a prioritized task from the beginning of the project, it needs to be the solid ground for the as sold price. In other words, a change procedure together with the requirement change shall be an integral part of the contract. In addition to the lack of requirement management in the project, if the design work is not managed and approved according to the engineering process, it causes indeterminacy for the end result.

It is fundamental to create a plan of design steps with reviews and approval both internally and with the customer. The review practice and design approval ensure right direction of the technical solution, in case that proper knowledge is available. If also requirements are identified correctly already during the sales phase, that gives more ground to reviews and discussion of a common understanding.

The existence and usage of the clear project implementation process was identified by some answers, but also notices to not to follow the related process were noted. An urgent timetable in the project and excessive workload were told to be main reasons to not to follow the process and implementation for it in general. This finding is paradoxical, due to general knowledge where strict process and exact implementation for it are important in those circumstances.

Preparing the meeting with an agenda was identified to be important to communicate the meeting targets to participants prior to the meeting. This is the way to get all relevant people to the meetings, who had already reviewed material before the meeting. The meeting will be more efficient for the information sharing and moreover for the decision making.

Dedicated reviews were seen as places where facilitation outside the project is needed. As well as a review process in general, it needs to be structured and be easily tested e.g. with specific checklists to be fulfilled. However, it was also noticed that project process review practices always need to be designed for each project to be suitable for it.

Generally, communication was an area that the respondents felt that should be improved, internally in the project team with projects stakeholders and with the customer. The respondents felt that short phone calls and regular meetings are more effective than emails.

However, the significance of preparing meetings with an agenda and material distribution prior to the meeting was raised to be one topic to be improved.

Management of the project overall status with a common review was identified. The project schedule or readiness were not identified to be included in the forecast as some single evaluated items. Project forecast focus on a general level readiness instead of a certain break-down readiness might lead to a forecast which is not accurate and not implemented systematically. Use of EVM (Earned Value Management) or simplified version of it might be a beneficial tool for a true forecast of the project. Used tools were more like an indication that the operation is staying at the level of monitoring the situation than managing it.

4.3.4 Hypothesis H#3, personal skills

Research findings support the hypothesis H#3: Project manager competency leads to predictable project management. Resource ability to apply certain techniques and methods to manage the project will support the project predictability. It is fundamental to pay attention that project resources have needed skills. This needs to be based on adequate competence management system in the organization.

Project manager certifications were seen as a good basis for project implementation. However, without organization support with suitable operation practices and processes, use of certification knowledge and benefits stays at a low level.

New product implementation, or transferred product information, should be well managed to ensure that product and engineering competences are at an adequate level in the project. During the sales, new implementation needs to be calculated and included, or at least there is a need to include contractual tooling which allows a fair change management implementation.

Project resource planning needs to be based on real resource competences instead of theoretical role competences. This gives more pressure to project planning and requires good team build skills capability from the project manager.

It is important that a proper resource management and effective supervision of the work are in use, specially in a matrix organization where multi-tasking is the way of working. Organizational resource management needs to operate at a level that it guarantees planned resources for projects. Also, core knowledge estimation, are all core areas truly owned and supported by company own resources, or is that beneficial to buy some core areas from outside? In the research it was found that some core expertise were bought as an outsourced service from subcontractors. This kind of activity was seen really problematic, where needed knowledge is not in house, but are creating expenses to the project. Also, the change of nominated resources during the project caused reorientation with the project.

Operative project resource planning needs to get integrated together with the sales resource needs in cases where the same resources are used for both. In the resource planning, it should be managed in a way that it is feasible to implement.

Some project managers answered that they are not using any generally known methods nor company processes. They are surviving with their own knowledge and experience. This kind of behaviors should always be studied case by case for root cause identification and corrective actions.

4.3.5 Hypothesis H#4, business factors

Research findings support the hypothesis H#4: The organization's project business expertise leads to predictable project management. Based on the results the following areas were found to be the basis of business support for project implementation:

- Project management process
- Resources and competence management
- Organization and operation management.

Principally, the above issues described in the previous chapters are organizational problems as well as a question of how to manage competences and resources. It is needed to be identified which kind of information, knowhow and skills are needed with the related tasks. The project manager and relevant key personnel competence in this context seem to be fundamental. Project resource nominations shall be focused by management. The

project manager should be able to identify and understand the problem scenario, followed by act of the necessary changes and continuously improving execution. Therefore, the project manager experience and knowledge in the context of project will be a fundamental core competence in project implementation.

The organization should adopt and own the processes, release those and continuously measure with the target to improvement. The management shall ensure that instructions and processes are truly followed. Otherwise the system existence needs to be questioned to find out why a process is not followed. This definitely is a considerable risk for uncertain events and unpredictability. If some parts of organization are using totally own rules, there might be problems for the higher level to manage those, while all operation and comparison with other business segments are not easy. Project ownership and decision making shall be communicated clearly to all business stakeholders. In project implantations decisions are needed, and they need to be easily escalated to ensure progress.

The project sales process needs to include an adequate requirement identification, and with complex industrial rebuilt project interfaces separate pre-study and pre-engineering projects might be useful. Also, adequate coverage of risk management during the sales phase should be followed by related reviews. Existence of the approving sales firm prices and quotation should be ensured, for attention of correct level of decision with needed information. Project personnel should be involved as much as possible during the sales phase to ensure suitable planning and definitions for the contract.

It is crucial to understand that project set-up planning prior to the kick-off meeting will create a foundation to the project. Also, it is important to define who needs to be available in the kick-off meeting, how suitable organization resources are planned to be used and should communication matrix exist prior to the project transfer from sales to delivery. If any of fundamental items, e.g. like Lock defines (2013, 19-21) are still missing during the project start-up, forecast for problems with project execution are probable.

The project transfer from the sales is a critical phase for the project. It seems that very often, present business culture accepts projects for implementation without sufficient definitions and an adequate budget. The lack of an adequate project kick-off meeting was clearly identified. In addition to a missing project identification, this is evidence of poor project organization, resource and communication planning. If the project scope is not

well known and stakeholders are not identified, the project shall be not started. Otherwise the project's nature will be to identify those fundamentals at the same time when the scope expected by contract is desired.

The above mentioned items, planning, implementation and scope, are a fundamental part of uncertainty when not managed properly, which however can be managed with a proper business approach. Project implementation needs to be the whole organizations' concern, with priorities, resources and enabling activities, seeing the entity. Business success will be subject to organization's capability to create a psychological contract between the resources and the scope of doing. (Lopes et al. 2016)

The need of a simple project process with explicit guidelines was indicated. This should be easy to adapt for the project. Basically, it is the question of the need of clear roles and process which need to be planned to apply but still easy to adapt. A suitable scalable process should be created for all sizes of projects and operation done in the company. The process should have space for the implementations and interpretations, but at the same time to be a strict body of structure for consistent business operations. Models found through personalized experience may be functional and useful, but should be adopted by the organization as a company's procedure when applicable.

The existence of a multicultural operation impact on success was seen as a big risk if it is not well managed. Specially communication and information exchange were seen important to manage. The organization should plan and manage also at the high level how to integrate multilocation cultures and teams together.

The organization should pay attention when selecting project management tools to be used with the EVM (Earned Value Management) methods. Use of EVM requires an organization wide culture and process, and it is not the decision of a single project manager.

The comparison from the previous projects can be seen as a useful practice. In the big picture of example projects portfolio, at the level of business unit, the number of negative profit projects was smaller than positive projects and business operation total profit was positive. However, there was not any evidence of systematic corrective actions or follow-up to ensure the existence of the current state, more like the portfolio management was handled project by project. In the example portfolio, the dispersion rate of success seems

to be relatively high and with high variations. The portfolio manager needs to have solid and clear rules for portfolio performance inspections in project reviews.

The formal lessons learned method should be enabled to be in use. This should be followed by data analyses and stored to a database. The organization should address questions: How to exploit information with the up-coming project and operation development? How to transfer knowledge from the findings to the process, which information needs to be filtered and tested more before taking in action for the real process? How to get lesson learned information distributed for use to all relevant persons and authorities?

The lessons learned process needs to be implemented in every project portfolio organization to ensure a continuous improvement process effect. It is fundamental to keep a knowledge database also for the management risks in addition to technical and product risks. In some cases, it seems that there is no time to implement and finish the lessons learned process due to new dedicated tasks, such as new projects. This is something which needs to be taken for further inspection in the organization, if available.

5 DISCUSSION

5.1 General

In general, project management is about having all related resources capable to make it happen and being willing to manage the project with proper and adequate planning instead of monitoring and following things to happen. The project object shall be adopted to the reality with a proper requirements management and delivery. All actions need to be based on understanding of the substance. The project manager is questioned to be capable and accountable and to take lead, with implementation of true leadership. The project shall be prepared, planned and applied for implementation while all situations and actions are properly communicated. As indicated in chapter 4.3, the research results support the theoretical model where the set of tools, skills, competences and business characteristics are a fundamental part of predictable project management.

This research outlines and focuses on the fundamental nature of planning in the context of a predictable project implementation. There are certain useful standards and guides for project's proper implementation, such as like PMBOK (2017), but it needs to be supported by useful and suitable operating processes by the business. Knowledge of the related personnel in the involved business context can be seen also one fundamental area for predictability and success. Based on research findings the elements indicated in the following chapter were found to be the basis of a minimum level project implementation in an international project environment.

5.2 Business factors

5.2.1 Project management process

The research results support the theoretical model where certain skills and project methods are prerequisite for project planning, and need to be enabled by the business. In many cases the variation of the project management implementation depends too much on the responsible project manager, in addition to the authorizing level senior management. Issues might be found that business is having a valid process for the project management

but it is not required to be followed. The process might be old and its ownership has been lost. A other issue might be that the process is so complex that it is difficult to follow due to e.g. disordered process descriptions. A simple problem might in many cases be that personnel just cannot use these processes, because those are too complex, difficult to understand and apply for reality. It might also be that the proper process just does not exist in the form it is needed. Therefore, this issue needs to be understood widely in the business organization from top executives to grass roots level of the projects.

When ensuring prerequisites for project management implementation, the following items shall be considered:

- Need for a common process for all projects implementation in general
- The process need to be clear, simple - easy to apply and close
- Needs to be based on the company rules but tailored according to the business area requirements.

It is important that the process gives a correct pressure to the project management for planning. Giving suitable planning components by the process, will enable right guides to recognize planning activities at the correct level. A useful example might be that milestones and reviews shall have checklists for the project, but always need to be planned in the project to identify the exact need of it and clarification of the content.

The more complicated the process, the more probable it is that the actual implementation is interpreted in a vague way. Therefore, simplicity shall be always targeted to avoid situations where processes are described with too many details. It should be targeted to avoid situations where it is not explicit to follow processes requirements or give an explicit interpretation of those.

A common process at a general level shall support measurement. It is crucial that correct project process measurements are planned. All possible factors to measurement inaccuracy need always to be studied. During the project planning the project manager shall always take a critical examination for the planned outputs for the project portfolio level usage.

5.2.2 Personal skills

Business operation processes should include proper ways to handle needed resources for the operation. Task and role related competencies should be identified and managed.

5.2.3 Culture of discipline

Management shall ensure that company is effectively implementing processes and instructions.

5.3 Project management techniques

When considering single project management activities, the following areas were identified by the research to be needed in any project.

5.3.1 Project planning

Project planning is a crucial sector with all projects for predictability. Moreover, it will have a relation to the whole project implementation with a commonly known plan-do-check-cycle. As part of the process described in the previous chapter, project planning and management shall cover the following areas:

1. Scope management
    a. identification during project set-up
    b. management during project
    c. validation prior to project closure

    Practical tasks:
    The creation of the project Work Breakdown Structure (WBS) in an executable format to identify project work according to the delivery scope. The process could include templates according to standard delivery contents, if applicable. The WBS

structure shall be formed in a way that enables the *Earned Value* or corresponding method use.

2. Organization management

   Project roles and needed competencies need to be planned according to their availability and need for the project. The project's Organizational Breakdown Structure (OBS) should be prepared. The process could include templates according to standard delivery contents, if applicable.

3. Project schedule and delivery implementation planning

   The project schedule and task list should be created for the project. This will need to be based on the company project process, WBS and OBS. The schedule should include main phases and reviews. Input and output criteria should be identified for milestones, deliverables and sub-deliverables. The schedule and task list structure shall be formed in a way that enables the *Earned Value* or corresponding method use.

4. Requirements management

   The project delivery and object should always be planned. As part of scope definition, the project deliverables and requirements need to be identified. The project requirements should be identified from identification to verification, to include also identification of the deliverables. The first level during the *"sales to project"* at the latest 2nd, 3rd etc. level according to the project scope and nature. The requirement management tool or methods, and testing philosophy, should be indicated by the process.

5. Communication management

   Project operation should be communicated based on the communication and approval plan. The plan should be released to include stakeholders. In addition to stakeholders and communication principles, it should indicate approval and operation progress reviews.

6. Risk management

   A visible and effective risk management for project implementation risks should be implemented.

7. Change management

   A change management procedure to cover internal and external changes to project should exist.

8. Procurement management

9. Improvement management
   a. Data collection and analysis
   b. A true lessons learned and corrective action procedure

5.4 Process creation and business operation management

Following areas should be taken in consideration when planning project process and project business operations.

Success

Project success criteria should be identified and agreed with stakeholders before and during the project. Also needs for general success criteria for the project portfolio should be discussed.

Leading

Project managers need to be supported to be accountable of the whole project. All parts and aspects of the project should be planned and led.

Forecast, predictability

Planning needs to be carried out with common rules and consistent milestones. The earned value method, or corresponding variations of it need to be considered.

Meeting practices

Business should consider a specific meeting culture creation to be done. Proper planning and preparation for the meetings should be carried out in

the organization. Meetings need to be led and facilitated. Meeting records should have a common format.

Operating culture

Business should implement the following items

a) Project management process and process ownership
b) Resource management where resources need to be planned according to actual availability
c) Competence management
d) Organizational information share and communication matrix
e) Organizational decision-making chain according to the communication chain.

5.5 Conclusion

An overall answer to the findings in the research scope was found with details opened in this document. A generated theoretical model mechanism and parts of it can be founded from the research results. Research findings support widely the identified hypotheses. Lack of planning and management can be seen as a general reason for failures. A well defined objective for the project is the key factor to a successful project. Lack of the project process or neglection of the process implementation are subject to considerable risks, uncertain events and unpredictability.

Project manager competence is a factor in project success, but knowledge of application area, project environment understanding and interpersonal management are needed to project success. (Crawford, 2000)

As a guideline for success targeting predictable project management, this thesis provides a general frame for the project management process. This is based on the findings of this research and the theoretical model. Business should create and enable a suitable scaled process for all sizes of projects and operation carried out in the company. Otherwise project operations can be shifted in a way of unique rules, personification and situation which cannot be predictable nor controlled by the business management.

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APPENDIXES

Appendix 1. Questionnaire form

QUESTIONS

1. Project Manager / Sales Manager background and PM knowledge

1. Working Area
    a) EU
    b) America
    c) Asia
    d) other: _____

2. Business
    a) Pulp & energy
    b) Automation
    c) Service
    d) other: _____

3. age;
    a) <30
    b) 31-40
    c) 41-50
    d) >51

4. education
    a) elementary school
    b) vocational school
    c) university (bachelor grade)
    d) university (master grade)
    e) other: _____

5. working experience years in Project management, experience with international projects
    a) <3
    b) 4-9
    c) 10-15
    d) >16

6. working experience years in company
    a) <3
    b) 4-9
    c) 10-15
    d) >16

7. Team Leading experience years
    a) <3
    b) 4-9
    c) 10-15
    d) >16

8. Completed Project Management education and training
    a) yes
    b) no

    If yes, then short description of those:

    _____

    _____

9. Description of the projects you have been working. Majority of your project have been
    a) high complex, extreme challenges, tailored project management
    b) basic project management, no special challenges
    c) simple, non-complex, routine implementations
    d) other: _____

10. Description of the projects you have been working:
    a) Traditional project management (like waterfall)
    b) Agile
    c) other: _____

Clarification of your answer

_____

_____

_____

11. What definition “Project complexity” means to you

_____

_____

12. General short description of your role in organization, and in the projects

13. Short description based on your opinion: What is the main role of the Project Manager.

14. Short description based on your experience: What kind of challenges you have faced in projects?

15. What is your opinion: Is there need to made some changes to your company project management and support organization?
    a) yes
    b) no

    If yes, then short description of those:

    _____

    _____

    _____

    _____

16. Short description based on your experience: What personal skills are needed for adequate project management to be able to implement effective project management?

    _____

    _____

    _____

17. Short description based on your experience: How does multicultural environment have impact on the project management and implementation in your organization, and in your project work?

    _____

    _____

18. Who owns projects in your organization? What can you comment on project ownership? And are roles clear for making decisions? (In addition to short description you should identify at least one positive and one negative example)

19. Describe key roles related to the projects in your organization? (In addition to short description you should identify at least one positive and one negative example)

20. How client satisfaction is measured in your projects/organization? (In addition to short description you should identify at least one positive and one negative example)

21. How ‘lessons learned’-practices are implemented in your projects/organization? (In addition to short description you should identify at least one positive and one negative example)

22. Describe briefly, how projects are transferred to you from sales phase? (In addition to short description you should identify at least one positive and one negative example)

23. Describe briefly, what kind of planning and related methods you are implementing in your projects?

24. Describe briefly, what instructions and/or process you are using in your projects? E.g. are you using any check-list in your work? (In addition to short description you should identify at least one positive and one negative example)

25. Describe briefly, what kind of planning tools you are using in your projects? (In addition to short description you should identify at least one positive and one negative example)

26. Describe briefly, what kind of risk management (tools and methods) you are using in your projects? And in what stages of the project? (In addition to short description you should identify at least one positive and one negative example)

27. Describe briefly, what kind of requirement management (tools and methods) you are using in your projects? And in what stages of the project? (In addition to short description you should identify at least one positive and one negative example)

28. Describe briefly, what kind of change management (tools and methods) you are using in your projects? And in what stages of the project? (In addition to short description you should identify at least one positive and one negative example)

29. Describe briefly, what kind of Communication management (tools and methods) you are using in your projects? And in what stages of the project? (In addition to short description you should identify at least one positive and one negative example)

30. Describe briefly, meeting and review practice in your projects? And in what stages of the project? (In addition to short description you should identify at least one positive and one negative example)

31. Describe briefly, project status reporting practice in your projects? And in what stages of the project? (In addition to short description you should identify at least one positive and one negative example)

32. Describe briefly, what are the methods and tools for project forecast in your projects? And in what stages of the project? Also how you ensure that project is overall on track? (In addition to short description you should identify at least one positive and one negative example)

33. Are you familiar with EVM – Earned Value Management (PBEV)?
    a) yes
    b) no

34. Have you used EVM – Earned Value Management (PBEV)?
    a) yes
    b) no

    If yes, please share some experience/notices based on it:

    _____

    _____

35. Describe briefly, how project success is identified in your organization? What is the criteria? What are critical factors for project success?

    _____

    _____

    _____

36. Describe briefly, how project failure is identified in your organization? What is the criteria?

    _____

    _____

    _____

37. What can be done to decrease project failure factors impact?

38. Which kind of project management methods and/or actions shall be followed and implemented that proper predictability can be increased and recognized in projects?

39. Any other comments related to project management predictability?

40. Free comments