ORGANIZATION OF AN INTERNATIONAL COMPLEX DESIGN PROJECT

HAMK
UNIVERSITY OF APPLIED SCIENCES

Bachelor's thesis

Degree Programme in Construction Engineering

Visamäki spring 2013

Suvi Tuhkanen

HAMK
UNIVERSITY OF APPLIED SCIENCES

ABSTRACT

Visamäki
Degree Programme in Construction Engineering
Steel Constuctions

Author Suvi Tuhkanen **Year** 2013

Subject of Bachelor's thesis Organization of an international complex design project

ABSTRACT

The purpose of this thesis was to study the organization of an international complex design project. Finnmap Consulting Oy commissioned this project in order to improve their project management in international complex design projects. The aims of this thesis were to create a functioning operation model used in project management concentrating on the organization of a design project management and communication between parties in an international working environment.

At the beginning of this thesis, the definition and special characteristics of the project were described. A general overview was created on the process of a construction project in Russia, organization structures, communication, and supervision of design. This thesis focuses on project organization and communication parts of project management. Because the success of a project depends on planning of the project, this thesis presents a variety of tools for project planning and controlling.

In the case part of this thesis, the design project management for a large building project located in Russia was studied. A complex design project is part of a building project but partly it is a delivery project, where drawings and documents are produced to a customer for applying a building permit. The case chapter introduces the project management of a case company, and it is then compared with project management recommendations in the theory chapter.

As a result of this study it is recommended that the project managers invest in proper project planning to improve project management. The project plan is prerequisite for a proper completion of a project and achievement of goals. The project plan can be accomplished with a work breakdown structure, which clearly defines the schedule, budget, and person in charge of a task.

Keywords Project management, design project, project planning, project

Pages 47 p. + appendices 16 p.

HAMK
HÄMEEN AMMATTIKORKEAKOULU

TIIVISTELMÄ

Visamäki
Degree Programme in Construction Engineering
Steel Constuctions

Tekijä Suvi Tuhkanen **Vuosi** 2013

Työn nimi Kansainvälisen kokonaissuunnitteluprojektin organisointi

TIIVISTELMÄ

Tämän opinnäytetyön tarkoituksena on tutkia kansainvälisen kokonaissuunnitteluprojektin organisointia. Finnmap Consulting Oy teetti tämän työn parantaakseen projektin johtoaan kansainvälissä kokonaissuunnitteluprojekteissa. Tavoitteena on luoda toimiva toimintamalli projektin johtoon keskittyen projektin johdon organisaatiorakenteeseen sekä viestintään osapuolten välillä kansainvälisessä työskentely-ympäristössä.

Työn alussa kuvaillaan projektin määritelmää sekä sen erityispiirteitä, sekä luodaan yleiskatsaus rakennushankkeen etenemisprosessiin Venäjällä, organisaatiorakenteisiin, viestintään ja suunnittelun valvontaan. Työ painottuu kuitenkin projektin hallinnan osalta projekti organisaatioon sekä viestintään. Koska projektin onnistuminen edellyttää hyvin suunniteltua projektia, työssä esitellään erilaisia projektinsuunnittelun ja hallinnan välineitä.

Opinnäytetyön case osuudessa tutkitaan suunnitteluprojektin johtamista Venäjälle tulevaan isoon rakennushankkeeseen. Kokonaissuunnitteluprojekti on osa rakennusprojektia, mutta osittain se on myös toimitusprojekti, jossa asiakkaalle toimitetaan tarvittavat piirustukset ja asiakirjat rakennusluvan hakemista varten. Case osuudessa perehdytään case yrityksen projektin hallintaan ja verrataan sitä teoriaosuudessa suositeltuihin projektinhallintamenetelmiin.

Kehitysehdotuksena on, että projektin johdon pitää panostaa kunnolliseen projektin suunnitteluun. Projektisuunnitelma on edellytys projektin kunnolliseen läpivientiin ja tulosten saavuttamiseen. Projektisuunnitelmaa voi avittaa työn ositusmenetelmällä, jolla määritellään selkeästi tehtävien aikataulu, budjetti ja vastuuhenkilöt.

Avainsanat Projektinhallinta, suunnitteluprojekti, projektin suunnittelu, projekti

Sivut 47 s. + liitteet 16 s.

CONTENTS

1 INTRODUCTION

1.1 Background and aim of the research

Project working has strongly increased in work communities and it seems to be continuing. The world has changed to more complex and harder to control. At the same time projects have become bigger and more challenging to control. With tightened schedules, lowered budgets, and overlapped projects, it is harder to keep up and still maintain quality. That is why project management is needed. (Ruuska 2005, 12)

One part of a project management, especially in large projects, is design management. With a good design management, quality, keeping to the schedule and budget can be guaranteed and as they say: well planned is half done.

The organization of an international complex design project concerns mainly huge projects, where the client wants a separate main design company, which has knowledge and capacity to run the management of a massive design project. This area, acting as a main design company in international projects, is not the strongest field of know-how of Finnmap Consulting Oy. Thus, some guidelines regarding the organization structure of project management and communication between parties around the world were needed. Hence, the aim of this research is to form a functioning operations model used in project management in an international complex design projects concentrating on the organization structure in design project management and communication between parties around the world.

Finnmap Consulting Oy is a design and consultant company. The clientele comes from the public sector, companies and private individuals. The company's roots come from the 1950s, but as a present-day form, the company has functioned since 1993. They employ approximately 260 persons, and their invoicing in 2011 was 26.3 million Euros. Finnmap Consulting Oy is the parent company of FMC Group. FMC Group is an internationally operating company, whose main business areas are structural engineering, building services, industrial and energy technology, environmental and civil engineering technology, and expert services. There are over 1100 persons working for FMC Group all over the world. FMC Group's network has spread to Latvia, Poland, Russia, and India. In Estonia there are partly owned companies. Its invoicing in 2011 was 82 million Euros. In February 2012, FMC Group became part of Sweco AB. Sweco offers consulting engineering, environmental technology and architectural services. It employs 7 700 persons worldwide. Its net sales in 2011 were approximately 700 million Euros. (FMC Group 2013; Sweco n.d.)

1.2 Definition of the research

This research is conducted for Finnmap Consulting Oy's exporting sector. The purpose of this research is to create a functioning operations model

used in international complex design projects. The aim is to provide information about managing an international complex design project to its readers. This thesis is focused on the organization structure of the project management and communication between parties around the world.

Research is confined to a real, ongoing complex design project, where contracts, between the customer and Finnmap Consulting Oy, are already signed and the main focus is to produce almost all required drawings for a building permit. This includes a variety of different disciplines of design, for example architect design, structural design, geotechnical design, and fire protection design, and also the approval of those designs. The basis of this research is a case study of a large building project located in Russia. The details of the design work, like modeling, are outlined in this research. The drawings are dealt with only by considering their quality.

The theoretical framework for the thesis is created with a literary research. Qualitative research is used in the theory part. Qualitative research means collecting comprehensive information in natural and real circumstances. The purpose is not to find universal solutions, but solutions suitable for a certain type of case. Literary research is made with traditional sources: literature and internet articles. (Hirsjärvi, Remes & Sajavaara 2010, 164,182.)

The next stage, after creating the framework, is to study the case and find out the problematics. The case study is a research perspective, which strives to produce intensive and detailed information about the case studied. The case is studied as context bounded, i.e. taking place, time and social context into account. The sources of the case study are collected through participating observation. (Hirsjärvi et al. 2010, 134.)

The thesis is divided into three main sections: theory, case study, and summary and conclusions. The theory chapter includes five different sub–categories. The case chapter includes company's present project management functions regarding the organization structure and communication. The case study chapter is written on a general level due to the confidential nature of the case. In the end, some improvement proposals are presented based on the theory.

2 THEORY

This chapter deals with the theoretical framework of this study. Emphasis is put on design project management literature and researches of the same subject. The focus on literature is on most recent and classic sources.

2.1 Definition of the concept of project

Ruuska (2005, 18) described that a project is a group of people and other resources that are put together to perform a certain task. A project is unique, it starts and finishes on time, it has a set frame, and it is target-oriented performance. Criteria of a project are also a defined schedule, budget, and quality parameters. Exact definitions may vary from source to source, but they all have uniqueness, limited time, and one-offness in common. The outcome of projects can vary a lot, even though the term "project" is commonly used. The outcome does not have to be anything concrete. (Lester 2007, 2; Ruuska 2005, 20; Stenlund 1988, 2; Stenlund 1999, 18.)

The use of project working is relatively common but project implementation is still not trouble-free. Project control can roughly be divided into project planning and monitoring. Planning means defining work requirements, quantity and quality of work, and resources needed. Monitoring is about tracking progress, comparing actual and predicted outcomes, analyzing impact, and making adjustments. A successful project management achieves the project objectives within time and cost, at the desired quality, and by utilizing the available resources efficiently. In project control, soft and hard techniques are often mentioned. Hard techniques (management) are related to scheduling, budget and quality control. Focus is on managing with tools and established practices. Soft techniques (leadership) are all about directing people, interaction and communication. (Kerzner 1995, 2–3; Pelin 1991, 10; Ruuska 2005, 30.)

The project can be divided into phases. The number of these sections changes slightly depending on the division method. Basically it can be divided into four phases: initiation, planning, execution, and closing, as presented in Figure 1 below. (Stenlund 1999, 18.)

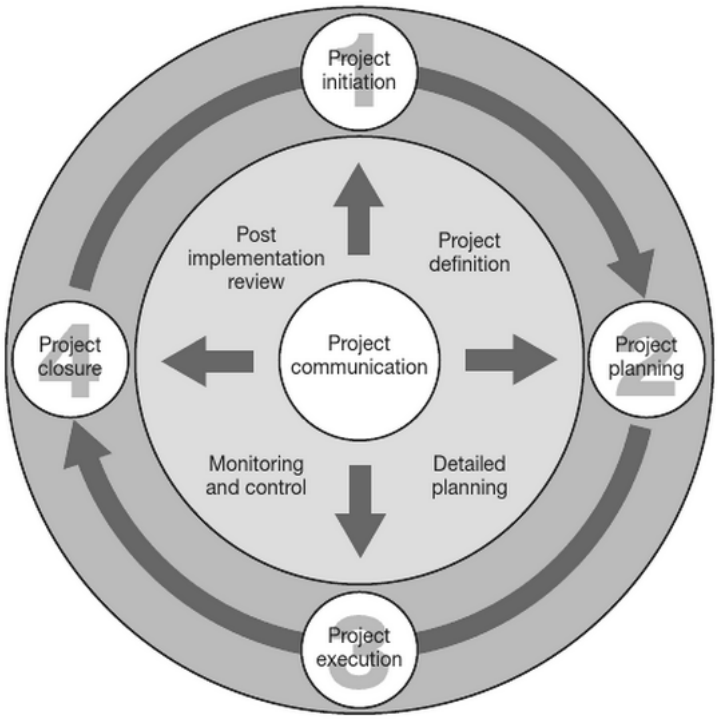


Figure 1 The four phases of project life cycle (Westland 2006, 4).

The project initiation includes two phases: defining the project and administrative start-up. Project defining is a sort of preliminary planning of the project and it is made by the project sponsor. This is done to present what is expected from the project outcome within a certain time and budget. The preliminary plans are defined more in the project definition phase. In preliminary plans the project sponsor informs when the actual project plan has to be done. An administrative start-up includes the start-up of a steering committee and project team, and cost pool opening in the organization account system. (Ruuska 2005, 34; Stenlund 1999, 20–21.)

The project plan is the second phase and it means making of the project's working plan. The project plan is based on the project sponsor's preliminary planning, and it is a document which is used in deciding on whether to start the project or not. In order the project to start, it is essential that all parties agree on the outcome and the project's benefits. The project plan is not used only in deciding on starting the project. It includes describing goals of the project, specification of outcomes, tasks description with resources and time requirements, risk assessment, organization and working practices which are defined in detail planning. The project plan is made by a project manager with a steering committee. (Stenlund 1999, 21–25.)

In the execution phase, the product or system is made and necessary documents are produced according to the project plan. The project manager starts up the implementation of tasks. The task implementation and supervision are an ongoing process until the project finishes. Deviations from plans are recognized and acted on to guarantee successful outcomes. (Pelin 1991, 134; Pelin 2009, 87; Ruuska 2005, 36.)

A project closure comes when the outcome of the project has been put into operation, and the project sponsor has accepted the delivery. A project manager draws up the closing report and presents it to the steering committee which checks that everything has been done, and then closes the project and takes down the project team. The project can be closed before the outcome finishes if there is a major change in the project plan, authorities' limitations, or client's financial difficulties. The project closure is the project team's and manager's duty. (Pelin 2009, 355–356; Ruuska 2005,37.)

There are many types of projects depending on the goals of the project. The goals define how much staff and what kind of skills are needed, in what circumstances the work is done, how long it will take, and what kind of intermediate and end results can be expected. This kind of a complex design project is a combination of a construction project and delivery project. (Kettunen 2003,17.)

The goal of a construction project is to have a concrete construction finished. Every construction project follows the same manner of action, but every construction is unique, so every project has its own unique characteristics. The main feature of a construction project is that it is a coopertion between many people and companies. The project management's job is to coordinate the work, supervise the quality, and control the schedule. The schedule control is perhaps the most demanding task because often the schedules are made really tight, and coordination of different tasks is very challenging. The persons working with the project are professionals, due to their work's nature, which is based on project working. The challenges are overlapping projects, which makes resource planning more difficult. To be more efficient, the tasks need to be overlapping each other in the right order. The completion of some work packages may often affect the schedule of the whole project. (Kettunen 2003, 25–26.)

The design work is only a part of a building project, thus it also fulfills the definition of a delivery project. The goal of a delivery project is an implementation of a beforehand defined outcome. These are often unique projects that can be executed by following a certain manner of actions. Generally, delivery projects are large and the customer is foreign. That is why the work usually involves traveling abroad. One characteristic of a delivery project is that it involves many parties, and often the tasks are corresponding. The project management has to be precise, punctual and coordinating. (Kettunen 2003, 19–20.)

2.2 Construction endorsement process in Russia

The construction endorsement process in Russia is very different from Finland's process: it is very scattered due to the many regional laws and complex hierarchy. The construction process in Russia is presented in Figure 2. The basis for the construction endorsement process comes from Town Planning Code. The basic information about endorsements can be found there. It is then complemented with various federal laws, regulations and governmental decrees. The endorsement sequence and composition of

required documents can vary a lot in different cities: every region has its local inspection and supervising organizations and their requirements can differ a lot. The construction designing and endorsement process can be divided into six different phases:

- contract agreements
- pre-design
- initial permissive documentation
- design documentation
- crucial endorsements
- detailed design.

In Finland, the construction endorsement process happens in a chronological order, but in Russia some of these steps can overlap each other in order to save time. (Avanesov 2010, 7, 10.)

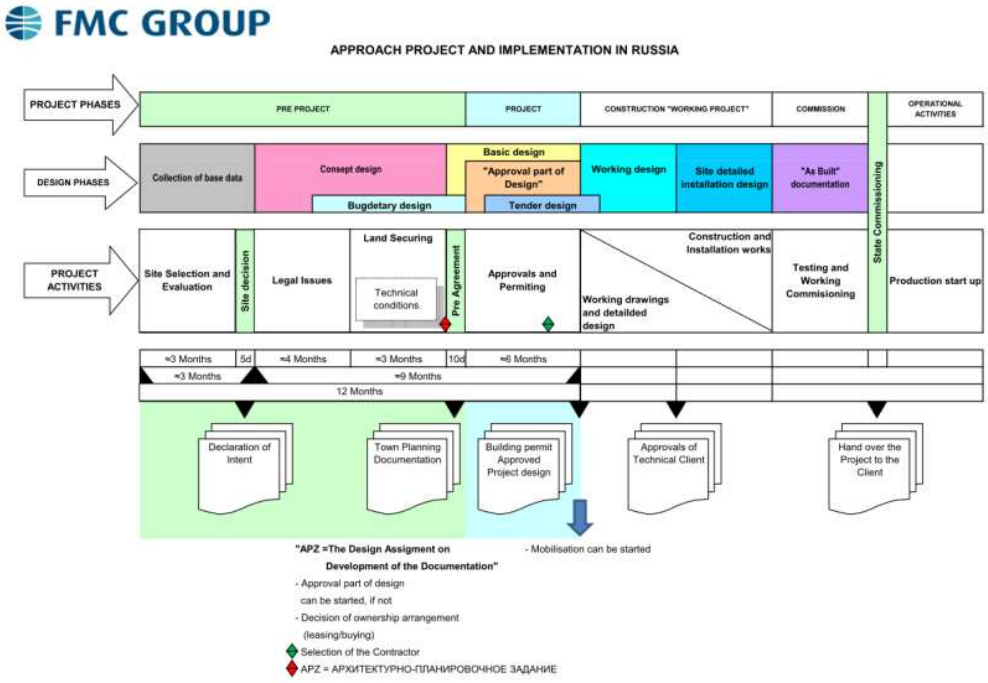


Figure 2 Construction process in Russia (Myllylä 2009, 44).

The main purpose of the contract phase is to find all main participants of the design process. The whole process of designing, endorsement and construction belongs to the contractor company according to the ordinary contract agreement. Typically one company cannot deal with all the actions, so it employs a main design company and possible other specialized companies. The result of this phase is "initial data –package" for the predesign phase. This package includes information about the budget, land plot, construction to be built, and designer, who is taking care of endorsements and of engineering surveys. (Avanesov 2010, 10–14.)

The pre-design phase is not compulsory in the Town Planning Code, but it is indirectly required to be done in some other federal laws. Therefore, there is no normative document regulating the content and composition of

the pre-design documentation. The outcome of this phase should be an architectural concept design and an estimated required capacity of engineering supply. This is considered to be the most crucial phase and it defines the whole designing process to come. (Avanesov 2010, 14–15.)

An initial permissive documentation allows the contractor to start the design documentation. It is a package of documents that contains endorsements and requirements of all organizations and authorities concerned. Depending on location and extension of the construction, the number of documents differ a lot, from few pieces to several dozen. Collecting the initial permissive documentation package requires requests to many different organizations such as local administration, architectural and planning authorities, and land affairs offices. The most vital documents received in this phase are the main permissive document, urban development plan of a land plot, and final technical conditions for connection to networks of engineering and technical supply. The outcome of this phase is to get a permission to construct on a particular land plot. (Avanesov 2010, 31–32.)

The main outcomes of the design documentation phase are finalized structural, architectural and space planning solutions. The level of perfection of these documents should be high, but all additional information should be left out. This package should include everything that deals with bearing capacities, safety and quality. The final design documentation package has to be first approved by concerned organizations, and then it is passed to the state's expert examination (expertise), which is similar to Finland's building inspection authority, and finally it is approved by the contractor. The design documentation has to be made by qualified specialists. In Russia, the designers are completely responsible for the design solutions, so high quality initial information from the contractor is often required by designers. In Town Planning Code article 48 §12, the names and number of design documentation sections are defined as follows:

1. Explanatory note
2. Layout drawing of a land plot
3. Architectural solutions
4. Structural and space planning solutions
5. Information about engineering equipment, networks of engineering and technical supply, list of engineering and technological activities, technological solutions content
    a) Electricity supply system
    b) Water supply system
    c) Sewage system
    d) Heating, ventilation and air conditioning, heating networks
    e) Communication networks
    f) Gas supply system
    g) Technological solutions
6. The construction organization design
7. The project of organizing the demolition or dismantling of construction object or its parts
8. List of measures for environmental protection
9. Arrangements providing fire safety

10. Arrangements providing invalids access
11. The construction cost estimation
12. Other documentation.

The design documentation has to be done according to these sections, deviation is not allowed. Degree of Government No 87 clearly describes the content of all sections. The section 12 “Other documentation” is for everything that does not belong to any of the first 11 sections. (Avanesov 2010, 40, 43–44.)

The crucial endorsements phase is the phase, where the actual building permit is applied for by the contractor. The approved design documentation package is passed to expert examination (expertise) and a positive resolution is the main document for obtaining the building permit. In expert examination, the compliance of technical requirements is checked. When the documentation package has passed the expert examination, it has to be completed with other documents and then passed to service of architectural and construction supervision. In this part, they check the compliance of the urban development plan and other town planning documentation requirements. If the documentation package passes this, too, a building permit will be granted. (Avanesov 2010, 51.)

The detailed design phase is the last phase of the designing process. After this phase, the actual construction work can start. The design documents made earlier are not precise enough, so more detailed design documents have to be made for carrying out the construction project. Detailed design documents include, for example, all required drawings, explications, cost estimations, and time schedules. In this phase, all the subcontractors are defined. (Avanesov 2010, 56.)

2.3 Organization

Project organizations always follow the basic structure: a project manager is responsible for the successful completion and the core team of project is involved in every step of way, but not necessarily full-timed. “Borrowed” resources, sub-consultants and supporters, are involved in certain steps of the project. The action of project is controlled by the steering committee. (Arppe 2004, 35–38.)

Project organizations are always part of some bigger organization, even though they are often regarded as individual events. The decision of starting a project is made outside the project by the functioning organization. Thus, the project has to be in line with the general strategy of the organization. The resources are often transferred between projects, or can be even simultaneously used. (Lester 2007, 2; Arppe 2004, 35.)

2.3.1 Organization structures

Organizations can be formed and evaluated in many different aspects. The basis can be, for example, functions, processes or clientele. Main general

organization types are functional (or line) organization, matrix organization, and project organization, which are shown in Figure 3. A project organization is single-use by its nature, because it is formed only to perform a certain task. (Lester 2007, 32; Pelin 1991, 30; Ruuska 2005, 53.)

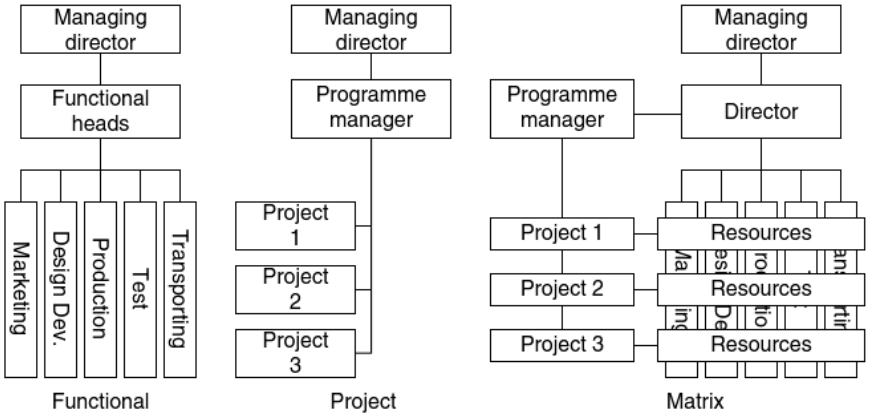


Figure 3 Types of organizations (Lester 2007, 34).

Functional (or line) organization means that there are functional departments, which have their own management. Functional organizations are suitable for routine operations, where there are no changes in the end product. This type of organization is not ideal for complex design projects, due to the fact that every department is expert in its area, the interrelationships between them are well established, and design projects are not mass products. (Lester 2007, 32.)

The most used project organization is perhaps the matrix organization. The project organization is formed partly from human resources of functional organization and partly from resources that are signed for that project. In the matrix organization, all the resources have two managers: a project manager and department manager. It is recommended to use this kind of organization structure, when the number of projects is great and the size of the projects is small. The advantages of this organization type are an efficient use of employees, expertise of the departments are well utilized, and the department manager of staff stays even when the project changes. The disadvantages are a conflict of priorities between different projects, split loyalties between the department manager and project manager due to the requirement of double reporting and the schedule and resource plans have to be made with a high level accuracy. The matrix organization is considered to be the most demanding organization due to dependence of shared resources and problems with double management. (Lester 2007, 32–33; Pelin 1991, 39–41.)

A pure project organization, presented in Figure 4, is considered the ideal type of organization due to its easy control: communication lines are short, planning, technical functions, cost control, and project accounting are all part of the team work. The organization of daily management, such as reporting, has to be delegated from the project manager in order to reduce his/her workload. In large projects, project organization is essential. (Lester 2007, 33.)

Of course, the organization does not have to be pure functional or project organization, but there can be some intermediate forms. These five different forms are presented in Figure 5. (Pelin 2009, 76.)

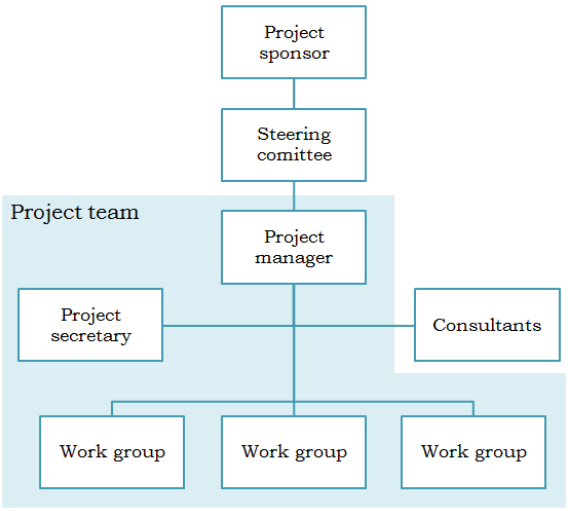


Figure 4 Project organization (Pelin 2009, 70).

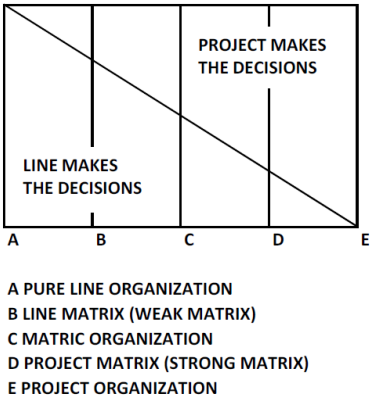


Figure 5 Matrix organization types (Pelin 2009, 76).

2.3.2 Project organization

In a complex design project, the starting point of creating a functioning organization structure of design project management is to see how the projects are generally designed. The most usual way is to have a head designer who is in charge of the coordination of design work, but every designer has their own contracts with the developer. This system is presented in Figure 6 and it is called a coordinated design. A less frequently used, but equally functioning is the design of a complex system which is presented in Figure 7. In this type of organization, the head designer is responsible for the coordination of design work due to the sub-contract obligation the designers have made with the head designer. These kinds of sub-contract relations with the head designer are still quite unknown here in Finland. When the organization structure of the design project is known, the organ-

ization of the main design company's project management can be observed. A pure project organization is presented in figure 4. (Kiiskinen & Seppälä 1995, 19.)

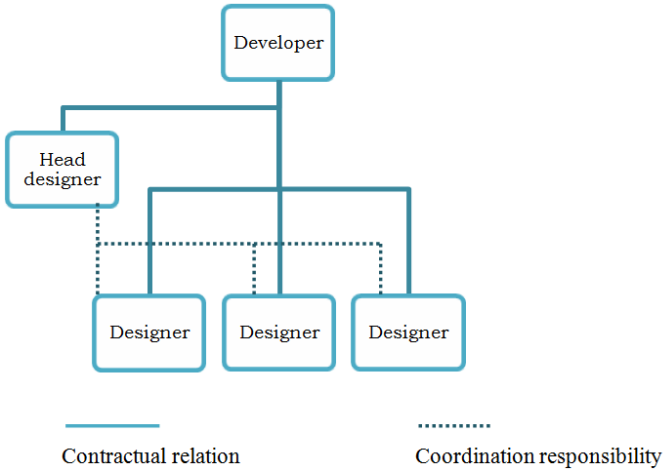


Figure 6 Organization of coordinated design project (Kiiskinen & Seppälä 1995, 20).

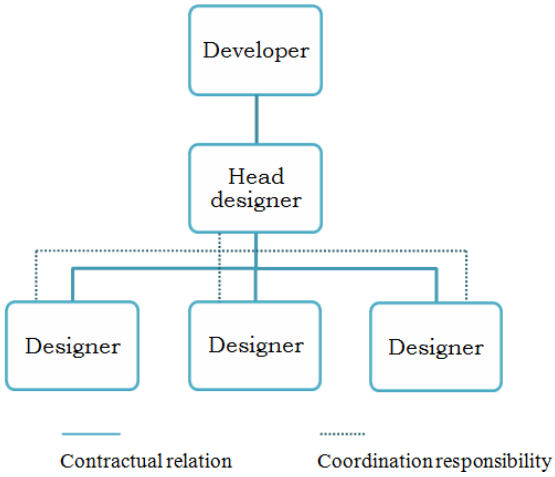


Figure 7 Organization of complex design project (Kiiskinen & Seppälä 1995, 21).

The project organization structure has to be viewed also from the corporation point of view. Usually the management of a functional organization in a corporation finds it hard to find time to apply themselves to matters of one project. If effective management is wanted in a project at stake, special arrangements should be considered, like creating a project organization which is recommended in large projects. (Ruuska 2005, 57–58.)

2.4 Communication

Communication means passing information between people and groups. It is normal for the message to transform in the way due to interferences. This is presented in Figure 8. (Pelin 2009, 296.)

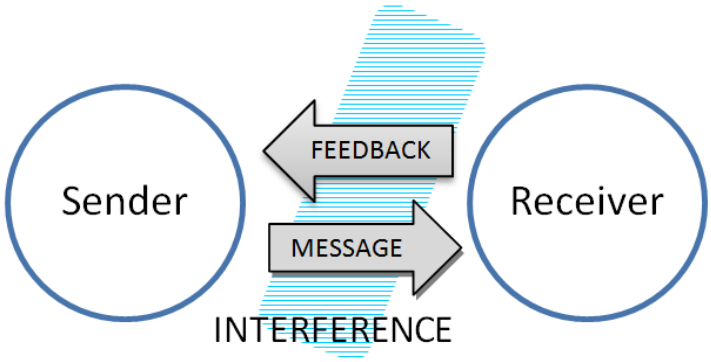


Figure 8 Messages going (Pelin 2009, 296).

A good communication system is vital for the project organization to achieve its goals. If a good information system exists, it is no good, if the information is not exchanged properly. To connect parts of a project together, and the whole project to its surroundings, communication is needed. Efficient communication needs planning, management and supervision. There are various ways to communicate but it can be simplified to written and oral forms. All communication always has a sender and a receiver. The sender is responsible for clear and unambiguous messages, and the receiver is responsible for understanding, interpreting and acting upon the message. (Kerzner 1995, 275–276; Lester 2007, 293; Ruuska 2005, 75.)

Planning of communication is part of a project management and in large building projects, the significance of communication stands out. Communication is, on the other hand, a critical resource and on the other hand also necessary in utilization of other resources. The feedback system also needs planning. Good communication is a two-way street, as presented in Figure 8, and it needs understanding of continuity. A communication plan can include the determination of a project's target profile, general principles and channels of communication, internal communication, external communication, risk assessment, and concrete actions for the next period. Of course, the communication plan needs to be adjusted to the project at stake. The plan needs to be operative and help the project manager is his/her day-to-day work. A reporting plan is also part of a communication plan. (Ruuska 2005, 190–196.)

2.4.1 Project communication

Project communication can be divided into internal and external communication. Communication between project group's members is called internal communication and external communication can be divided into two sections: customer communication and interest group communication. Project communication should be considered as various interaction processes instead of just passing information because the feedback is as important as the message itself. (Helenius 2008.)

Well working internal communication is one of the key things for the success of a project. That is why, it should be taken seriously and it should be one of the most important priorities. Everyone involved should know what has happened at what point, what has been done and what has not, and everyone should have the right to get feedback from the project manager and other group members. External communication has to be consistent even if it comes from separate sources. Mixed messages cause confusion, reduce trust, prevent consistent working, and produce extra work for the customer. Whether it is internal or external communication at stake, they both have to fulfill requirements regarding time, sufficient quantity and quality, and consistency. (Helenius 2008.)

Communication can be also classified as formal and informal. Formal communication is used in contractual, organizational, and technical information. Informal communication on the other hand is used in management communication because it is found to be the most effective way. A general frame for the project communication comes from an organization's communication system. (Lester 2007, 293; Ruuska 2005, 76–77.)

In all communication it should be noticed that inconsistency should be avoided. The message should be clear and in line with other messages regardless of who sent it and to whom. Confusing communication affects many things than can be seen in the outcome. (Helenius 2008.)

2.4.2 Reporting

When the project execution has started, it is important to follow the progress. In order to do this, a progress reporting system has to be created. The purpose of the reporting system is to help comparing the actual and planned progress. The reporting system should provide timely, complete, and accurate information, warn of pending problems in time to take action, and be easily understood. The progress should be monitored with a purpose relative to the project. In order to create this reporting system, a reporting plan is needed. The plan defines quarters that the information is wanted to pass, informed information, procedures, schedules, and persons in charge. (Lewis 2006, 100; Silfverberg 2007, 107; Wysocki 2011, 281)

Project status reports can be divided into four different categories: current period, cumulative, exceptions, and variance. A current period report covers only the most recent completed period. It should include activities completed, variance between actual and planned progress, and possible corrective measures if the work is behind schedule. A cumulative report contains the history from the beginning of the project execution to the end of the current period. It shows the trends in project progress, so it is more informative than the current period report. An exception report indicates variances from the plan. They are usually used when reporting to superiors. A variance report contains information about differences between the planned and actual progress. It contains three basic sections: planned, actual, and variance between the two. Typical variance reports are snapshots from the current period. It is recommended that variance reports are at

least used in duration and cost variances in order to allow early corrective actions. (Wysocki 2011, 281–284.)

2.4.3 Problem areas in communication

Problems in communication are the most common reason for a project failure. There are many reasons for a failure to occur and these failures are called communication barriers. Here are listed the most common ones:

- cultural and language differences, pronunciation, translation errors, and technical jargon
- geographical separation of locations, and equipment or transmission failure
- misunderstanding, attitude, perception problems, selective listening, assumptions, and hidden agendas
- poor leadership, unclear instruction, unclear objectives, poor document archiving and distribution system, unnecessarily long messages, withholding of information, and information overload. (Lester 2007, 293–294; Richardson 2010, 229.)

Cultural differences may cause problems with different customs, etiquette, and trading practices. In Finland etiquette is quite informal. For example, forms of address are fairly informal in Finland, but in new contacts with foreigners formal personal pronouns should be used, in order not to offend the other party. Language differences come also in question when only the other or neither party is speaking their native language. Incorrect translations, wrong pronunciation, and technical jargon can cause difficulties or misunderstanding, especially if the receiver is from a different culture or environment. (Lester 2007, 294)

Members of the project group can be located in different offices, which sets requirements on the electronic transmission equipment. This equipment should be correctly installed, regularly checked, and properly maintained which also includes updating. With the technical equipment, possible training should be arranged to people involved if necessary, so that communication does not get influenced by the fact that someone cannot use the equipment. At geographical distances, the time difference should be considered in order not to wake anyone up at 4 o'clock in the morning. (Lester 2007, 294–295.)

A sender's or receiver's prejudice, bias, tiredness and other failings, which are often related to mood or health at the time, affect the communication. Misunderstanding can be caused due to bad hearing, bad eyesight or not sufficient time to get to know the message. Also, personal conflicts between the sender and a receiver can cause a belief of hidden agendas, and suspicion which may lead to the fact, that the message is not taken seriously or the receiver will not co-operate. Personal opinions or relations can sometimes be fixed with face-to-face meetings, where things are talked through. Assumptions and possible misunderstanding can be avoided by being very clear and specific with the message. (Lester 2007, 295.)

Instructions should be clear, short and unambiguous and the same applies to objects. Simple sketches are often more beneficial than long descriptions because they are usually more explicit. The sender should consider what to send and to whom, in order to avoid causing information overloading with unimportant messages. Basic information that everyone should know can also be excluded from messages. The communication manners and working environment can be affected by the right leadership. (Lester 2007, 295.)

Communication is a way to control, especially employees, but clear messages are not guaranteed by knowing how to communicate. But with sensitive management and planning, good communication can be achieved. (Kerzner 1995, 278; Lester 2007, 295.)

2.5 Supervision of design

With the supervision of design work, the fulfillment of defined targets is being controlled. Supervision helps to integrate different design solutions and to understand mutually the content of the design. Besides the outcome, with the supervision of design, the project costs, quality and schedule can be controlled. The costs, quality and schedule form a project triangle presented in Figure 9. If the aim is unclear or lacks something, it can be completed during the project and in this way control the design work. (Lester 2007, 2, RT 13-10860, 2, 4.)

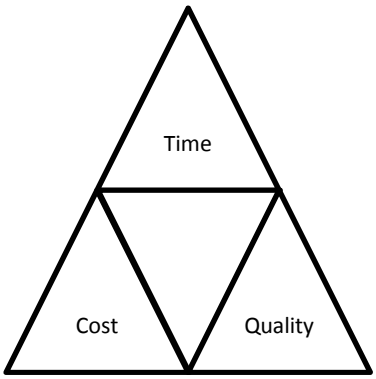


Figure 9 Project triangle (Lester 2007, 2).

Controlling is a three step way: measuring the progress, evaluating what is left to be done, and finally correcting or taking corrective actions in order to achieve the goals. All the aspects of the project triangle must be controlled and that is easier said than done. (Kerzner, 234–235.)

2.5.1 Schedule control

The schedule is the basis for resource and budget control. Nowadays maintaining the schedule has stood out due to the tightening schedules, in order to release the great amount of involved capital and to gain the profits from the investment as soon as possible. The function of the schedule control system is to make scheduling and maintaining the schedule reliable and easy. A good system still does not guarantee the project to finish on

time, but it gives the basic necessity for it. A well-planned schedule also shows in the budget. Overtime work and additional resources usually cause overruns of budgets. (Pelin 2009, 111–112).

Overrunning of schedule is relatively common and the used scheduling systems can usually be improved. The main problems in schedules are broad task specifications, lack of task dependencies and even the whole tasks, defective resource identification, lack of updating, dictated schedules, and poor legibility. (Pelin 2009, 113.)

The work breakdown structure (WBS) is the basis of the schedule. The purpose of WBS is to divide the work into smaller, manageable work package elements. WBS is structured according to work performances, and it reflects the payment program. The work packages should have the following features: work performance units, clear functional groups, clear defined starting and ending dates, specified budget in measurable units, and work performance limited to a relatively short period of time. WBS can be broken down to the needed degree. From WBS a cost breakdown structure (CBS) can easily be created. By adding names of persons in charge of the work packages of WBS, the organization breakdown structure (OBS) is also created. WBS is then a really powerful tool, which shows clearly who is responsible for the task, how much the task should cost, and how the task relates to other tasks. (Kerzner 1995, 591, 596; Lester 2007, 42.)

Scheduling starts with creating a task list. The task list has to be realistic, and the easiest way is to do it in cooperation with the worker who performs the task. All the tasks need to be specified in order to find a critical path and leeways. In long projects, the schedule is not made with the same accuracy throughout the project. This system is called “the rolling wave planning” and it is presented in Figure 10. In the rolling wave planning the first phases are specified in detail and the following phases more roughly. The plans are then specified when proceeding. (Pelin 2009, 114–115.)

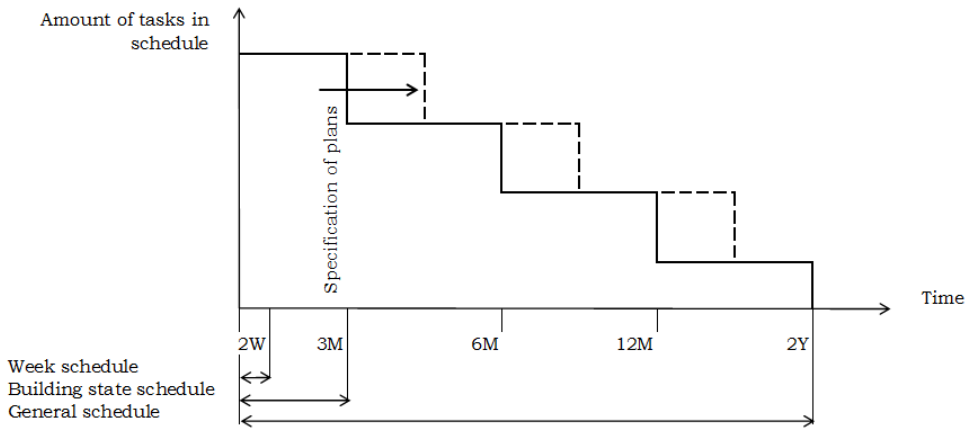


Figure 10 Rolling wave planning (Pelin 2009, 115).

The problems in task listing are usually forgotten tasks. If the task does not have a person in charge it is forgotten easier. The task name in the list should be clear and short so that the duration can be easily estimated by

knowing what the task is and what it includes. There should not be big differences in the durations of the tasks in one function group. An optimal design assignment specification is from one to six weeks. With a critical path analysis, working order can be made. (Pelin 2009, 116–117.)

A reliable schedule comes from reliable task workload estimations. The workload estimation means estimating of the size, cost, resource and duration of the task. The estimation work is an ongoing process throughout the whole project. The workload estimations should be checked every time the schedule is updated. A good estimation needs time, work and experience. The workload estimation system is a massive operation and it cannot be corrected within one project. There are many reasons for the workload estimations to be inaccurate: project expanding, environmental changes (like organization changes, and changes in laws and regulations), lack of experience in estimation, lack of information from previous projects, staff changes, and dictated estimations. It is essential to recognize the estimation errors and reasons for them, and then to correct them. (Pelin 2009, 120, 126.)

Task dependencies give the working order. In complex projects, where there are multiple overlapping tasks, special attention should be paid to planning the right working order. In confused situations, experts of certain sectors should be consulted in order to find out the dependencies. The task dependencies should be defined to guarantee fluent and efficient working. (Pelin 2009, 128–129.)

It is important to control the schedule regularly. The purpose of the schedule control is to recognize variances early. The variances need to be analyzed, and then make corrective actions in order to fulfill the defined goals. The schedule control can be divided into four phases: progress evaluation, schedule update, variance analysis, and corrective actions. Progress evaluation should be linked to something that can be measured concretely. In large projects the schedule upkeep is started from the bottom schedules. Progress information is then transferred to higher level schedules. When all the progress information has been collected, the project situation is evaluated and possible corrective actions are taken. Special attention should be paid to the critical path tasks: if they are not finished in time, the whole project will be behind schedule. (Pelin 2009, 141–143, 146.)

2.5.2 Cost control

Cost control is a vital element in the project management. The cost control is often perceived only as an expense ratio but it includes monitoring, analyzing data, and possible corrective actions. The project budget has to be reasonable, attainable and based on contractual negotiations and a statement of work. The budget has to be based on something, whether it is historical costs or just the best estimation. The budget needs to be traceable by a distributed budget, management reserve, undistributed budget and contract changes. (Kezner, 813; Lester 2007, 204.)

Budgeting and cost controlling help to get tasks performed more effectively and to develop the cost awareness of people working in the project. In a delivery project the price is defined in the delivery contract. The purpose of cost control is to keep the costs in control and to keep the delivery profitable. The purpose is not to minimize the costs at the expense of quality but to adjust them to the benefits. (Ruuska 2005, 186–187.)

The cost control includes cost estimation, project budgeting, optimization of costs and schedule, cash flow statement, cost reporting, control decisions, and cost accounting. The project cost control can be divided into two sections: realization control and estimated costs at completion control. The realization control is for monitoring that the goals are achieved and the estimated costs at the completion control are for noticing variances soon and it also serves the company's profit plans. (Enkovaara, Haveri & Jeskanen 2000, 167; Pelin 2009, 169–170.)

The cost controlling should be concentrated at the beginning of the project because most of the decisions affecting costs are made in the project planning phase. In an investment project, the design work costs approximately 6-10 % of the total expenses. In the designing phase about 90 % of the remaining costs are defined. But with careful designing, the operating expenses can be minimized. Cost-conscious designing adds the costs of the design phase but it will pay for itself in operating expenses of the investment. (Pelin 2009, 171.)

In delivery projects the cost control is affected by the contract type. A fixed price contract agreement defines the project very precisely. In long projects, cost variables should be added in the lump sum. A fixed price simplifies the cost control. (Pelin 2009, 172.)

Cost estimations are the basis for the profitability of the project calculations and in the project execution phase they are the point of comparison in cost controlling. Cost estimations should be done with a sufficient precision level, they should be able to be used in controlling, and used estimation methods should not shake the project profitability if the estimation is overrun. Cost estimating specifies gradually and these estimations can be divided to stages which are preliminary cost estimation, basic cost estimation, and final cost estimation. The preliminary cost estimation is - 20 % to + 40 % precise, basic cost estimation should be +/- 10 % precise, and final cost estimation aims to 3-8% precision. (Pelin 2009, 174–175.)

WBS is used in cost estimating and budgeting. The project is divided into small and manageable work packages and each package has its own budget. The costs are allocated to either a certain work package or to costs that cannot be allocated to any certain work package, like rent and other administrative costs. Wild card effects are striven to minimize with a management reserve. Estimation errors can occur due to scope changes, additional work, external changes, estimation mistakes, and change in the level of costs. (Pelin 2009, 177, 179.)

The project budget is tied to schedule, but cost estimations are just listed costs. The budget is the financial strategy of the project. The project budget usually presents only an expense budget but a financial budget can be presented separately. A cash flow graph presents both the expenses and the revenue, and the balance or cash flow. The project budget is based on a calendar year and the costs are broken down in months, so it can be easily taken to a company's annual budget. (Pelin 2009, 179.)

The cost control is performed to assure the project's financial execution. Cost controlling and expense ratio have to be regular, including fresh information, covering all the costs, and controlling. Often the cost controlling, invoicing action, and accounting of a functional organization are connected to the cost controlling of the project. Then there is a danger that the project cost controlling becomes similar to the cost accounting of functional organization, which is retrospective and precise whereas the project cost control should be up-to-date. (Pelin 2009, 170, 182.)

An expense ratio can be based on committed costs. Committed costs mean costs where the contract has already been made. As the project proceeds and orders become contracts, costs at stake are transferred to committed costs. The expense ratio should be done regularly. Actual costs and committed costs are calculated, and remaining costs are evaluated, and then the sum is compared to the budget. With realistic estimations, the cost development of the project can be controlled. Expense ratios should be fulfilled carefully so that the same cost is not marked twice. With the cost controlling, differences between the budget and actual costs are recognized. The project's expense ratio should not be parallel to the functional organization's system because multiple reporting is laborious and it is not usually reliable. (Pelin 2009, 183; Ruuska 2005, 188–189.)

2.5.3 Quality management

The basis of project management is quality, and it forms the third corner in the project triangle. The project can be considered failed if it has been completed on time, within the set budget but the quality criteria have not been fulfilled. Where quality is synonymous with safety, like in structural design, it can be seen as the most important part of the triangle. Even if safety is not at stake, failure in quality can be expensive, dangerous, and destroy the company's reputation. (Lester 2007, 73.)

Quality management is an essential part of project management, and special attention should be paid to it. Quality management does not happen on its own. The quality of a product or service has to be defined, planned, designed, specified, manufactured, erected, and commissioned. (Lester 2007, 73.)

Quality is a relative concept and it is reviewed by how the outcome measures up to the defined goals. That is why it is defined by the customer. Quality includes, in addition to the quality of outcome, also the accuracy of schedule and budget. Quality management is not a one man's job, but the whole project team is responsible for it and it should be included in

day-to-day working. Although everyone is participating, quality management starts from the top. (Kerzner 1995, 1040, 1072; Lester 2007, 73; Ruuska 2005, 210–211.)

To enable the consistency of quality, six concepts of quality management should be built-in within the corporative culture. The six concepts are: quality policy, quality objectives, quality assurance, quality control, quality audit, and quality program plan. (Kerzner 1995,1051–1052, Lester 2007, 73–74.)

A quality policy is a document, set by the top management, where are presented the quality objectives, the level of quality acceptable to the organization, and responsibilities for executing the policy and ensuring the quality. A good quality policy should be a statement of principles stating what, promote consistency throughout the organization, provide information about the organization's quality standards to external quarters, provide specific guidelines for important quality matters, and provide provisions for updating the policy. (Kerzner 1995, 1052; Lester 2007, 76.)

Quality objectives are specified objectives that have a time frame for completion and they are part of the organization's quality policy. Quality objectives should be obtainable, understandable, define specific goals, and state specific deadlines. (Kerzner 1995, 1052.)

The process that ensures that adequate quality systems are processed, and procedures are in place is called quality assurance. It includes formal activities and managerial processes which prove that quality systems are actually being implemented and that compliance with the quality policy is being ensured. The quality assurance system should identify objectives and standards, be multifunctional and prevention orientated, plan how to guarantee the improvement continuation, plan the establishment and maintenance of performance measures, and include quality audits. (Kerzner 1995, 1053; Lester 2007, 76.)

Quality control means activities and techniques performed in order to create specific quality characteristics. Quality control certifies that quality objectives of the organization are being met. The active role in quality control is in the hands of the project team's members who have a special technical expertise. Quality control should state what to control, set standards for the basis of decisions, establish the measurement methods, compare the actual outcome to quality standards, and include a detailed documentation for all processes. (Kerzner 1995, 1053–1054; Lester 2007, 77.)

Regular quality audits are made to ensure that the procedures are implemented correctly. It is an evaluation made by a qualified personnel. The audits vary from scope to depth depending on the case. A good quality audit ensures that planned quality will be met in the project, the products are safe and fit for use, laws and regulations are followed, data collection and distribution system are accurate and adequate, proper collective actions are taken, and improvement opportunities are identified. (Kerzner 1995, 1054; Lester 2007, 79.)

A quality program plan is specially made for the project at issue by the project manager. It contains all the requirements for that project. The quality plan can be made by utilizing WBS. Every work package will be identified with a specific quality action. The quality plan identifies the organization's external and internal customers, causes the design of a process that produces the quality that the customer wants, proves that the process is working and quality goals are being met. (Kerzner 1995, 1054, Lester 2007, 77.)

The quality of design affects the quality of a building project significantly. The goal of design is to achieve the best possible quality within given resources. The quality of design can be divided into quality of design activity, quality of design, and to quality of design documents. The quality of design stands for that the building presented in the design documents meets the goals and expectations the sponsor has set. The high quality designs match the quality, extension, and cost objectives and they are also practicable. The quality of design documents means that their content and the manner of representation meet the set goals and that they are clear and unambiguous. (Junnonen & Kankainen 2001, 28; Junnonen & Kankainen 2004, 33.)

The design quality depends on how well the customer can define his/her needs and demands. A successful achievement of goals is the outcome of interactive designing process, where design solutions are defined and changed if necessary. This process also sets some limitations for the customer: he/she must know what the demands, goals, and conditions for the project are. The designer's task is to filter the information and work the needs and demands into a design-form. The customer's needs can also affect the design with their demands for the premises. (Junnonen & Kankainen 2001, 28.)

The problem in the quality of design comes from how to change the demands into a form that the building project can then be executed. In construction planning, collaboration between designers is crucial, if the quality goals are wanted to achieve. The design needs to meet the conditions set by functionality, environment, authorities, and the feasibility. The designers will, however, meet only those demands that are presented. (Junnonen & Kankainen 2001, 29.)

3 CASE STUDY

Due to the confidential nature of this case, this section discusses the topic only on a very general level.

3.1 Case

The subject of this case study is a large building project that is located in Russia.

3.2 Construction endorsement process in Russia

The problems arisen with the Russian system have been mainly that the project team or either the Finnish sub-consultants are not familiar with the Russian laws and regulations that are related to building projects. This causes problems that are shown in the schedule. Because the process is not that clear to every party, the designs are made with a wrong accuracy, and often time is wasted on too accurate drawings than needed, and the drawings are not finished when they should be. The Russian and Finnish design processes are compared in Table 1. Of course, this is only a rough comparison.

Table 1 The correlation between Finnish and Russian design process.

Russia	Finland
Pre-design/ concept design (AK)	Sketch design
Project design (P)	Basic design
Working design (RP)	Working design
"As built" –documentation (R)	"As built" -documentation

The design work in Russia can be divided into two phases: pre-design phase and design phase. The pre-design phase includes an architectural concept design (AK) and it corresponds closest to the Finnish design development phase. The design phase includes four parts, which are sketch design (EP), technical and economical account (TEO), project design (P), working design (RP), and implementation documentation (R). The number of approval phases depends on the scale of the building project. The sketch designs correspond roughly to the Finnish design development phase but the drawings are made with a master plan accuracy. A technical and economical account is made as preliminary when applying for a land plot and it is then completed when the preparedness of designs is sufficient for doing it. The project design is only made with large projects and it basically means combining of the sketch design and technical and economical account phases. The working design and implementation documentation correspond to the same phases in Finland. (Lod 2001, 150.)

There are three different difficulty categories in Russia. The projects are categorized based on the individuality of design, scale of the construction,

degree of difficulty, and building type. Difficulty category 1 is for the most demanding and category 3 is for the easiest, smallest, and standard type constructions. (Lod 2001, 150–151.)

This building project is very large and demanding, so it belongs to the difficulty category 1.

In difficulty category 1, the project is performed in four stages, so the design process includes architectural concept (AK), technical and economical account (TEO), project design (P), and implementation documentation (R) phases. In these cases, the developer confirms the design documentation in the project design phase. In category 3 there is only one phase, and in category 2 the developer and designer can choose the number of phases between 1 and 3. (Lod 2001, 150–151.)

The architectural concept (AK) is made to prepare initial data for the design and to examine urban, social, economical, historical, archeological, cultural, and functional characteristics of the construction. The architectural concept includes

- initial data and permit documents
- accounts
- sketch drawings
- other material, if necessary.

Initial data and permit documents include, for example, a fundamental regulation document, and geodetic base map. Accounts are needed, for example, of the design solutions from an urban planning point of view, ecological features of used materials, economical aspects, and the scale of the construction under and above ground level. Sketch drawings are needed, for example, of arrange drawing, layout, floor plans of main floors, sections, and facades. Other material includes a perspective drawing, photomontage, model of the construction, and historical and architectural map. (Lod 2001, 152–153.)

The architectural concept design can be approved by expert examination. It is not compulsory in smaller cases, but in difficulty category 1 it is required. (Lod 2001, 151, 155.)

In the sketch design phase (EP), the developer has to get approvals from certain authorities, and in special cases some other approvals are required. The sketch design documents are

- initial data and permit documents
- summary account
- schema drawings
- other material.

Initial data and permit documents include, for example, an urban development statement, engineering geology statement, and technical conditions of community development connections to city networks, as well as

documents included in the architectural concept design. A summary account presents urban planning, space and structural solutions, proposals for HVAC, plumbing, and telecommunications networks, and for traffic solutions. It also includes energy conservation actions, and environmental and fire protection actions. Schema drawings include the same drawings that are in the concept phase, but in here they are done in more detail. If other material is required it is presented in the scale which is specified in an urban planning statement. (Lod 2001, 155–156.)

After the developer has approved the sketch design package by certain authorities, the developer approves the package by expert examination. In difficulty category 1, the sketch designs are not approved but they will be approved in the project design phase. (Lod 2001, 151, 156.)

Technical and economical account (TEO) includes

- initial data and permit documents
- accounts of center stages of project
- key drawings
- environmental protection account
- summary calculation of costs.

The content of technical and economical account, of course, includes all the previous documents added with, for example, proofs of the area's ecological state, and technological assignment. Accounts of center stages include, for example, an organization plan for the construction project, key technical and economical figures, main technological solutions, fire protection activities, and environmental and nature protection. Key drawings include drawings of previous stages added with, for example, structural types, and technical networks and floor plans presenting technical design solutions for each floor. An environmental protection account includes, for example, a general description of the ecological condition of the plot and its nearby areas, waste management issues, and noise protection measures. A summary calculation of costs includes costing, financial statement, and business plan. The business plan includes a proposed concept of project, economical examination, and financial arrangements. A costing and financial statement need to be approved by authorities. (Lod 2001, 157–160.)

The technical and economical account needs to be approved by expertise. The expert examination is final and it binds all different parties involved. (Lod 2001, 151, 160.)

A working design (RP) needs to be in the cost frame specified in the technical and economical account. The developer needs to deliver sufficient initial data for the designers. The initial data includes, for example, a plot control documentation, geotechnical documents, information about organization of constructor, information about existing structures, and a list of structures and building products that do not meet the standard or norm requirements. Authorities have to accept the costing and financial statement. In difficulty category 1, working designs do not have to be accepted in expertise examination. (Lod 2001, 160–161.)

A building permit can be granted in two phases, for constructions below and above ground level. An execution permit is needed for different working phases before the work can begin. The documents that are needed for applying the building permit are

- urban area development sketch accepted by authorities and passed to the expert examination
- construction plot action area plan for the preparation work period accepted by authorities
- sketch design of foundations and/or constructions below ground level that are accepted by authorities and passed to the expert examination
- constructions below ground level acceptance documents
- constructions above ground level binding dimensional drawings. (Lod 2001, 161–162.)

The building permit requires almost finished working drawings, cost estimations and constructor contract. (Lod 2001, 161–162; Vänni 2001, 116.)

The project team members should get familiarized with the Russian construction endorsement process in order to get good results. If everyone knows the stages and what is expected and when, the project management gets easier, and unnecessary workload decreases. Then it is easier to keep to the schedule, and the work estimations will be more realistic. The construction process in Russia should also be explained to sub-consultants in contract negotiations, so they would know what to do and when, and misunderstandings could be avoided.

One solution for the project team's familiarization with the construction process in Russia could be a simple presentation or a meeting about this subject, hold by a person who is familiar with the Russian process. This occasion would make it clearer and possible questions could be answered.

3.3 Project organization

A functioning project organization is the key thing for a successful project management: everyone has to know what their role and duties are. At the moment the problem is an unclear organization structure, confused responsibilities, and sometimes overlapping duties or task boundaries. A well-functioning organization structure means well-defined tasks and every task has a person who is in charge of performing the task. The duties have to be fitted so that it is possible to perform those tasks in a given time. Doing overwork will cause only problems in the long run and that influences the project team's productivity. In a functioning organization, everyone is also responsible for someone, so there is always a clear manager, who is in charge of the project, and of course, the project director is responsible further.

An unclear organization causes, besides internal, also external problems. The client has noticed some problems in the running of the project, and the

sub-consultants are also somewhat confused about the roles of the project team members. This influences external parties' image of the organization, and may cause ending of the cooperation due to the fact that the client thinks the organization is too unprofessional to handle these kinds of projects. Poorly done WBS and changes in the personnel also caused a lack of sufficient person resources. A well-functioning project also needs enough skilled labor force in order to achieve the goals, because running a complex design project is not a one man's job.

A well-organized project gives an idea of professional organization. It affects the performance of actual work, which will be well-organized, precise and punctual. The budget, schedule, and quality will be guaranteed. With that kind of organization, cooperation is a pleasure, and the client, as well as sub-consultants, will continue the cooperation.

A good basis of an organization starts from the basics of project management: work breakdown structure (WBS). In this case, it was not done sufficiently enough in the beginning. With a properly done WBS, and in addition to that with persons in charge of a task at stake, organization breakdown structure (OBS) is given in result. With that OBS, a sketch of the project organization can be made. Figures 11 and 12 present Albert Lester's (2007) example of WBS and how an OBS can be added to it.

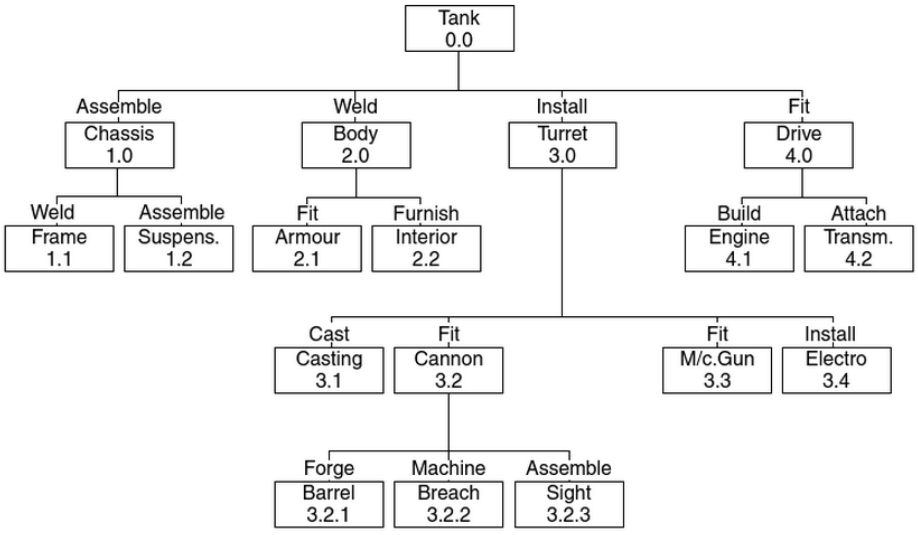


Figure 11 Example of work breakdown structure in battle tank project (Lester 2007, 374).

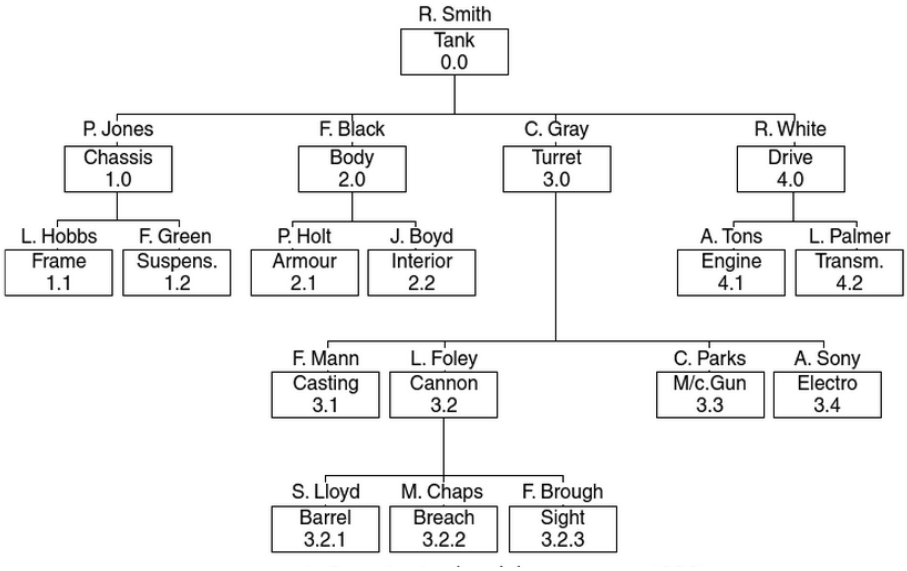


Figure 12 Example of organization breakdown structure in battle tank project (Lester 2007, 375).

3.3.1 Gathering a project team

Gathering a good project team is essential for the project to succeed. The composition has to be considered carefully, in order to achieve the goals in a given frame. A good project team makes management and work coordination easier. In larger projects, the process is more complex. The following issues should be thought of: who are the right persons for the job, how many persons are needed in certain stages of the project, and with what kind of work contribution they are involved. (Kettunen 2003, 117–118.)

The main tasks in a complex design project are tasks related to design work supervision, costs, documentation, administrative work, and GIP and GAP positions, which are required in the Russian laws. It is important to create clear manageable duties and boundaries, in order to avoid overlapping of tasks, and to guarantee the quality of the work. The structure and duties of the project organization are presented in Figure 13. Appendix 2 also presents the organization chart including central responsible areas.

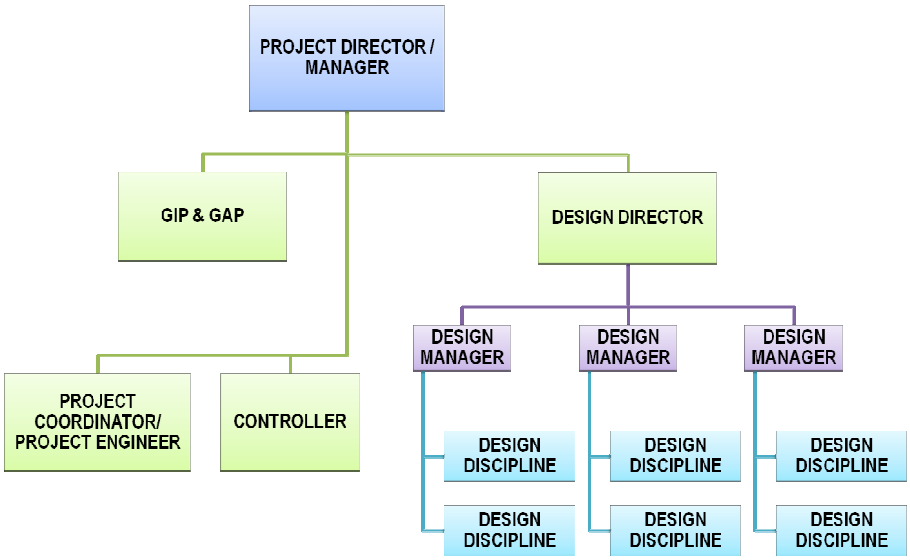


Figure 13 Project organization in a complex design project.

Of course, the project needs a director. The project director's work is to take care of the administrative matters, overall management of the project, and communication with the client. The duties can be broken down to contractual and tendering actions, official communication with the client, contracts of additional work and changes, claim management, economics of the project, project schedule, scope control, and risk management. In this kind of a large project, the project director's job is a full-time duty.

The project director does not have the time, and often the skills to handle design work, that is why a design director is needed. The design director takes care of overall management of design work. His/ her duties are supervision and coordination of design work, design quality control, design schedule, technical responsibility, initial data management, and design related information control. The design director also has hands full of work, so the job would also be full-time.

Design managers take care of the supervision of the actual design work. The design disciplines have been connected to compatible work packages, for example, architectural, structural and geotechnical designs could be one package, and every package has its own design manager. There could be, for example, in total of three work packages: architectural, structural and geotechnical designs could form one package, HVAC, plumbing and electricity design could form one, and fire and area design could be the last package. The first two packages could be run from Finland, but the third should be run from Russia, to guarantee the legality of the design work. Managers form the schedule of their work package, and control the quality and information flow. All managers should work in cooperation with each other to guarantee the uniform design work, keeping to the schedule, and information flow between different design areas. They also approve the designs. Design managers have quite big work packages to take care of, so their work contribution would also be needed full-time.

GIP and GAP are required in the Russian law in design projects. GIP is the head engineer that confirms every technical design. GAP is the head architect that works as a head designer in the project and confirms every design. (Lod 2001, 148.)

A controller is in charge of costs. He/she takes care of the financial issues. The duties are invoicing, cost control, payments, and forecasts. The controller could handle from one to two projects at a time so his/her work contribution to this project would be 50-75 %.

A project coordinator or project engineer is responsible for the design reports, document control, and other supporting services. The project coordinator could handle from one to two projects at a time so his/her work contribution to this project would also be 50-75 %.

The purpose of the project organization is to define clear areas of responsibilities, and superiors who to report to. Of course, this is only one, quite general, solution and should be customized. Yet, it offers a basic structure for organization and it can also be applied in similar projects to come.

3.4 Communication

Communication is a very important part of a project. In order to successfully finish the project, good communication is needed, and in larger projects, creating a communication plan is recommended and it can be included in the project plan.

In this case, a communication plan has not been made. Therefore, there are many problems in communication. Some problems have arisen due to the international working environment, thus cultural differences and difficulties in communication across cultures should be observed. Some problems originate purely because the communication plan has not been made, or it has not been thought of at all. These problems are, for example, inconsistent messages and forgotten messages that do not get replied.

The basic communication plan includes six sections, which are

- definition of aimed project profile
- general principles and channels in communication
- internal communication
- external communication
- communication risks
- concrete actions for the next period.

In the first section the target profile between the client and project team, and the target profile between the project team and functional organization should be thought of. General principles and channels include the decision making process, meeting practice, reporting and informing practice, documentation practice, inspection practice, orientation practice, brochures, assignments, social interaction, and technical devices. Internal communi-

cation includes communication inside the project team, communication between experts of the functional organization and project team, analysis of special characteristics, and application of communication channels and principles of internal communication. External communication includes communication between the project team and interest group, as well as communication between different interest groups. It also includes the application of communication channels and principles of external communication. Communication risks include consideration of internal, external, and crisis communication risks and how to prepare for them. Concrete actions include defining of what to communicate and when, from who to whom, and where and when to communicate. Also the feedback system needs to be planned. The communication plan should be operative, and help the project director in his/her day-to-day work, not just a paper among others. (Pelin 2009, 300; Ruuska, 192–194.)

The communication control is defined in Finnmap Consulting Oy's quality management system. In it the communication control is divided into seven categories, which are

- responsibilities
- internal communication
- external communication
- communication documentation
- document lists
- internal informing to outside the project team
- transportation of project information to planning guides and libraries. (Quality management system 2002.)

The project director has the main responsibility for information flow, and for communication planning and control. Internal communication actions are divided into a start-up meeting, project meetings, assignments, controlling and monitoring of work. Every member of the project team informs other members when necessary. At the close-up phase there are a close-up report and close-up meeting. External communication actions can be divided into tendering and contract phase, starting phase, sketch and accounting documentation phase, working design and construction site phase, and close-up phase. The starting phase includes defining the project organization, making a contact information list, finding initial data, and defining information flow policy. The sketch and accounting documentation phase includes holding design meetings, presenting design stage regularly, furnishing initial data, and holding work meetings as well as coordination meetings. The working design and construction site phase also include design meetings, attending site meetings, furnishing initial data, and design inspections. The close-up phase includes acquiring feedback and guaranteeing the continuation of cooperation. The center stage of communication documentation is the design report, which has to be prepared regularly. The communication documentation phase also includes the management system of project documents, whose basic structure is defined in more detail in the quality management documents. The documentation list has to be maintained. The other categories, like internal informing to out-

side the project team, are carried out when necessary. (Quality management system 2002.)

Creating a functioning communication plan and following it, will solve some of the practical problems that have come up in this case study, for example, who is responsible for external communication. The rest of the problems can be solved by learning cultural differences.

Attention should be paid to naming the person in charge. The person in charge will put the communication plan into operation, and supervise that the plan is followed. This job is suitable, for example, for a project coordinator. The main task would be the harmonization and standardization of communication and making it happen on time.

As Figure 14 below shows, there are three main types of cultures. The main types are multi-active, reactive and linear-active. The multi-active culture is very people-oriented extrovert, inter-relative, and talkative. The reactive culture is people-oriented introvert, and respectful listener, and linear-active is a job-oriented introvert, highly organized planner. How the countries are situated can be seen in Figure 15. Figure 15 does not impute any other cultural resemblances, like religion, core beliefs, or taboos etc. (Lewis 2005, 33–34, 38, 42.)

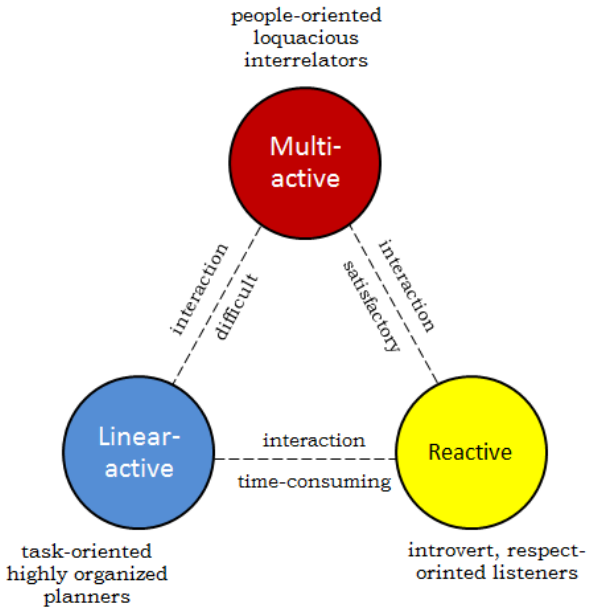


Figure 14 Levels of difficulty in linear/multi/reactive interactions (Lewis 2005, 39).

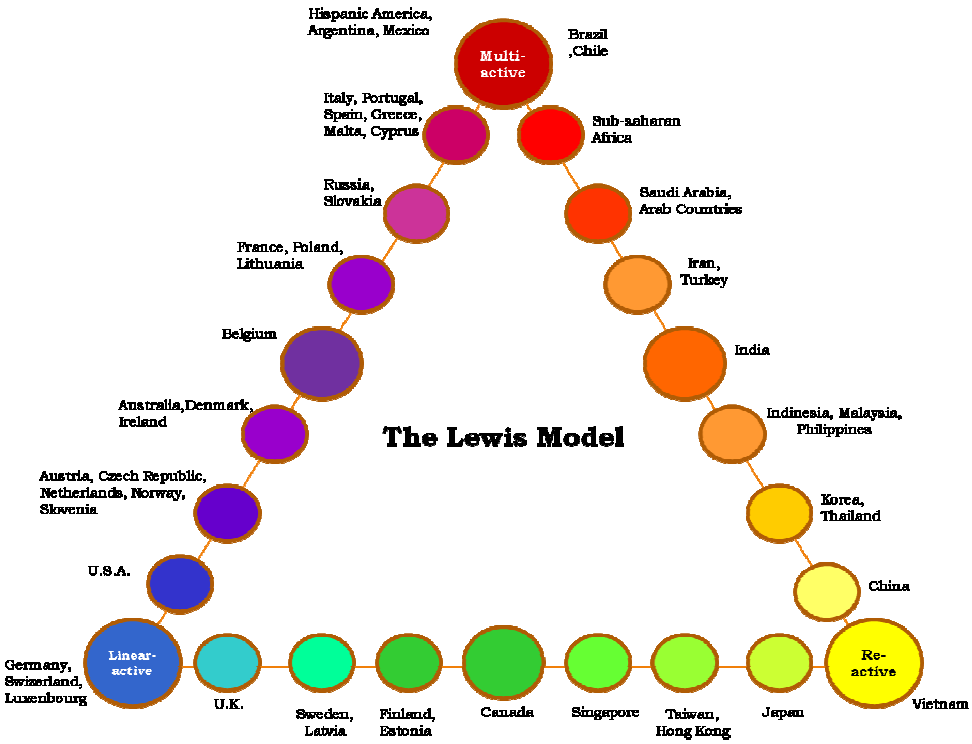


Figure 15 Cultural types model (Lewis 2005, 42).

As can be seen, Russia is very near multi-active between multi-active and linear-active line, and Finland is almost in the center of linear-active and reactive line.

The interaction between linear-active and multi-active person is the most demanding, and usually the differences outnumber the commonalities, when people from different cultures interact. That is why communication should really be planned carefully. (Lewis 2005, 38.)

The best way to start learning about communication across cultures is to first examine one's own culture. Secondly, one should review one's own experiences with other cultures, and then observe discomfort that might reflect cultural differences. The final step is to recognize and modify one's own communication approach. Communication skills can be improved by paying attention to speech, writing and body language. (Prince & Hoppe 2000, 8, 14, 19.)

Non-verbal communication is also used in relaying messages. As in verbal communication, in non-verbal communication there are also cultural differences. These differences can relate to personal space, facial expressions, hand gestures, eye contact, and tone of voice. Non-verbal communication can be misunderstood like verbal communication. Misunderstood communication causes cultures to collide, not to communicate. (Prince & Hoppe 2000, 18–19.)

When talking to a person from a different culture, it should be considered that it might be that either of the speakers is speaking their native lan-

guage. It is normal to use idioms and slang when speaking one's own native language. But if the language is learnt at school, it is quite formal. Then idioms and slang can cause misunderstanding or confusion. To enhance communication skills, it is good to pay attention to how one speaks. One should speak clearly and a little bit slower, so the listener has time to translate and understand the message. An even voice should be used to ease the listening. Special attention should be paid to the pronunciation of words. Wrong pronunciation can easily cause misunderstandings. Slang and colloquial expressions should be avoided because they might be hard to understand if the person is from another culture. Simple and common words should be used rather than technical jargon, but the listener is also responsible for asking explanation if he/she cannot understand something. Sometimes rephrasing also helps. Inclusive language should be used, and possible offensive terms and labels should be avoided. Attention should be paid to the language uses in other cultures, for example, a simple question, whether one could do an assignment, can be understood as a polite command, or as a legitimate inquiry. The use of universal stories and analogies can also be helpful, as long as one avoids sports and military references, which may be unfamiliar or controversial to some. Spoken communication is good to be reinforced with written messages, like with an e-mail, a report, or a memo. In this way, misunderstandings can be decreased. (Prince & Hoppe 2000, 19–22.)

In written communication the same principle applies as in oral communication: it should be clear. Clear language, complete sentences, and standard expressions should be used. Attention should be paid to e-mails, which are often used in a conversational way, so that they are clear. (Prince & Hoppe 2000, 19–22.)

When writing e-mails one should be careful not to make any spelling mistakes which could cause misunderstandings –it is good to reread the text before sending. Also, language translations available in Internet should be used wisely, because sometimes the translations are quite hard to understand or even completely wrong translated. The best way would be, if one does not know the language himself/herself, that someone would read the text through before sending.

The biggest stumbling blocks that Russian people find when working with Finnish people can be divided into four categories, which are preparation for the Russian business, organization of Russian trade, partnership, and cultural sensitivity. Russian people appreciate understanding of the Russian practices and juridical procedures, when coming to the Russian market. Unclear communication, lack of coordination, and obscure responsibilities also cause confusion. Long partnerships are valued in Russia. Finns' tendency to end relationship after many years of cooperation without explanation is found rude. Also, Finns' inclination to consider themselves as members of a more advanced culture causes annoyance among Russians. (Luoma-Keturi 2009, 14–15.)

The last mentioned facts are clearly the main focus areas because the same problems have come up in this case study: the Russian system is poorly

known, there are unclear responsibilities and communication, and a lack of cultural sensitivity. Because Russian people are very multi-active in Lewis' model, they emphasize human relations more. This should automatically lead to the fact that the communication should be focused more on actual meetings, where people are in the same room. It would create more sense of solidarity, which will improve the cooperation. It is also clear that the more one sees persons from another culture, the more he/she will learn of it. This will decrease mistakes both in verbal and in non-verbal communication and helps to understand the other person better, both his/her cultural background and also accent, so serious misunderstandings can be avoided.

3.4.1 Reporting

Reporting offers vital information of the project's process and it is an essential communication tool between the project director and members of the project team. Reporting may seem to be a waste of time in all the hurry, but it gives up-to-date information about how things have progressed, and when problems arise, the reason for them is visible. The purpose of reporting is not only to report realized actions, but also to forecast near future. Regular reports share responsibility, and make the whole project team be responsible for possible problems. (Kettunen 2003,157; Ruuska 2005, 196.)

The reporting system cannot be just made-up. It has to be uniform, regular, and well planned. The purpose of the reporting system is to collect and share information related to the project, and with it the progress can be controlled and, if necessary, corrective actions can be taken. Planning of reporting requires a clear decision making process, responsibilities and organization. The target of the report can be found in the project organization and environment description, where different interest groups are shown. Information should be passed to everyone, whose work is influenced by the project or whose action can influence the project. When planning the reporting system, one should think who the report is for, what is reported and when, how is reported and who is reporting. (Ruuska 2005, 195–197.)

At the beginning of this project, there was no reporting system. The design work was not controlled uniformly and the information was lying around. To help the control of the design work, a regular design reporting system was needed. The purpose of the report is to give information to the design director, project director, and finally to the client.

The basis for the report was obtained from the Russian legislation, where the design work is categorized into 12 sections. The same sections are used in the report. In every section, there are seven topics: ongoing design tasks, completed design tasks in this period, design tasks which will be finished during the next period, the status of design schedule, completion percentage of project part, initial data needed for the next two weeks, and other issues. These seven topics help to see the realization and forecast of the next period, and to control schedule, work progress, collaboration be-

tween designers what comes to initial data requests, and other possible issues. The report template is presented in Appendix 3.

Now the design reporting is done weekly. Every Monday sub-consultants send design reports, which they have filled in in their part, for example, an architect fills in section 3. Then the reports are joined together by the project coordinator, and an overall look at the situation is done. The rest of the report that does not belong to sub-consultants is filled in by the project team. The reports are then sent to the client every other week, and every other week it is just for an internal use.

3.5 Supervision of design

Finnmap Consulting Oy has a really good quality management system. The quality management system includes many different sections, and one of them is about project planning and controlling. This section covers topics, such as organization and planning of a project, project financial planning, schedule, quality targets and initial information, project working control-ling, control and approval of designs, project documentation control, actions caused by an error, additional work and changes design, communication control, and feedback and decision actions. Although the quality system is basically good, it cannot be utilized so well in this project, because mostly it deals with smaller structural design projects and many of the documents have not been translated into English.

Even though a very good quality management system exists, it is not familiar to the project team. Also, a poorly done work breakdown structure (WBS) at the beginning of the project affects the supervision by making it harder.

3.5.1 Schedule control

Schedule control is a clear problem area now. The basis for general and week schedules should be WBS but now it has not been done properly. This causes difficulties in the coordination of design disciplines, keeping to the schedule, and generally in controlling the schedule because there are not clear tasks and milestones to control.

The main starting point for creating a functioning schedule is WBS. Usually a general schedule is included in contracts, and if the WBS and scheduling is not done properly in the project plan, the whole schedule that is put in contracts is incorrect. The schedule control with an incorrect schedule is impossible, and may even cause more problems when trying to draw up a more detailed schedule and connect all the designers' schedules together.

For the general schedule in contracts, experts should be consulted in order to get accurate information about the duration of the task performances. In the group these experts can be easily found, in the fields of architecture, geotechnical design, structural design etc. The utilization of this existing

information will make the schedule reliable and easier to control. This also helps to avoid major changes in the schedule after the contracts have been signed.

When it is the time to draw up a more accurate schedule, the Last Planner system, usually used in production management, can easily be modified to fit also in the design management. Last Planner system focuses on a short period scheduling and controlling. Its main elements are drawing up and controlling of a week schedule. Its goals are to get the person in charge to commit himself/herself to perform the task at stake in time, and monitor the completion level of tasks and find out reasons for unfinished tasks. By affecting the reasons for unfinished tasks, the completion level of a week schedule can be raised. One main target of Last planner is to have preparatory planning, whose purpose is to guarantee starting conditions for performing a task. (Koskela & Koskenvesa 2003, 14.)

In summary, Last Planner system means that every party of the design work is involved in scheduling. They have a better understanding of the actual steps of the design work and they also know the actual critical tasks of the work. This information provides a great overall look at the whole process, and it definitely should be utilized better. Not only the short-term schedules become more accurate, but the cooperation becomes closer, which will improve the atmosphere of working environment.

The traditional push management system, where WBS is done first, which defines all the tasks, is created from top to bottom. The starting point of management are different kinds of schedules, starting from a general schedule and ending to week schedules. At the bottom, the week scheduling starts from upper level schedules. The project is then controlled by comparing the actual time spent on what was planned. When deviations are discovered, corrective actions are applied in order to catch the plan. (Koskela & Koskenvesa 2003, 15.)

The problems in this system are errors in the general schedule, the commitment of the persons who perform the tasks, and control system. The general schedule usually becomes outdated, and its updating is forgotten. Hence, most of the work goes into solving different schedule problems, instead of planning or improving. That is why the significance of general level schedules decreases, when coming to planning of short-term schedules and especially, if the general schedule has been done right from the beginning with inadequate information. The main assumption in controlling is that the person in charge will perform the task when told to. This does not take into consideration the commitment of the person performing the task or whether he/she fully understood the assignment. The main problem in controlling is that it corrects the deviation and gets the schedule back on track but it does not resolve the reason for deviation. These lacks cause the control to be on a case by case basis instead of being systematic. Learning, continuous improving and productivity are minor. (Koskela & Koskenvesa 2003, 16–17.)

Last Planner's main sections are a week schedule where starting conditions of the tasks have been ensured, parties are committed to the implementation of the tasks, completion checks of the tasks in the week schedule, systematic lookahead planning where the starting conditions for tasks to come are created, finding out reasons for unfinished tasks, affecting the reasons, and cooperation of parties. (Koskela & Koskenvesa 2003, 17–19.)

The quality of a week schedule or short period schedule is in central position. The schedule needs to be well defined, working order needs to be suitable, estimations of workloads should be realistic, and it needs to be practicable. The commitment of parties can be done with cooperative schedule planning. When everyone has a say in the schedule, they are more committed to it than if the schedule was just pointed to them. The completion of tasks is checked weekly at the end of the week. Lookahead planning concentrates on four to six week plans. Its main purpose is to ensure the starting conditions for the tasks to come. Lookahead planning is pull management, where necessary information and the availability of drawings are ensured actively. If the task is not finished according to the plan, the reason for it will be found out from the person in charge. The reasons can be grouped appropriately and compiled statistics are done on their occurrences. When the reasons are known, the common development starting point can be defined, based on actual knowledge. The best execution order of tasks is chosen together and every party expresses their net time for performing the given task. The time buffers are then placed on problem sensitive tasks by a uniform decision. (Koskela & Koskenvesa 2003, 17–19.)

Winograd and Flores (1986) have presented a work coordination method in organization called language/action perspective theory. According to them the schedule control consists of giving commitment and keeping it. The person commissioning the work is called the client and the person performing the work is called the performer. They form a circle presented in Figure 16, when the client asks for a certain task to be performed, the performer agrees to perform the work with negotiated terms. Then the performer performs the work, and after it the client either accepts the work or states that it does not qualify. (Koskela & Koskenvesa 2003, 17–19.)

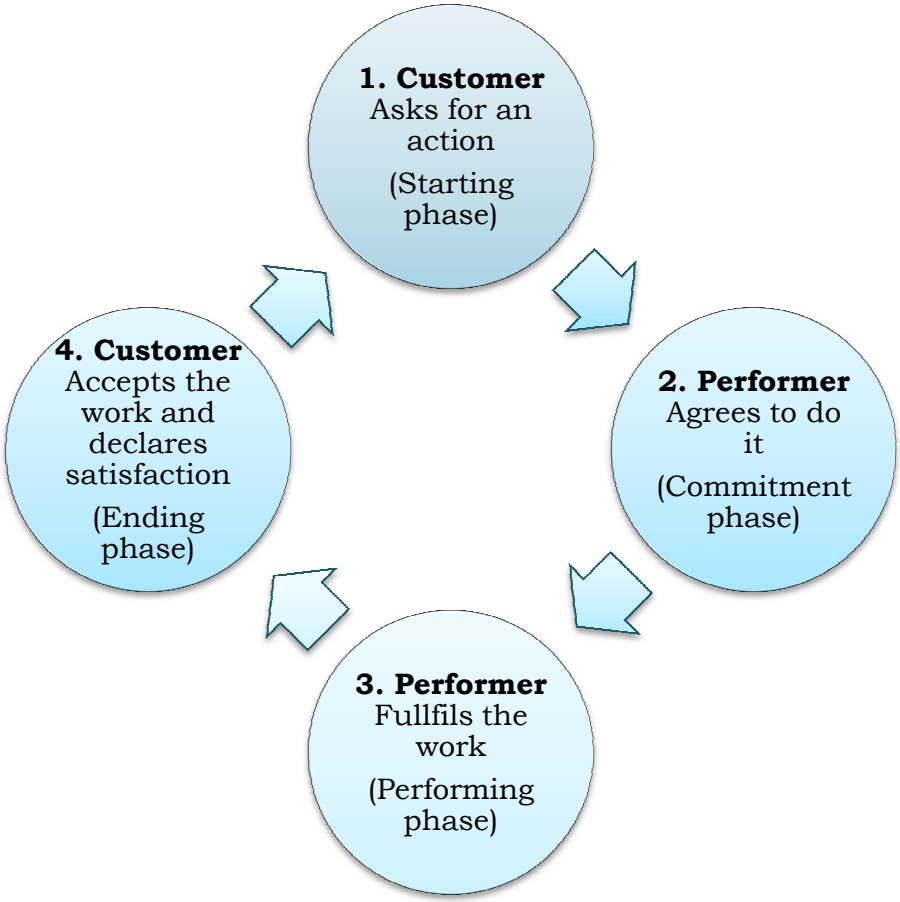


Figure 16 Work coordination according to language/action perspective. (Koskela & Koskenvesa 2003, 26.)

This language/action perspective theory underlines a two-way communication. It is important to ensure that both the client and performer understand the content of the task in the same way and that all preconditions exist. The vital element of this theory is commitment, which is a promise to perform the task. The idea behind the theory is that in order to have a successful coordination, every step of this method has to be performed. The conversations of tasks included in Last Planner system are similar to this language/action perspective model. (Koskela & Koskenvesa 2003, 25–26.)

Last Planner system has many benefits. It improves productivity, quality, and working environment, and it reduces work durations. The fact that the tasks can be started on time when all the preconditions are in order improves productivity. The number of unplanned or improvised tasks decreases with a well-planned schedule. Also the goal setting and feedback performed weekly increases productivity. The quality improves because the tasks are done with control and according to plans. The performer's commitment to perform the work according to the plans also increases the quality. The working environment is improved by the cooperation and communication, which leads to a working environment that is based on trust, where the fulfillments of commitments are valued more. With a careful lookahead planning the durations between tasks can be shortened. The Last Planner system is also all about continuous improving. With the clarified reasons for unfinished tasks, the level of performance can be di-

rectly affected by solving them. This continuous improving is built-in in the Last Planner system. (Koskela & Koskenvesa 2003, 29–33.)

The utilization of Last Planner system depends on a project and situation. The content also forms and develops to meet the needs. It can be introduced gradually which is shown in Figure 17, like it was done in one building company, which tested Last Planner system on their construction site management. (Koskela & Koskenvesa 2003, 17.)

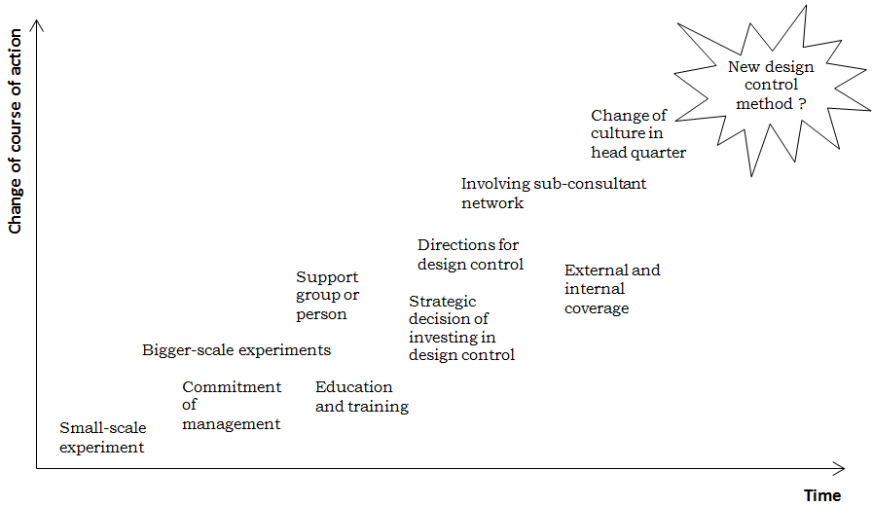


Figure 17 Last Planner development path (Koskela & Koskenvesa 2003, 39).

First its use could be started by giving the project team training in Last Planner system, and then it could be tested in some project. Gradually it could be introduced. The putting into operation should be planned and supervised closely. In the future, it may offer a brand new style in the schedule control. The design schedule control should be the design director's job and overall schedule control is done by the project director.

In Finland the schedule of drawing is usually derived from the construction schedule, but in Russia the authoritative procedures will affect the schedule fundamentally. When the designs are done in a distributed manner both in Russia and abroad, it is more time consuming concerning the actual design work and alteration work required by the authorities. (Vänni 2001, 116.)

Therefore, it is more important to control the design in shorter periods and keep the strings in hands. In the beginning, the Last Planner system can be introduced gradually to ease the change.

3.5.2 Cost control

In the cost control there have not been major problems, but of course. there is always something to improve.

There have been some minor problems with task definitions in contracts: the content has been understood differently by the customer and by the

performer. This was due to a rough task definition and it has caused additional work contracts because the work is needed to be done anyway, and of course, it costs more than planned. This could have been avoided with a properly done work breakdown structure, where every task is divided into smaller pieces. This work breakdown structure could have been added to the contracts, and then both parties would have been unanimous about the task definition in the contract. A proper work breakdown structure also allows a more precise cost control because every expense can be allocated to a certain task or part of a task.

Additional costs have also been caused by the change of the structural designer. This was due to the original designer's inability to perform the work. The service was bought from a sub-consultant inside the group. This emphasizes the importance of checking the sub-consultant's capability to perform the task, especially in large projects where it can cause not only additional costs but also delays in schedule and possible variety in quality. In a large project the project plan of the sub-consultant's task should be required.

3.5.3 Quality management

The main problems in quality management in this case are an unutilized quality management system, customer satisfaction, quality control, and lack of consistency.

Quality management has been considered really well in Finnmap Consulting Oy but somehow it has not reached this project. The documents of quality management mainly deal with structural design and smaller projects. They are easy to access but quite heavy to read. Also, only some of the documents are in English, which means lots of extra translation work if they are wanted to be included in project documentation, where English is mandatory. This heaviness, unsuitability, and extra translation work are the main reasons for the project team's lack of knowledge related to these quality management documents. More practical documents, which means that those documents should be in English, lighter to read, easy to use, and suitable for complex design projects, would increase the project team's desire to get to know them. The documents can be made easier to use and lighter, for example, by making ready templates which the project director can fill out according to a project at stake. These templates could be made, for example, from the project plan and communication plan.

Last year an Instructions manual for international project operations was made in Finnmap Consulting Oy. In it every step of project completion, starting from the tendering phase and ending in a project closure, is described in detail. The problem here is that excellent material is completely left out. Special attention should be paid to the training of project team members and that these existing systems would be adopted. This manual is slightly heavy tome, but it should be looked through together, and then adopted gradually according to the plan.

The quality is defined by the customer and therefore, a needs assessment should be done inclusively. A rough needs assessment will later appear to the customer that his/her needs and wishes have not been taken into account and he/she will not be happy with the quality. Customer satisfaction is not only concentrated on the product quality but on service, too. In order to have a good overall quality, the service has also to be controlled and the quality of it needs to be kept high. A proper needs assessment requires a continual interaction between the customer and performer throughout the whole project in order to get specific information about the needs and desires.

The SERVQUAL system is a method to measure how customers experience the service quality. It is based on five sections, which are tangibles, reliability, responsiveness, assurance, and empathy, and comparison of the customer's expectations and gained experiences. Tangibles mean the appearance of physical facilities, equipment, personnel, and communication materials. Reliability is an ability to perform the promised service dependably and accurately. Responsiveness stands for willingness to help customers and provide a prompt service. Assurance is knowledge and courtesy of employees and their ability to convey trust and confidence. Empathy indicates caring, individualized attention the firm provides its customers. These sections are not equal but some are more important than others. These relatives are presented in Figure 18. (Berry, Parasuraman & Zeithaml 1990, 26, 28; Grönroos 2009, 116.)

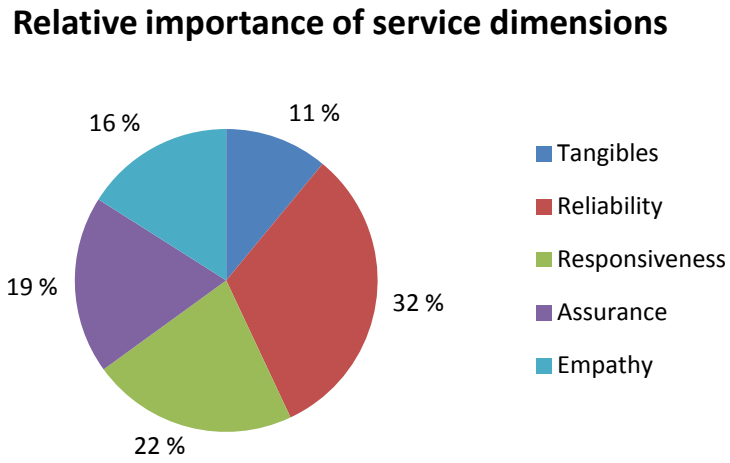


Figure 18 Relative importance of service dimensions. (Berry et al. 1990, 28.)

The most important sections are reliability and responsiveness. To ensure the customer satisfaction, it is important to keep to the schedule and budget, and in order to do that the project team needs qualified persons.

Quality control always starts from the top, and when there were problems regarding the quality management system of the organization, there inevitably will be problems with the quality control. Quality control should be automatic and part of everyone's day-to-day actions. But because it does not happen on its own, attention should be paid to it. Why this is not happening at the moment is because the project plan, whose one part is the

definition of quality targets, was not done properly. Also, the work breakdown structure was not done properly, and so the persons in charge were not defined. That happened due to the difficulties with the quality management system. Quality control is a really important part of the design service because the quality of the final product and customer satisfaction depend on the process. The process needs to be planned, monitored, evaluated, and corrected if needed in order to continuously improve the quality. This continuous quality improvement was developed by Walter Shewhart and Deming (1939) and it is presented in Figure 19. (Rose 2005, 71.)

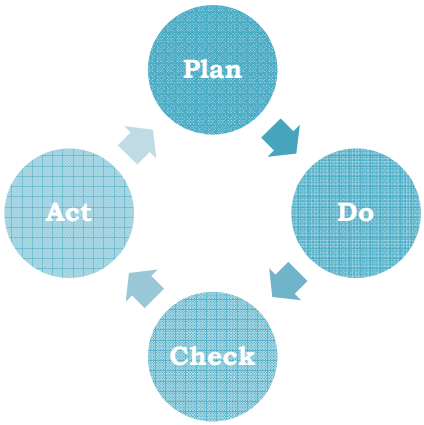


Figure 19 Deming cycle (Rose 2005, 71).

A lack of consistency in service and with the product originates from a poorly done project plan. If the project plan had been done properly, the project organization and working and action methods would have been defined. The design director and design managers in the project organization would have ensured the uniformity of designs. Now that there have not been those positions, there has not been a person in charge of the designs. That has affected the information flow between designers and overall quality of the work, and that has caused customer dissatisfaction with the organization's methods. Some confusion has also been caused by the slightly different practices in the firms in the group. But this problem will most likely be solved, when merging with Sweco has been completed.

4 CONCLUSIONS

Projects are getting bigger and more complex all the time, and it brings new challenges also to project management. But with successful project management, even large and very challenging projects can be finished successfully. Luckily, there are plenty of possible project management systems to help that difficult work. However, most of them are related to careful planning, which is perhaps the most important thing in project management. This is especially the case in delivery projects, where the budget is defined very early in the project.

The project management starts from the project director. He/She is responsible for the project to succeed. The success should be based on a thorough planning and before anything on the project director's preventive actions instead of corrective ones. The project management should aim more at pull management than push, which would improve cooperation and quality considerably. It will be shown in long term in overall customer satisfaction and through it, in sustainable and continuous cooperation.

The beginning of a project is full of with significant decisions what comes to success and progress of the project. Thus, it is very important to plan everything. A project plan becomes the most important document of the whole project, because it offers the basic plan on how to follow through the project and monitor its process. It is the project director's task to draw up this project plan. The project plan can be supported with a work breakdown structure, which offers great tools for schedule, cost and quality control, and in large projects it is essential in order to make the project succeed. WBS also helps to clarify responsibilities and makes the distribution of tasks explicit. Making of a project plan and proper WBS were clearly the weakest areas in this project, and they need lots of improving.

The key thing in the future is to have a clear person in charge of the project plan. When doing the project plan, the person in charge has to delegate some parts of the plan, like the WBS making to those who have the capability to do it. It could be made by the design director, who can consult other experts when needed. Cooperation and clear responsible areas would create a useful project plan, which would help the project director later on in controlling the project.

A matrix based project organization is suitable for these kinds of large projects, where some persons work full-time with this project and some persons can work on multiple projects at a time. The project director and the design director are the key resources in these types of projects. It is vital that they both have enough professional skills for projects of this scale. The main purpose of the project organization is to define the areas of responsibilities, task boundaries and superiors clearly.

Communication and reporting are vital for success of a project. Both areas should be improved in project management. A communication plan including reporting section could be included in the project plan. Regular reporting should be maintained to support the supervision. The communi-

cation plan and a person in charge of it will provide consistent and regular communication to all parties involved. Communication and reporting plans could be the project coordinator's duties.

In general, communication should be paid attention to so that it is uniform and it happens on time.

The supervision of design is the key thing in the project management in order to achieve the set goals. Attention should be paid to careful planning and a functioning WBS. Together with WBS, Last Planner system can be used in scheduling because of international working environment. This gives more accurate short-term schedules and it helps supervision of the design because the work is controlled regularly.

Last Planner system could be put into operation in a project start-up meeting, where all the participants are present. Together, the rough WBS made by the design director can be specified, and critical paths recognized. With cooperation, the quality of work and consultants' commitment to the work will be ensured.

The main focus area in the future is planning the project ahead properly, which includes making a functioning WBS. WBS making will take some time and effort for it to be proper, but it will pay itself back in an easier design control. Also, Last Planner system should be utilized, and the process how it should be adopted, should be observed carefully. Attention should be paid to the fact that these operations model changes are really taken into practice, and this requires a person in charge of the job. With a good project plan, WBS, Last Planner system utilization, and cooperation, the projects to come will be profitable and nice to work with.

Most of the problems have arisen because there have not been clear areas of responsibilities and perhaps because of laziness. A new operations model needs active and hard working in order for it to be successful. Otherwise it will just be among the other guides, getting dusty on the shelf. That is why special attention should be paid to putting it into operation and name a clear person in charge to run it.

The results are based on the case at stake. That is why, they cannot be directly generalized and introduced, but they should always be modified to the project at issue. But then, the international complex design projects, especially projects located in Russia, are similar in outline, and that is why this study offers a great basis for the organization structure, communication, and supervision methods of future projects.

SOURCES

Arppe, A. 2004. Projektityöskentely. Accessed 06.02.2013. Pdf-file.
http://www.ling.helsinki.fi/kit/2004k/ctl310pro/ojenteet-2004k.pdf

Avanesov, A. 2010. Construction endorsement process in Russia. Saimaa university of Applied Sciences. Double Degree Programme in Civil and Construction engineering. Bachelor's thesis. Accessed 14.02.2013.
http://urn.fi/URN:NBN:fi:amk-2010083012815

Berry, L., Parasuraman, A. & Zeithaml, V. 1990. Delivering quality service: balancing customer perceptions and expectations. New York: The Free Press.

Enkovaara, E., Haveri, H., Jeskanen, P. 2000. Rakennushankkeen kustannushallinta. 4th edition. Helsinki: Rakennustieto Oy.

FMC Group 2013. Finnmap Consunting Oy FMC Group. Accessed 10.1.2013.
http://www.fmcgroup.fi/etusivu

Grönroos, C. 2009. Palvelujen johtaminen ja markkinointi. Finnish: Maarit Tillman. 4th edition. Helsinki: WSOYpro Oy.

Helenius, T. 2008. Projektitoiminta. Accessed 07.02.2012.
http://projektitoiminta.blogspot.fi/search/label/Viestint%C3%A4

Hirsjärvi, S., Remes, P. & Sajavaara, P. 2010. Tutki ja kirjoita.
15-16th edition. Helsinki: Tammi.

Junnonen, J.-M. & Kankainen, J. 2001. Laatuajattelu ja rakennustyömaan laatutoiminnot. Helsinki: Rakennustieto Oy.

Junnonen, J.-M. & Kankainen, J. 2004. Rakennuttaminen. 2nd edition. Helsinki: Rakennustieto Oy.

Kerzner, H. 1995. Project management: a systems approach to planning, scheduling, and controlling. 5th edition. New York: Van Nostrand Reinhold.

Kettunen, S. 2003. Onnistu projektissa. Helsinki: WSOY.

Kiiskinen, M. & Seppälä, R. 1995. Rakennusten suunnittelu. Helsinki: Rakennustieto Oy.

Koskela, L. & Koskenvesa, A. 2003. Last Planner –tuotannonohjaus rakennustyömaalla. Espoo: VTT. Accessed 07.03.2013
http://www.vtt.fi/inf/pdf/tiedotteet/2003/T2197.pdf

Lester, A. 2007. Project management, planning and control. 5th edition. Oxford: Elsevier Ltd.

Lewis, J. 2006. Fundamentals of project management. 3rd edition. Saranac Lake: Amacom Books. Accessed 14.02.2013. Available in Ebrary database:
http://site.ebrary.com/lib/hamk/Doc?id=10196219&ppg=1

Lewis, R. 2005. When cultures collide: Leading across cultures. 3rd edition. Boston: Nicholas Brealey Publishing. Accessed 27.02.2013. Available in Ebrary database:
http://site.ebrary.com/lib/hamk/Doc?id=10448428&ppg=6

Lod, T. 2001. Viranomaismenettelyt Moskovan rakentamisprosesseissa. In Junttila, T. Venäjän rakentamisen oppikirja. Tampere: Tampereen teknillinen korkeakoulu, 143–162.

Luoma-Keturi N. 2009. Intermediate report 2008. Hämeenlinna: HAMK University of Applied Sciences. Accessed 17.03.2013.
http://portal.hamk.fi/portal/page/portal/HAMK/Tutkimus_ja_kehitys/Valtakunnalliset_verkostohankkeet/STROI_Network/Publications/interm_report08.pdf

Myllylä, M.-T. 2009. Venäläisen käyttöympäristön luominen: määrittelyt ja vaatimukset. Metropolia. Degree Programme of Construction Engineering. Bachelor's thesis. Accessed 14.02.2013.
http://urn.fi/URN:NBN:fi:amk-200904282248

Pelin, R. 1991. Projektin suunnittelun ja valvonnan menetelmät. 2nd edition. Vantaa: Risto Pelin

Pelin, R. 2009. Projektihallinnan käsikirja. 6th edition. Helsinki: Projektijohtaminen Oy Risto Pelin

Prince, D. & Hoppe, M. 2000. Communicating Across Cultures. Greensboro: Center for creative leadership. Accessed 01.03.2013. Available in Ebrary database:
http://site.ebrary.com/lib/hamk/Doc?id=10185366&ppg=1

Quality management system. 2002. Finnmap Constulting Oy quality system. FMC Group, intranet [intranet]. Accessed 26.03.2013.
https://intra.finnmapcons.fi/index.php?1761

Richardson, G. 2010. Project management theory and practice. Florida: Taylor and Francis Group Ltd.

Rose, K. 2005. Project quality management: why, what and how. Boca Raton: J. Ross Publishing, Inc. Accessed 17.03.2013. Available in Ebrary database:
http://site.ebrary.com/lib/hamk/Doc?id=10124760&ppg=80

RT 13-10860. 2005. Suunnittelun johtaminen rakennushankkeessa. Helsinki: Rakennustieto Oy.

Ruuska, K. 2005. Pidä projekti hallinnassa. 5th edition. Helsinki: Talentum Media Oy.

Silfverberg, P. 2007. Ideasta projektiksi. Helsinki: Edita.

Stenlund, H. 1988. Projektin ohjaus. Helsinki: Valtion painatuskeskus – ammattikasvatushallitus.

Stenlund, H. 1999. Projektijohtamisen perusteet. Espoo: Promanet Oy.

Sweco n.d. About Sweco. Accessed 10.1.2013.
http://www.swecogroup.com/en/Sweco-group/

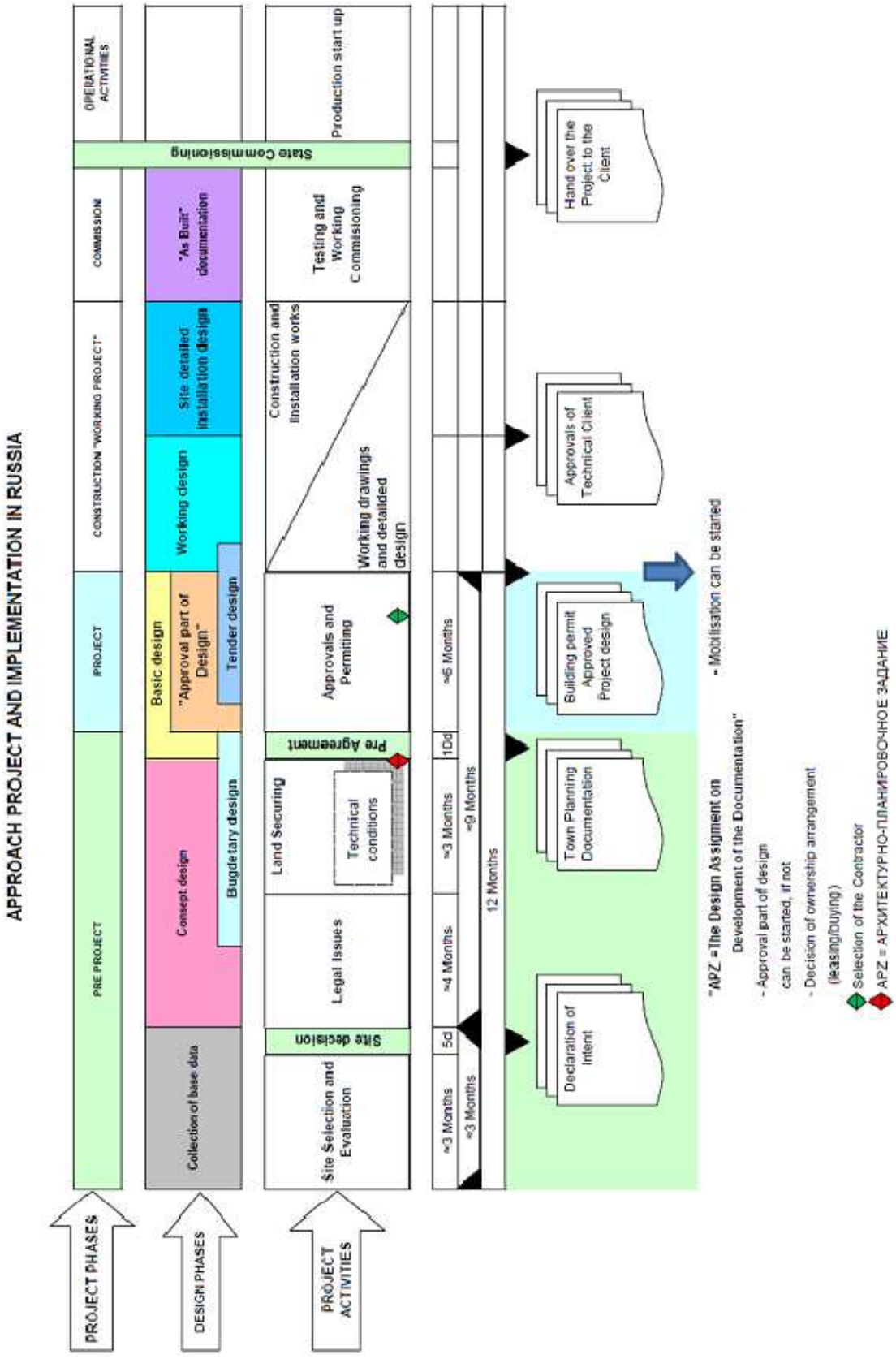
Vänni, M. 2001. Näkemyksiä projektinhallinnasta Venäjän kohteissa. In Junttila, T. Venäjän rakentamisen oppikirja. Tampere: Tampereen teknillinen korkeakoulu, 111–120.

Westland, J. 2006. Project management life cycle. London: Kogan Page Ltd. Accessed 14.02.2013. Available in Ebrary database:
http://site.ebrary.com/lib/hamk/Doc?id=10120229&ppg=1

Wysocki, K. 2011. Effective project management: traditional, agile, extreme. 6th edition. Hoboken: Wiley Publisihng Inc. Accessed 14.02.2013. Available in Ebrary database:
http://site.ebrary.com/lib/hamk/Doc?id=10510632&ppg=3

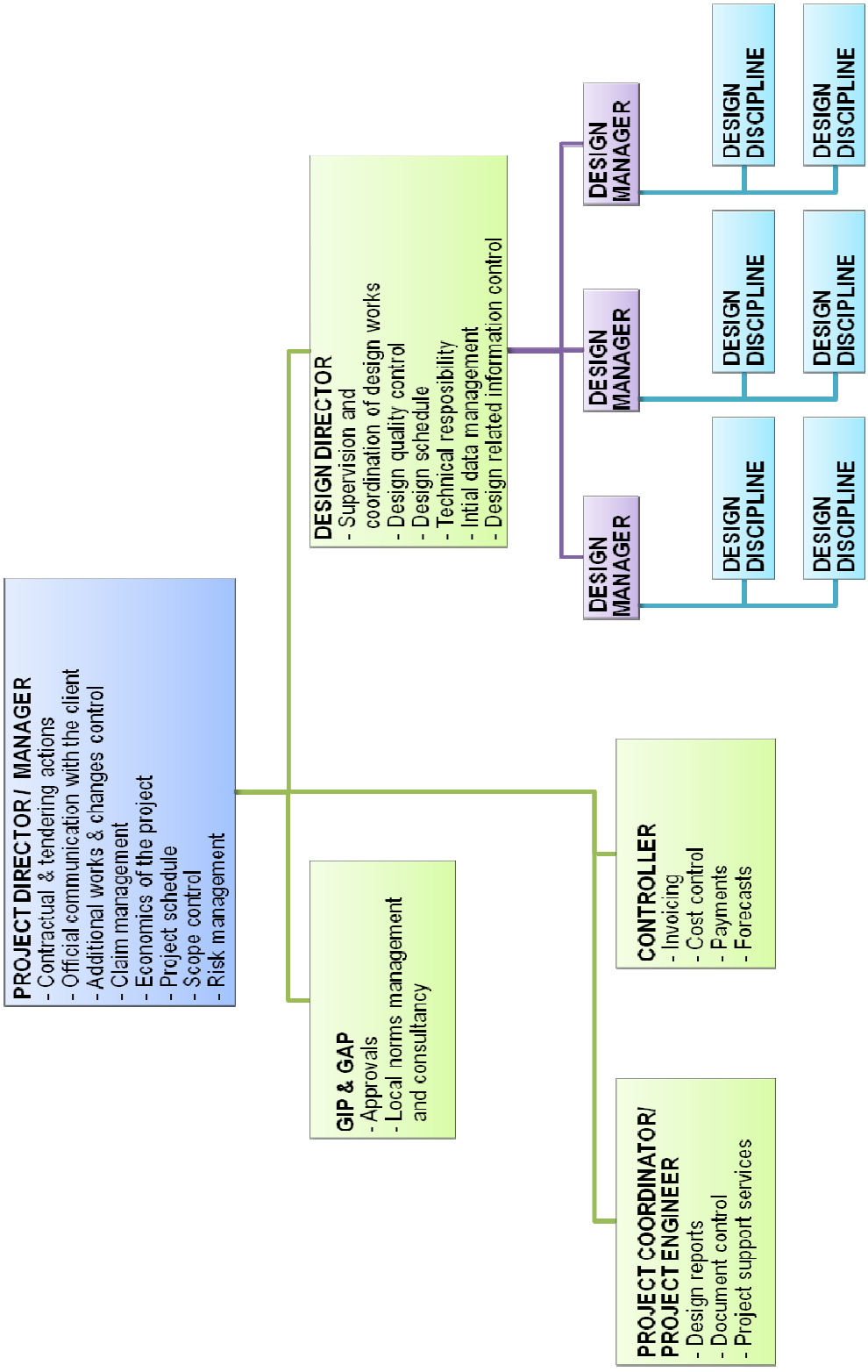
Appendix 1

CONSTRUCTION PROCESS IN RUSSIA



Appendix 2

PROJECT ORGANIZATION IN A COMPLEX DESIGN PROJECT



Appendix 3

DESIGN REPORT TEMPLATE FOR A COMPLEX DESIGN PROJECT

DESIGN REPORT

Project name:
Project name

Date and place:
xx.xx.2013

Author and company:
N.N.,

Design period:
Monday xx.xx.2013 - Friday xx.xx-2013

1. GENERAL EXPLANATORY NOTES

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

2. SCHEMATIC OF THE LAND PLOT PLANNING

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

3. ARCHITECTURAL SOLUTIONS

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

4. STRUCTURAL AND SPACE AND LAYOUT SOLUTIONS

4.1. Geotechnical design

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

4.2. Structural design

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

5. ENGINEERING SYSTEMS

5.1. Electricity supply

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

5.2. Water supply system

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

5.3. Water disposal system

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

5.4. Heating, Ventilation, Air Conditioning and Heat Supply Networks

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

5.5. Communication networks

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

5.6. Technology solutions

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

5.7. Fire security

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

5.8. Automatic and dispatching control of utility system, fire safety system

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

6. CONSTRUCTION ORGANIZATION PLAN

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

7. WORKS ORGANIZATION PLAN FOR DEMOLITION OR DISASSEMBLY OF CAPITAL CONSRUCTION FACILITIES

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

8. LIST OF ENVIRONMENTAL PROTECTION ACTIVITIES

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

9. FIRE SAFETY PROVISION ACTIVITIES

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

10. ACTIVITIES AIMED AT PROVISION OF ACCESS FOR THE DISABLED

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues

11. OTHER COMPONENTS

- Ongoing design tasks
- Completed design tasks in this period
- Design tasks, which will be finished during next period
- Status of design schedule
- Completion percentage of project part
- Initial data needed for next two weeks
- Other issues