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AN EXPANSION INVESTMENT PROCESS IN BOLIDEN HARJAVALTA OY

Master's Thesis in Accounting and Finance

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1. INTRODUCTION

1.1 Background of the study

Organisations are often required to make capital investment decisions which have long-term effects and the consequences are not known in advance. Such decisions frequently involve large amounts of money and they have uncertain actual outcomes that have long-lasting effects on the organisation. The investments and their outcomes are collectively referred to as investment projects. (Horngren 2005, 411.) More precisely, Patton (1990, 40) defines project as “a specific, clearly demonstrable set of activities and dedicated resources aimed at achieving a certain non-recurrent goal in a set time”.

The importance of capital investments and capital budgeting cannot be overemphasized. The capital budgeting decision is one of the most critical decisions managers have to make. (Lumijärvi 1990, 20.) Capital budgeting is a many-sided activity, and the decisions made in that process are based on the objectives and strategies of the organisation. Capital budgeting is the decision process that focuses primarily on projects whose effects span multiple years. (Horngren 2005, 411–413.) Lumijärvi (1993, 15) argues that capital budgeting is a procedure in which people act and behave, and in which they might have conflicting goals.

What is typical for investment projects is that their effects extend over a long period of time. This means that the nonrecurring expenses are not covered in the short term, but the revenues are expected to accumulate in the long term. Due to the high nonrecurring expenses, the cancellation of the invested project is possible only with a high cost. This aspect stresses the importance of a careful investment planning. (Honko 1979, 13–19, Wikman 1993, 21–22.) According to Northcott (1991, 1–2), other characteristic features in investments are the considerable financial effort, the risks and the uncertainty about the future and the ability of the organisation to achieve the strategic and operational goals.

A capital expenditure is any cash outlay expected to generate cash flows lasting longer than a year. In recent years, managers have focused more on return on investment than on allocating capital resources. This is, largely, a response to the combination

of high capital costs and poor returns that many companies have been earning on their assets. Partly, this reflects the availability of more analytical tools to perform these analyses and an increased supply of technically qualified managers capable of applying them. (Shapiro 2004, 2–3.) The ultimate aim of capital budgeting is to maximize the market value of company's common stock and thereby better the wealth of its shareholders (Shapiro 2004, 11).

A capital budgeting process should be carefully planned and guided because of its long-term consequences and uncertain revenues. It requires authority and commitment from its organisation and individuals. Poor long-term investment decisions can affect the future stability of the organisation because it is often difficult for organisations to recover money tied up in bad investments. Some managers aim at a long-range process to analyse and control investments with long-term consequences. (Horngren 2005, 411.)

Lumijärvi (1990, 20) claims that the literature lacks empirical studies of people's capital budgeting behaviours. Junnelius (1974, 282–283) has found that simple and stereotyped process models are inadequate to describe the chain of events, which many investment projects go through. Also Honko (1979, 4–5) has stated that investment research needs more problem-oriented, interdisciplinary empirical investment studies. Especially the whole investment process and its contents should be investigated (Wikman 1993, 15). Consequently, there is a need to describe more precisely the properties of the investment process.

1.2 Purpose of the study

As stated above, investment research has usually concerned the evaluation and the choosing of the investment proposals and the rest of the investment process has been ignored. Empirical investment studies should focus on the whole i.e. from searching investment ideas to investment implementation and monitoring. (Wikman 1993, 15.)

The aim of this study is to describe an expansion investment process in Boliden Harjavalta Oy. This is achieved by answering the following study questions:

- What components does the investment process consist of?
- What are the constitutive functions at each stage of the investment process?
- What factors influenced the case-project positively and negatively?
- How can the case company improve the investment process?

The first question can be considered a general target, while the others are more specific. This means that the goal is to analyse the capital investment process in general and more closely, the functions at every stage of the process. In addition, the guidance of the process control is studied. At the end of the investment project, the positive and negative functions related to the investment case “FoCus” are analysed. Consequently, some reform proposals are given to make the process more efficient.

The theoretical part of the research includes the prevailing models of the capital investment process, a theoretical framework and a presentation of the case investment. These constitute the background to the empirical study.

In the empirical study, the case investment with its critical factors is carefully presented step by step. In addition, it is brought up how the case investment is handled differently than the company’s other investments. Finally, in order to describe the process, possible hinders which may prevent the efficient progress of the project are studied and development suggestions are given when needed. This study concentrates on the major expansion investment “FoCus” in Boliden Harjavalta Oy. This investment project was launched in December 2006 and it was completed in February 2008, hence the researcher had a good opportunity to observe how this project advanced from planning to implementation.

1.3 Case company

Boliden is an international mining and smelting company that extracts smelts and refines zinc and copper. Boliden’s by-products include lead, gold and silver. Boliden is one of the leading copper and zinc smelting companies in Europe – the third largest in copper and the second largest in zinc and the world’s sixth largest mining company within zinc. The company shares are listed on the Large Cap of the Stockholm Stock Exchange in Sweden and on the Toronto Stock Exchange in Canada. The number of employees is approximately 4500 and the turnover amounts to 30 billion SEK annually. (Boliden group, Facts 2008)

Boliden has operations in Sweden, Finland, Norway and Ireland. The head office is situated in Stockholm. Boliden’s operations are conducted through three business areas, each of which possesses cutting-edge skills and assets vital running a competitive metals industry business. These strategic business areas are mines, smelters and market.

The business area mines conducts Boliden's exploration, mining and concentration and within business area smelters, the smelting, refining and recycling operations are conducted. Within Boliden's sales of zinc and copper metals as well as of other products are managed by the business area "Market". Business Area Market is responsible for all sales of the smelters' products. It handles all raw material flows between the Group's mines, smelters and customers. It is also responsible for the purchasing and sale of metal concentrates and for the purchasing of recycling materials from external suppliers. Boliden's production units in a geographical form are presented in figure 1.

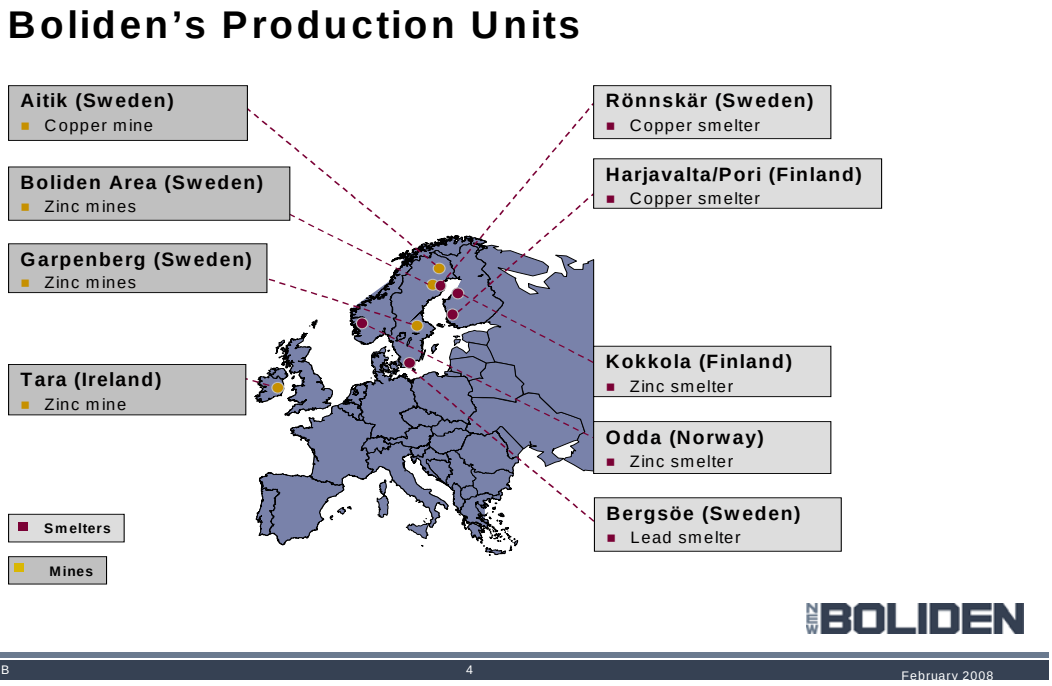


Figure 1 Boliden's production units (Boliden group, Facts 2007)

The production units are smelters and mines. There are three mines in Sweden (one copper mine and two zinc mines) and a zinc mine in Ireland. Boliden has five smelters, of which two are situated in Finland: in Harjavalta is located a copper smelter and Kokkola a zinc smelter.

Case company Boliden Harjavalta Oy was established in 1945 when Outokumpu's copper smelter started in Harjavalta. In 1990 the company was incorporated as one of Outokumpu's units (called Outokumpu Harjavalta Metals Oy). Outokumpu sold its smelting and refining operations to Boliden AB in 2004 and the case company's name was changed into "Boliden Harjavalta Oy". Boliden Harjavalta Oy has activities in Harjavalta and in Pori. The total number of personnel is over 400. Boliden has copper and

nickel smelters and sulphuric acid plants in Harjavalta. The copper refinery is situated in Pori. Copper concentrates are smelted at the copper smelter in Harjavalta. Here, copper anodes the copper content of which is 99,3 percent are produced. From Harjavalta copper anodes are transported by rail to the copper refinery for refining into copper cathodes the copper content of which is as high as 99,998 percent (Harjavalta Facts 2008, Intranet 27.6.2008)

The option of sending anodes to Rönnskär for conversion increases efficiency of the capacity utilisation at Boliden copper smelters. Harjavalta also produces gold, silver and sulphuric acid and smelts nickel concentrates for the customers from the customers' own concentrates on a tolling[1] basis. The concentrates mainly come form copper mines in South America and South East Asia and from Portugal. Harjavalta uses the in-house developed flash smelting method, which is nowadays the most commonly used method of refining copper and nickel concentrates. It uses the energy generated within the smelting process and constantly reuses waste from earlier process stages. The majority of Harjavalta's copper cathodes are delivered to Luvata in Pori. (Boliden annual report 2007, 28.)

Boliden Harjavalta Oy has set a clear direction to expand its production to maintain its competitiveness in the future. This aim is stated in the company's strategy and consequently it is one of the most critical processes in the case company. Therefore the investment process should be carefully planned and the case company has made guidelines for controlling the process to ensure its effectiveness from the beginning of the project.

Boliden's business concept is to extract minerals and produce high-quality metals in a cost-effective and environmentally friendly way, and to exploit the commercial opportunities that the market offers, thereby creating value for shareholders. Boliden's strategies were established in 2005 and they are the following:

- To continuously improve operational efficiency
- To implement organic growth projects
- To expand exploration activities
- To participate in industrial consolidation
- To develop and expand recycling activities

[1] Boliden Harjavalta Oy smelts customer-owned concentrates and returns the smelted concentrates back to the customers.

The operational efficiency improvement is realised when productivity and cost-effectiveness are primarily boosted through continuous process improvements that focus on the interaction between technology, processes and people. The organic growth projects are implemented in the business areas, Smelters and Mines, when they continuously evaluate their operations to ensure that, given their respective assets and core competencies, the use of opportunities offered by the metals market and of economies scale of production. Intensified exploration and cooperation with exploration partners ensure ore reserves that secure mined production for at least ten years ahead. Participation in an industrial consolidation is used to exploit attractive consolidation opportunities with industrial logic and at a reasonable value over a business cycle. The final strategy is to develop and expand recycling activities with the help of Boliden's technology and know-how. This goal helps to ensure long-term material supply and profitability of the smelters. (Konsernisivu: Bolidenin strategia, Intranet 21.3.2008)

The competitiveness of Boliden's smelters is based on strong technical know-how and the latest technology. The technology enables the utilisation of a wide raw-material base and maintenance of the valuable by-products. The growth strategy of Boliden is driven by mass production and the value of the Boliden share in the market. The financial result of the smelters mainly comes from the refining charges. An investor who had invested his own money was behind the growth strategy. After restructuring, Harjavalta and Rönnskär competed for the Group's resources. The scarce investment funds were allocated among the same line of business. (Puolamäki & Ruusunen 2009, 187–188.)

Boliden Harjavalta Oy has a reasonable good competitive position, even though it is a pretty small producer. All the operations of Boliden Harjavalta Oy are certified e.g. Quality System (ISO 9001:2000), Environmental Management System (ISO 14001) and Occupational Health and Safety Management System (OHSAS 18001). The increase in copper smelter production capacity has been remarkable: in 1945 it was 2000 tonnes per month and in 2007 it was as high as 18 500 tonnes per month. (Boliden Harjavalta Oy, General Presentation Intranet 6.6.2008).

The figure 2 demonstrates the production process of Boliden Harjavalta Oy. The figure shows the investment targets: in drying, the company invested in a new a steam dryer (1), new bigger equipment replaced with one of the four converters (2). In slag handling, the company acquired a new flotation cell (3). At the anode casting plant, disposable starting sheet cathodes replaced with permanent cathodes and the distance between anodes and cathodes diminished (4).

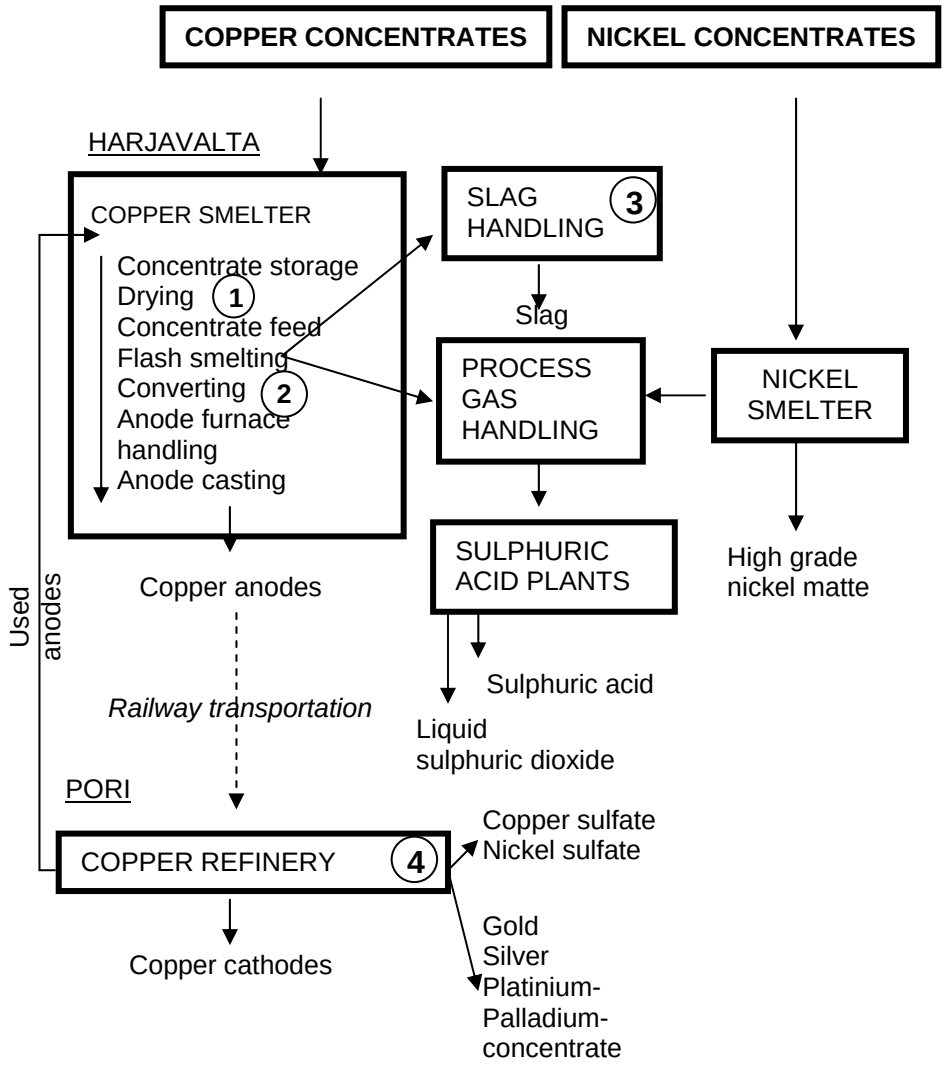


Figure 2 The investments to the production process (Puolamäki & Ruusunen 2009, 191)

Boliden implements process management in its operations. Typical for the process management are continuous improvement, as well as the customer and the process viewpoints. The whole process is customer-oriented; the customer's need launches the process. The core processes describe the main activities of the company and these are implemented through support processes. Typical for describing the process is a flow chart showing the activities, information flow and outputs, using defined symbols. It helps to understand the order of and the interaction between activities (Laamanen & Tinnilä 1998, 23). A core process is a process that adds value for the customers. Core processes are essential part of business and directly related to serving external customers e.g. developing new processes or delivering products to customers. These are critical

to the success of the organisation and improvements should be focused on these. (Laamanen & Tinnilä 1998, 22.) The support process enables the core processes to operate and these commonly have only internal customers performing supporting activities for the core processes (Laamanen & Tinnilä 1998, 43). Process description means a detailed description of a process, which includes a flowchart of the process activities and the most critical activities, like the necessary resources, methods and tools, the output, the environmental description and the boundaries with other processes. (Laamanen & Tinnilä 1998, 34.)

The company has established detailed process charts, basic knowledge records and description of tasks and stages in every process. Basic knowledge include the description of the process, the customer's needs and requirements, the process owner, starting and closing points, the customers, process guidance, central resources and the systems development models. Boliden's process chart is described in figure 3.

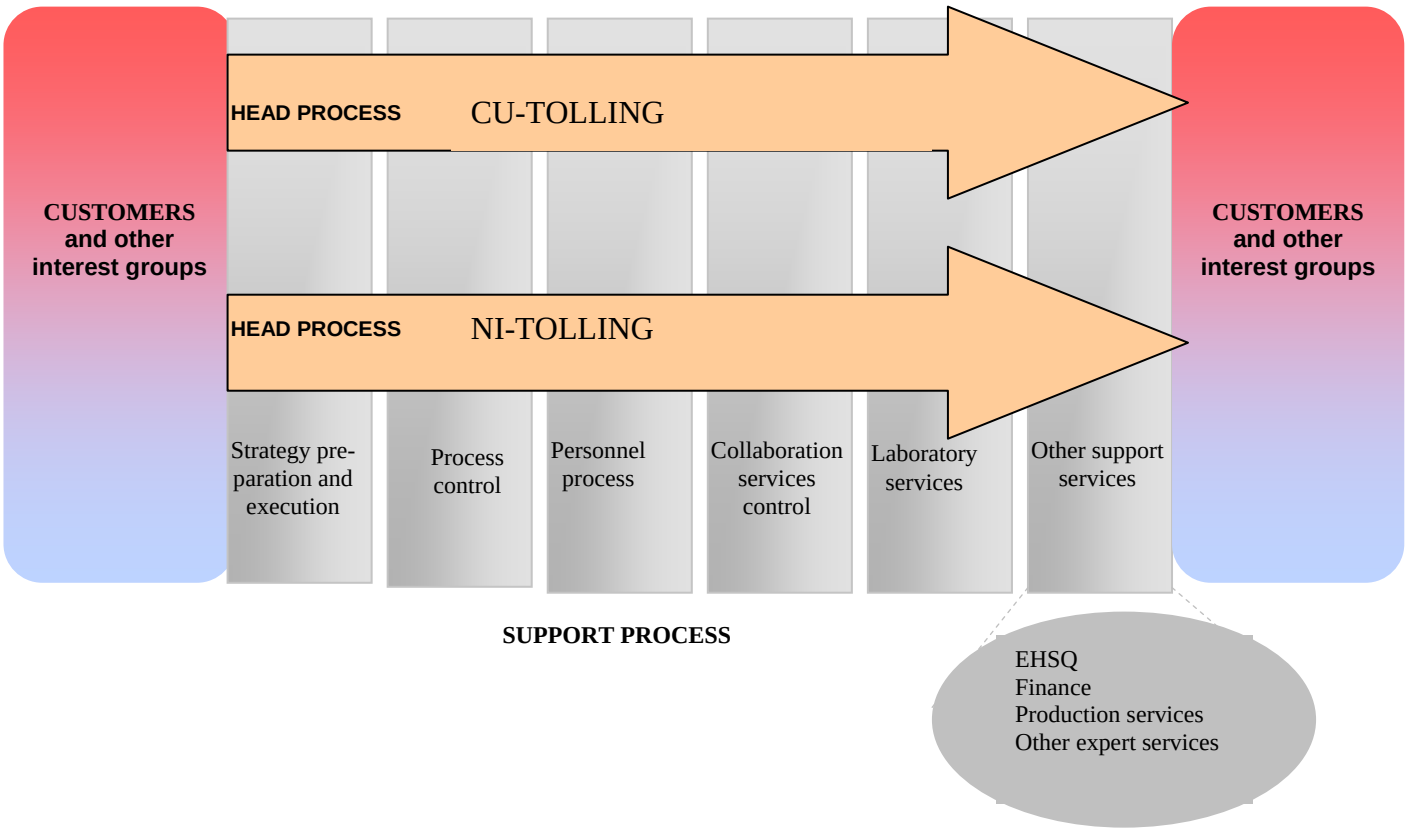


Figure 3 Process chart of Boliden Harjavalta Oy (Toimintajärjestelmä-kuvaukset, prosessikartta, 21.4.2008)

The main processes are copper (Cu) and nickel (Ni) tolling. The purpose of Cu-tolling is to handle the incoming raw materials to products and store eligible waste. In addi-

tion, the products are delivered to the customers and these products are invoiced. Commensurately, in the purpose of Ni-tolling is the same, but in this process the *nickel waste* is stored. These core processes are implemented through support processes.

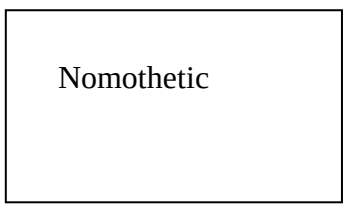
The support processes are:

- Strategy preparation and execution: Creating a strategy and guidelines according to the strategic plans of the Boliden Group.
- Process control: Implementing different projects efficiently
- Personnel process: Supporting strategic planning and project's realisation as well as individuals' development
- Collaboration services: Controlling and developing collaboration services and actions in a network
- Laboratory services: Sampling and analysing of raw materials
- Other support services consist of EHSQ, Finance, Production services and other expert services. These processes produce expert services in their own field to support the head processes. (Toimintajärjestelmäkuvaukset: Prosessikuvaukset 27.6.2008)

The company has established goals and evaluated indicators for every process in order to evaluate and guide the process in every stage. Investment projects can be considered as support process, especially engaged with project control.

1.4 Methodology

The basic methodological solutions of business economics research have been classified into conceptual, decision-oriented, nomothetic and action-analytic research approaches. (Neilimo & Näsi 1980; Lukka 1991, 166). Later on, Kasanen, Lukka and Siitonen (1991) added the constructive research approach to this classification. This approach is a type of hybrid of the decision-oriented and the action-analytic research approach (Lukka 1991, 167.) Figure 4 depicts the division of these five methodological choices.



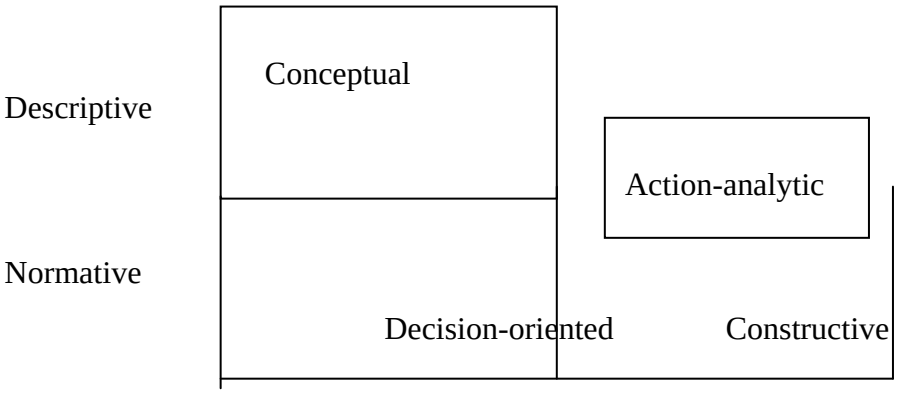


Figure 4 The five research approaches in business economics (Kasanen, Lukka, Siitonen 1993)

Within this research approach context, distinct segments can be distinguished based upon two central dimensions, which are the descriptive/normative dimension and the theoretical/empirical dimension. The former dimension deals with questions related to the information content of research (i.e. the study answer to questions what is and why it is or questions such as how it should be and how to act.) The descriptive study is frequently explanatory or predictive, whereas the normative study attempts to answer the latter type of questions. When it comes to the other dimension, the dichotomy between theoretical and empirical research is unambiguous. The contribution of theoretical research is based upon the method of thought, while the data of empirical research is acquired from the field or laboratory (Lukka 1991, 167.)

However, the division of research approaches mentioned above is not all-inclusive since there are couple of approaches that exceed dimensions. For instance, the decision-oriented approach might be empirical although it is typically regarded as a normative approach. Furthermore, the action-analytic research approach might have a normative part although it is mainly considered as empirical research approach. (Lukka 1991, 167.)

To conclude, it can be stated that the research approach of this study is action-oriented. In particular, the broad empirical data based on theoretical framework and the subjective nature of the study confirms the choice of the most appropriate research approach to the specific research design.

1.5 Research method

This study is a qualitative case study. Qualitative methods permit studying the subject in depth and detail, while a quantitative method requires the use of standardised measures. Quantitative methods give a broad, generalisable set of findings presented in a compact form when it is possible to measure the reactions of many people to a limited set of questions, thus facilitating comparison and statistical aggregation of information. By contrast, qualitative methods produce a wealth of detailed information about a much smaller number of people and cases, which increase understanding of the cases but reduce general assumptions. (Laamanen & Tinnilä 1998, 13–14.)

Yin (1987, 23) defines the case study as follows: "A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used."

Accordingly, a case study is a traditional research strategy, which gives specific and intensive information on e.g. one particular group, institution or a larger society. In a case study, the processes are often researched and data is collected in multiple ways. (Hirsjärvi, Remes & Sajavaara 2001, 122.)

Miles & Huberman (1994, 10) list the strengths of qualitative data. One major feature is that it focuses on naturally occurring, ordinary events in natural settings, so that we have a strong handle on what 'real life' is like. Another feature of qualitative data is the richness and holism providing thick descriptions that are nested in a real context, having the ring of truth that has a strong impact on the reader. Furthermore, the fact that such data is typically collected over a sustained period of time makes it powerful for studying any process and even for assessing causality as it actually plays out in a particular setting. Also the inherent flexibility of qualitative studies gives further confidence that we have really understood what has been going on. Accordingly, the emphasis of this method on people's lived experience is fundamentally well suited for locating the meanings people place on the events, processes and structures of their lives: their 'perceptions, assumptions, prejudgements and presuppositions and for connecting these meanings to the social world around them. However, the nature of the case study supposes that the empirical study is not meant to tie up with a tight concept.

Qualitative methods are not without critics. Most criticism centres around the researcher's effects on the collected data. Some argue that the qualitative researcher, being the sole instrument acts like a sieve, which selectively collects and analyses non-representative data. What critics might fail to realise is that the researcher acts as a

selective sieve in all forms of research. A related criticism concerns the generalisability of the qualitative researcher's findings to other settings of subjects. When researchers report their data they should give sufficient details concerning the procedures to permit readers similarly weighing this influence. (Hirsjärvi & Remes & Sajavaara 2001, 214; Yin 1994, 10.)

In qualitative research the interviews vary depending on how they are structured. There are structured and non-structured dimension. In a structured interview, the context of the communication is determined by questions, which are minutely prepared in advance. In the open-ended interviews, the researcher encourages the interviewee to talk in the area of interest. (Hirsjärvi & Hurme 1988, 29–35.) A half-structured interview is between these two extremes. It consists of themes related to the subject matter, which are formulated before the actual interview takes place. Themes are areas and the interviewer is able to deepen the conversation as far as the interest demands and the interviewee's qualification and motivation permits (Hirsjärvi & Hurme 1988, 35–36.)

Fundamentally, this study is a descriptive and interpretive case study. The data was collected using half-structured theme interviews (appendix 1) and supportive documentation from the case company increased the understanding of the capital investment process. The researcher interviewed the vice president, development, the vice president, finance and the finance assistant in June 2008. These persons were selected to this study, because they have central roles in investment process and good overall picture of the investment process. Interviews were implemented in a silent conference room, besides vice president, development was interviewed in his office. Interviews took 1,5–2 hours, the atmosphere was relaxant and interviewees talked freely about the subject. Each interview was transcribed.

1.6 Study outline

This chapter illustrates the structure of the study. In order to understand the investment process as a whole, this study is divided in three parts. First, the theory grounds the basic knowledge of the subject matter and in empirical part the researcher presents the case investment process. After this, the comparison between theory and practice is possible: does the theory correspond to real life?

1. Theoretical part

After introduction (chapter 1), the types of investments are presented and the existing frameworks of the capital investment process are reviewed (chapter 2). Accordingly, a theoretical framework and its constituent parts are presented in order to describe the ideal capital investment process. This constitutes the background to the empirical study.

2. Empirical study

The purpose of this part is to demonstrate the case investment process. The empirical part of the study starts in chapter three by presenting the capital investment process and its central elements in Boliden Harjavalta Oy. This chapter is based on the theoretical framework.

3. Study results

In chapter four the aim of the study will be evaluated together with the summary of the study, i.e. the previous chapters are put together. Accordingly, the case investment process is described in a flow chart, which demonstrates the constitutive functions at each stage of the investment process. After this the reliability and validity of the study is evaluated. The concluding comment -chapter describes if the case investment process follows the established framework, i.e. whether practice equals theory in real life. Accordingly, some suggestions are made to improve the capital investment process in the researcher’s viewpoint.

In order to carry out the whole investment process successfully in the organisation, full understanding of the process and its outcomes is required. Next chapter presents the types of the investments, because they strongly effect to the nature of the investment process.

2. CAPITAL INVESTMENT PROCESS

2.1 Types of investments

There are many ways to divide investments. In practice, investment projects are classified into different groups according to their type and purpose. This can sometimes be difficult because the project may have several purposes simultaneously. The distribution criteria can affect the project's risk assessment and how the project can be assessed with quantitative methods. (Wikman 1993, 40.)

One common and easy way is to divide the investments into classes according to the amount of money. Lumijärvi (1990, 62–63) divides investments into small and other investments in his case study. The basis for the small investments is that they are below 1 % of the fixed assets of a business unit at the beginning of the budget year. All other investments, including any company acquisitions are considered other investments.

Investments can also be divided according to their basis and significance:

- Mandatory investments (e.g. environmental protection)
- Investments that guarantee a good market position
- Replacement investments (e.g. the renewal of the worn equipment)
- Rationalisation investments (e.g. to improve efficiency of the operations)
- Expansion investments (e.g. to increase the production)
- Strategic investments (e.g. to develop new production or to respond to the changes in the operating environment)

(Etelälahti et.al. 1992, 11, Northcott 1992, 15.)

Shapiro categorises investments into four types of projects within the capital budgeting projects:

- Equipment replacement,
- Expansion to meet growth in the existing products
- Expansion generated by new products
- Projects mandated by law.

These have proved to be of value in classifying projects according to the analysis required. The risk increases depending on the investment type and the amount of money,

the analysis becomes more detailed and the amount of information collected increases, for example from the cost reduction projects to the expansion in the existing product lines to the projects involving new products. (Shapiro 2004, 12.)

There are four types of investments in the case company: *mandatory, sustaining, discretionary and other investments*. The type affects strongly the nature of the investment calculations. Significant for these groups is that the impact, i.e. benefits and/or costs, are direct distinguishable. Investments in EHSQ (Environment, Health, Safety and Quality), R&D and Exploration etc, where the benefits can only be assumed on a long-term basis, are referred on "Other".

Mandatory are the investments that are required by law of governmental/semi governmental regulations. Cases can be that new emission levels have been imposed or that existing levels can not only be achieved due to, for example, change in a raw material feed. As this is a cost only investment, every measure that would avoid, postpone or represent an alternative solution should be investigated. All investment proposals should include clear and substantiated motivations as well as a comprehensive statement on the feasibility study. If the case investment is more than 500 000 euros, an incremental NPV calculation comparing the investment with possible alternatives shall be enclosed.

Sustaining/replacement investments are necessary to keep the production on existing level. It can be replacement of a critical production unit that threatens to break down and thereby causing an extended production stop, replacement of machinery and equipment that have passed their economical life time and cost more to keep than replace or it can be rock excavation necessary to get access to ore needed to feed the concentrator. If the increase is more than 20 % over last year strategic plan for the coming year, or above depreciation, a substantiated motivation for the increase is required. For units or groups of units exceeding 500 000 euros an evaluation of consequences and financial impact of doing or not doing the investment shall be added. The financial evaluation should include incremental NPV, IRR, payback time and cash flow.

Discretionary, i.e. expansion or "de-bottleneck" investments are generally investments aiming at rationalizing or expanding the production as well as opening of the new mines or ore bodies. An investment proposal should follow the structure of appendix 2 in a case of metallurgical plant projects, which shows the requirements for a full feasibility study and naturally are not included in full in smaller investments. However, it is up to the person who is making the proposal to judge what to include and how deep into detail to go, in order to get approval. In the investment proposal the project should

be defined as an expansion or “de-bottleneck” investment. This definition is used in reporting given to the Group on a quarterly basis.

A bottleneck can appear in a system consisting of several interlinked processes. These processes have often-divergent capacity. The process with the lowest capacity places a constraint on the whole system and becomes a bottleneck: When two or more processes must be used to manufacture a product, one process is usually slower than the others and becomes the upper constraint on total volume throughput. A bottleneck is a resource whose capacity is less than the demand placed on it limiting production volume to all other process linked to it.

The definition of de-bottleneck is an investment made to improve a process that lets the system use its full nameplate capacity. For instance this could be an investment to improve logistics to use a grinder at full capacity.

An expansion investment is aimed at fulfilling the strategy i.e. new product areas or a new or expanded plant. For instance this could be an increase in nameplate capacity of a unit. The expansion investment could either be in organic growth as in the case of an increase in capacity in an existing plant or by a merger of acquisition of another plant or company.

Other investments category consists of investments that do not belong to the three above-mentioned categories, for instance EHSQ, R&D and Exploration. Investments to these can only be assumed on a long-term basis. R&D and Exploration will however not be capitalized. (Boliden, corporate investment manual 9.7.2007, 3–5.)

According to Vice President, Development (interview 17.6.2008) most of the investments made in case company are made to improve the process, to eliminate the bottlenecks and to reline the critical equipments in production. The purposes of these investments are to raise the production capacity, improve the effectiveness and to comply with the environmental regulations.

All in all, there are many ways to divide investments. The categorisation is necessary because the type of investment defines the nature of the investment process. However, the basic functions are the same appearing in most investment projects. Next chapter describes the stages of the ideal investment process.

2.2 Capital investment process

There are many process models that describe the investment process (e.g. Bower 1970, King 1975, Mills 1988). Horngren et. al. (2005) has presented the ideal investment process in a simple and comprehensive way and consequently is selected to this study.

Horngren (2005, 413–414) defines the stages of capital budgeting as a process from identification to implementation. The stages 1–6 include the following:

Stage 1: Identification stage

The first stage is to distinguish which types of capital investment projects are necessary to accomplish organisation objectives and are closely tied to the strategy of an organisation. This task is largely the responsibility of the line management.

Stage 2: Search stage

The second stage is to explore several alternative investments that will achieve organisation strategies and goals. Employee teams from all parts of the value chain evaluate alternative technologies, machines and project specifications.

Stage 3: Information-acquisition stage

In the information-acquisition stage, the potential alternative investment projects are evaluated more thoroughly, for example, the predicted costs and consequences of these alternatives. The consequences can be quantitative and qualitative. Capital budgeting emphasises financial factors, but non-financial quantitative and qualitative factors are also very important. Management accountants help to identify these factors.

Stage 4: Selection stage

In the fourth stage, the projects are chosen for implementation. Organisations choose those projects whose predicted outcomes (benefits) exceed predicted costs by the greatest amount. Managers re-evaluate the conclusions reached on the basis of this formal analysis, using managerial judgment to take non-financial and qualitative considerations into account. Evaluating costs and benefits is usually the responsibility of the management accountant.

5: Financing stage

After the project has been selected, the project funding has to be settled. Sources of financing include generated cash within the organisation and the capital market. Financing is often the responsibility of the treasury function of the organisation. Depending on the context, this stage may precede stage 4.

6: Implementation and control stage

In the last stage, the task is to put the project in motion and monitor the performance. As the project is implemented, the company must evaluate whether capital investments are made as scheduled and within the budget. As the project generates cash flows, monitoring and control may include a post-investment audit, in which the predictions (made in stage 4) are compared with the actual results.

According to Horngren (2005, 414), in practice, the capital budgeting process in most organisations follows these formal stages but is also influenced by behavioral, organisational and political factors. For instance, the financing issues were not relevant in this study, because the case company did not have to consider different financing forms when it was all the Group's money. The whole financing situation in the Group was good because of the good metal price. (Interview with the Vice President, Development 17.6.2008)

A systematic approach to capital budgeting requires an administrative framework, which facilitates the gathering and transferring of relevant information on alternative courses of action both for purposes of decision-making as well as for the control of expenditures, once these decisions have been reached. This requires a uniform set of procedures and forms, which can be used to check project estimates for accuracy and against budget limits as well as to transfer the proposals to the decision level. (Levy & Sarnat 2000, 24.) Figure 5 sets out a highly simplified flow chart for a typical investment proposal.

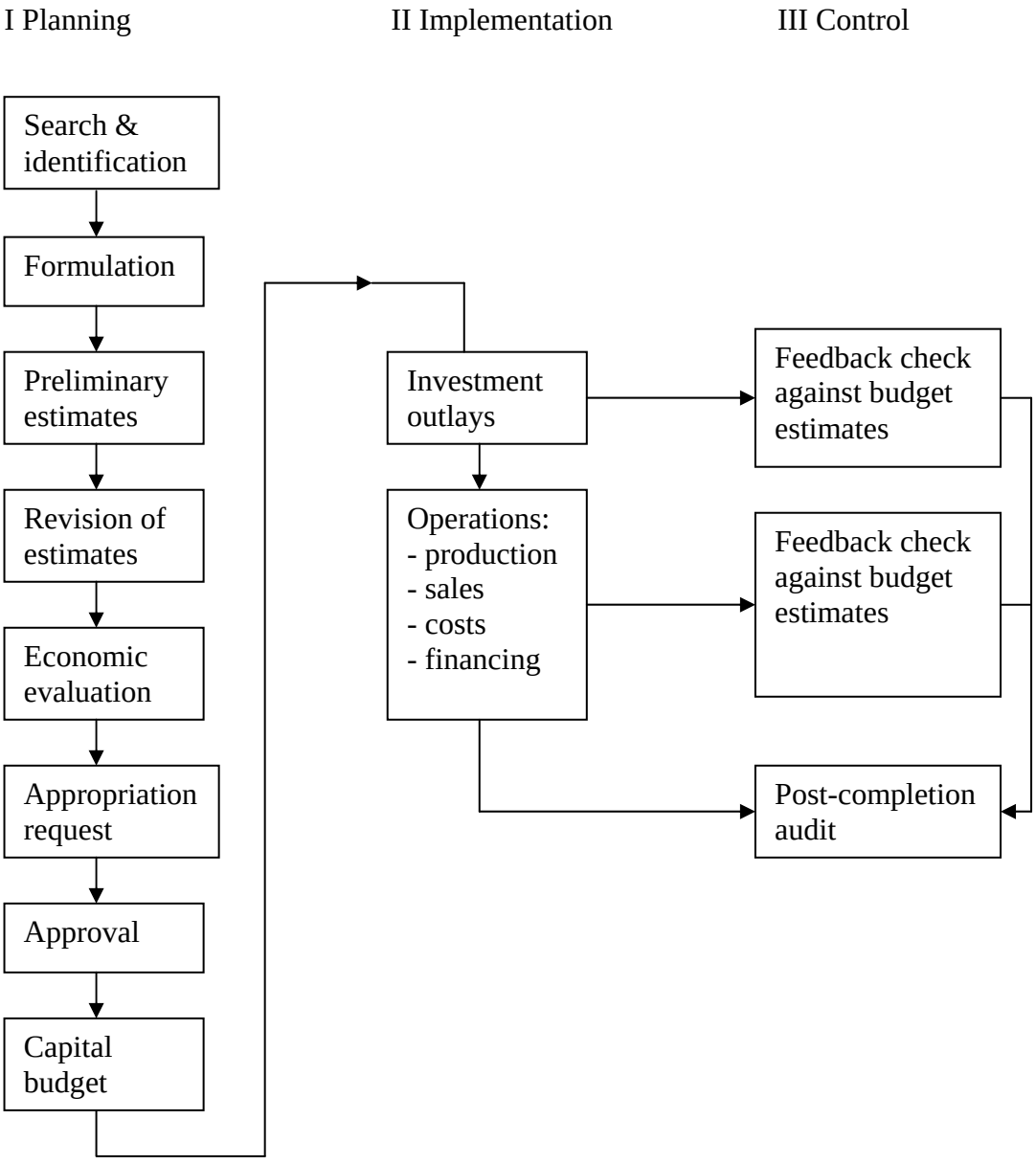


Figure 5 Project planning (Levy & Sarnat 2000, 25)

Basically, the investment proposal preparation consists of three major phases: planning, implementation and control. The preparation of investment proposals is a very central factor in the planning stage. In the beginning of the investment process an investment need or an idea is identified. Proposals include preliminary estimates, revision of estimates and economic evaluation. The expected costs and revenues generated by the project must be estimated. Often these rough preliminary estimates have to be revised and refined when the proposal is incorporated in the firm's formal budget. Finally, on the eve of the actual budgeting decision, these revised estimates must be presented in the form of an appropriation request. (Levy & Sarnat 2000, 20–21.) After the

proposal is approved and the capital budget is prepared, the investment is ready for implementation. This requires outlays and operations from every function related to the investment. With the help of feedback, the implementation stage can be monitored and revision made when necessary. Finally, the post-completion audits for the capital investment project are made when the project is implemented. A systematic approach of evaluating past decisions can contribute to the improvement of current decision-making by analysing the patterns of past estimation. (Levy & Sarnat 2000, 24.)

The above described investment models reveal that the central factors in capital investment processes are the detection of investment need, the definition of project features, evaluation, selection and implementation as well as the monitoring of the implemented investment project.

2.3 Theoretical framework

The theoretical framework of this study is based on Wikman's (1993, 42, 53) view on the investment process. The framework does not go into detail, because it has been shown that structural and stringently stage-based process models do not describe the decision-making in practice. This is the case especially when the investment situation is unique, unclear and new.

Figure 6 shows the theoretical framework of the study, representing one kind of work method and instrument, which facilitates the approach of an indistinct and complex decision situation. It consists of four central stages in the capital investment process. These are the project start up, the definition and the evaluation of the investment target and the decision to implement the project. A successful project implementation requires a distribution of liabilities and commitment from individuals at every stage of the project.

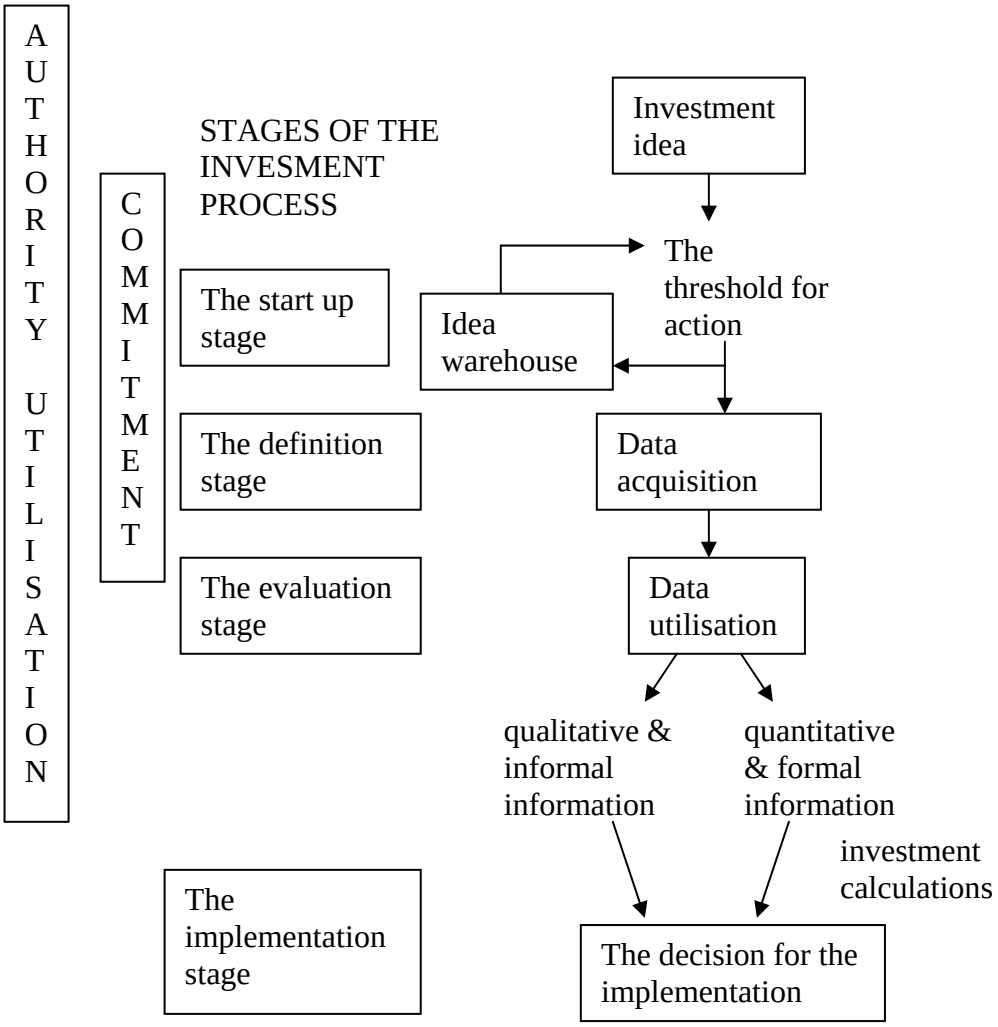


Figure 6 The theoretical framework (Wikman 1993, 42)

The first step in describing the framework is to explore the start up of the investment process where individual's motivation and creativity are central factors. In some cases, the idea can go into the idea warehouse to mature before it goes forward in the process. Data acquisition starts when the threshold for action is exceeded. In the definition stage, the information is acquired with the help of different activities. In the evaluation stage, different calculations about the investment profitability are prepared. Besides quantitative information, qualitative information also affects the investment decisions. In quantitative data acquisition, investment calculations are prepared to support the decision-making. However, the investment project is also carefully controlled during its implementation (Wikman 1993, 54.)

2.3.1 The start-up stage

Starting the investment process requires ideas, creativity and motivation. In literature, the investment ideas and investment proposals are usually taken as given, although every investment problem has to be identified. (Wikman 1993, 26.) In practice, this can be hard when the decision maker has to recognize problems and make decisions in a very uncertain atmosphere (Mintzberg, Raisinghani, Théorêt, 1976, 253). There is hardly any evidence about the idea creation process because of its individual nature, and getting information e.g. with surveys is difficult (Wikman 1993, 26–27). Authority utilisation can affect the production of investment ideas when the ideas are evaluated from the personal viewpoint, and sometimes they progress predominantly out of personal interests (Lumijärvi 1990, 173).

Starting up the investment process requires commitment at every stage of the process. Strong commitment enhances individual motivation, and it is usually required from the person who makes the proposal, so that he/she would get support for the investment from the other team members. Basically commitment means a desire to get something implemented. (Lumijärvi 1990, 109.)

According to Bower (1986, 50–52), the investment process can begin when a problem, a divergence or an event of dispute emerges in the company's present and target position. Bower divides these states of affairs into three groups:

1. High cost
2. Inadequate quality
3. The sales exceeding the production capacity

The first state of affair indicates that the company needs investments, which enable amore cost-effective method of productions. The second factor requires investments, which enable producing more high-class products. The third factor refers to expansion investments that the company needs for covering the demand of the product.

The investment idea can go into a kind of idea warehouse before its implementation. The idea is stored in this idea warehouse until the circumstances are favourable for implementation. (Bower 1986, 126.) The decision-maker can also hesitate to utilise the idea, which is not connected to the problem and the process does not start until a suitable problem has emerged (Lumijärvi 1990, 146).

The investment idea launches the investment process, and it is basically an individual action. The producing of ideas and solutions requires a lot of creativity, i.e. the ability to develop new modes of operations and ways of thinking. Especially the leaders of the company have special positions to observe the investment needs and to produce new investment ideas, because they get a lot of stimulus from the business environment. In this way they should have an overall picture of the business situation, which is required by the new significant alternative course of actions. The intimations about the new investment possibilities are usually received from both inner and outer information sources, for example, fairs, trade journals and company visits. (Wikman 1993, 26–28.)

However, empirical studies have shown that investment ideas can be produced at every stage of the organisation; especially the technical management and groups that work closely with the management have a very central position (Honko & Virtanen 1975, 25–27.) In big companies, the ideas can also be developed, for example, in planning committees, within the product development department or among employees whom company can offer financial incentives.

The accumulated amount of the internal and external information stimulus and the threshold of the decision-maker affect the progress of the investment idea. The stimulus source, the decision-maker's interest in the idea and the expected benefits affect the height of the threshold. (Wikman 1993, 28.)

2.3.2 The definition stage

When the accumulated amount of information stimulus has exceeded the threshold of the decision maker, the investment target is defined and data required. The company may use a working group, an exploring committee or a consultant to analyse the situation. This can happen in a formal or an informal way, and the data acquisition can happen with the recent information channels, but new channels are opened as well. (Wikman 1993, 30.)

In the definition stage, the investment idea is completed into a concrete form by preparing an investment proposal. This is prepared when the investment idea matures enough and is ready for implementation. The investment proposal is usually the first official document, which is made in the investment project. With the investment proposal, the project is presented to accept it into the investment budget. The person who

proposes the project completes the forms that help the decision-maker to consider the idea. (Cooley 1994, 280.)

According to the study made by Mukherjee and Henderson (1987, 80), the eligibility of the investment idea has to be examined before it goes forward in the investment process. This so-called particle size analysis is informal, because this does not require any official document or demonstrations. Usually the executor of the idea completes the investment idea into the investment proposal together with the acceptor or with the help of the experts in the field.

The preparation of the investment proposal should be made carefully and accurately, because it can resolve the progress of the project. Below there is a list of requirements that a comprehensive investment proposal should include:

1. The reason why the investment is proposed and how it supports the business strategy
2. Alternative methods of implementing the investment
3. The gross expenditure of the investment and the effect in the company's working capital
4. The influence of the investment on the financial index of the business unit.
5. A plan about the finance of the investment
6. The depreciation period and the depreciation method of the investment
7. The sensitivity of the investment
8. The date when the business unit makes a more precise report of the investigation of the investment. (Lumijärvi 1990, 64.)

Bower describes the investment proposal as a summary application for getting the budgetary appropriation for the proposed project. The proposal includes all the most relevant factors in a comprehensive way, as well as the most essential calculation results and ratios. This summary goes to the next stage in the investment process. (Bower 1986, 60–61.)

2.3.3 The evaluation stage

After the properties of the investment idea are characterised, it is possible to start looking for alternative investments to solve the situation. Financial and technical components have to be put into specific terms before a clearer understanding of the investment alternatives is achieved. (Wikman 1993, 31–32.)

A realistic investment evaluation requires many kinds of evaluations, e.g. of the size of the investment, its type, location and timing, the taxing and the different finance alternatives. To facilitate the investment decision, different calculations are prepared. When evaluating the profitability of the investment, the following phases are connected to the investment evaluation:

1. Definition of the profitability of the investment proposal
2. Ranking proposals according to their profitability
3. Definition of the investments that are acceptable
4. Choosing the most profitable proposals that the finances allow (Pellinen 2006, 171.)

The basic calculation methods used in investment evaluation are classified as follows:

1. The methods based on the imputed rate of interest: The net present value (NPV) and annuity method
2. The methods based on the rate of return: Internal rate of return and return on investment (ROI)
3. Payback period methods. (Wikman 1993, 31–32.)

Net present value (NPV) and internal rate of return (IRR) are time-discounted methods of evaluating capital investment expenditures. NPV is derived by discounting a project's cash receipts using the minimum required rate of return on a new investment, summing them over the lifetime of the proposal and deducting the initial investment outlay. IRR is a rate of discount, which equates the present value of the stream of net receipts with the initial outlay. All of the necessary calculations can be reduced to very simple procedures by using present value tables. Generally speaking, when using the NPV method, the project can be accepted when NPV is positive, and when using the IRR method, when IRR exceeds the discount rate. (Levy & Sarnat 2000, 43.)

When examining the incremental cash flows, special attention must be paid to the timing of receipts and outlays, the handling of fixed and variable costs, the accounting depreciation, the working capital, the interest expense and the opportunity costs. In gen-

eral, the cash flows of a project should reflect all of the cash flow generated by the investment decision, independent of whether they occur directly in the department in question or elsewhere in the firm. (Levy & Sarnat 2000, 121–122) The relevant cash flow is also a very important factor in the investment evaluation and decision. Depreciation is not a cash flow, but it is deductible for tax purposes. (Levy & Sarnat 2000, 122.)

Long-term money tied-up and revenues scheduled in a long holding time should be noticed when evaluating investment profitability. Since the euro today is more valuable than the euro tomorrow, it is necessary to evaluate the waiting time. This value of waiting is called interest. Different methods can be used when defining interest. The interest and discount factors are used as investment methods when defining the value of time. Interest factor answers to the question: how high does the investment increase in coming years, and with the help of the discount factor, the available value of money in the future can be evaluated. (Pellinen, 172–173.)

Interest usually represents an actual cash outflow, unlike accounting depreciation. According to Levy & Sarnat (2000, 108), despite this, the interest should not be deducted from the annual cash flow, because the discounting process already takes the interest outlay into account.

Opportunity (alternative) cost must be taken into consideration when estimating the cash flow of a proposed capital investment project. For example, the opportunity cost of using the limited services of key personnel may have to be estimated, if their involvement in the new project creates a need to hire additional people elsewhere in the firm. Sunk costs refer to those costs, which have already been incurred, and because they are not incremental costs, they should not affect future investment decisions (Levy & Sarnat 2000, 109.)

The components that affect the economic efficiency of the investment are the current revenues and expenses, the acquisition cost, the residual value, the repayment period and the imputed rate of interest (Aho 1982, 25). The investment components can be evaluated by using sensitivity analysis or different trends e.g. statistics about the business field development. Probably the most common method of evaluating a project's risk in practice is the sensitivity analysis in which the company makes its best estimate of the revenues and costs, calculates the project's net present value and then checks the sensitivity of the NPV to possible estimation errors of the gross revenue and the various cost items. (Levy & Sarnat 2000, 219.)

There may be qualitative effects from long-term investment decisions, which can indirectly influence financial performance and economic viability (Horngren 2005, 411). When reducing the decision situation into a computational form, some important qualitative factors can be ignored in the investment evaluation. Nevertheless, it should also be remembered that when making the decision, qualitative and abstract factors are also relevant. (Wikman 1993, 34–35.)

In addition, Farragher et. al. think in their article that in the investment selection situation, the company may concentrate too much on the investment calculations and the risk analysis. These are very important issues to explore, but what is more important for the success of the project is to understand the whole investment process in a more comprehensive way than to short-sightedly concentrate on some specific choice situation. (Farragher, Kleiman & Sahu 1999, 138.)

2.3.4 The implementation stage

An investment decision means the official acceptance of a project and the commitment to implement it. This is the culmination of the investment process, and getting to this point requires a lot of choices and part decisions. The decision usually matures gradually, because many small decisions about selection and eliminations precede it. (Wikman 1993, 40.)

According to Wikman (1993, 41), the factors that also affect the decision making are the size of the investment, the uncertainty, the strategy and goals of the company, the total amount of investments, the markets, the availability of capital and the personal attributes and preferences of the decision-maker. Consequently, many factors affect the decision making, some of which are measurable and some are not. The decision-maker's job is to bring together the financial information and non-financial factors in the decision situation. (Kasanen 1993, 63.)

The goals, the evaluation technique and the project's duration affect the investment decision-making. The project lifespan can be based on the expiration of technology, physical wear down of equipments or a decrease in demand. The starting point in the investment methods is the evaluation of the expected revenues and their certainty. In addition, the finance and business risk, the waiting time of the revenue, the committed

capital, the adequacy of finance, the available finances and the size of the investment cost and residual value are under estimation. (Pellinen 2006, 172.)

The standpoint of investment analysis is the fact that a dollar received tomorrow is not equivalent to a dollar in hand today. This aspect has to be evaluated when evaluating the desirability of an investment proposal. A typical capital investment decision invariably involves the comparison of present outlays and future benefits, and problems relating to the timing of receipts and outlays lie at the very heart of the capital budgeting process. (Levy & Sarnat 2000, 30.)

When the different investment alternatives have been set up in an equivalent form, the implementation decision can be made. In the implementation stage, the final investment targets are selected and approved, and the investment budget is confirmed. Some alternatives are eliminated at the lower level of the organisation. Usually the corporate management does the final investment decision. (Kasanen et. al. 1992, 62.)

As stated above, the investment process consists of four stages: the start up, the definition, the evaluation and the implementation stage. The investment idea launches the investment process, which requires creativity, commitment and motivation. However, it is possible that the investment idea will be stored in a warehouse if the circumstances are not favourable at the moment, i.e. the threshold for action is not exceeded. In the definition stage, the investment is defined and data required when the investment idea matures enough and is ready for implementation, i.e. the accumulated amount of stimulus has exceeded the threshold of the decision maker. This means that the investment idea is completed into a concrete form by preparing an investment proposal including all the most relevant factors in a comprehensive way.

In evaluation stage, after the properties of the investment idea are characterised, qualitative and quantitative evaluations are made to facilitate the investment decision. This evaluation is necessary in order to make comparisons between the alternative investments. When the different investment alternatives have been set up in an equivalent form, the official acceptance of a project, i.e. decision to implement the project, can be made. The investment decision usually matures gradually and getting to this point requires a lot of choices and part decisions.

As presented above, the investment process consists of many factors and a successful project implementation requires a distribution of liabilities and commitment from individuals at every stage of the project. Consequently, many factors affect the decision making, some of which are measurable and some are not. The decision-maker’s job is to

bring together the financial information and non-financial factors in the decision situation. Next chapter describes the case investment project reflecting it to this theoretical framework.

3. INVESTMENT PROCESS IN BOLIDEN HARJAVALTA OY: CASE FOCUS

Investment case: FoCus

The expansion project “FoCus” implements Boliden’s growth strategy of copper production. The capacity of the smelter in Harjavalta and of the capacity of the copper refinery in Pori was raised by eliminating the bottlenecks and by adopting new technology. The annual production capacity of the copper smelter increased from 165 000 tonnes to 210 000 tonnes of anode copper and at the Pori copper refinery the production of cathode copper increased from 126 000 tonnes to 153 000 tonnes.

The expansion project was divided into two projects: a smelter and a copper refinery project. The aim of this project was to improve the cost-efficiency of the company as a copper producer and thereby maintain the competitiveness of the company also in the future. The project was implemented within the existing environmental licences. The project started in January 2006 and the goal was to achieve the planned capacity during the year 2008.The value of the project is approximately 36 million euros. (BOHA Projektiohje: FoCus projektin tavoitteet 6.2.2006)

The smelter project consisted of the following sectors: the copper drying plant, the converting and the anode casting plant as well as the slag concentrator. The descriptions of these sectors include a detailed investment need and technology requirements, e.g. the demolishing of the old equipments and the installations of the new ones. (BOHA Projektiohje: Sulattoprojektin tavoitteet 6.2.2006). The description of the copper refinery project includes technical descriptions of the electrolysis and of the precious metal and solution purification. (BOHA Projektiohje: Elektrolyysiprojektin tavoitteet 6.2.2006)

Investment decisions are important when executing the strategy. Successful investment operation requires accurate directions. The investment instruction includes the basic elements, for example an operation plan, strategic evaluations, a project plan, profitability calculations and risk evaluations. (Puolamäki & Ruusunen 2009, 132.) At the Group level, organising the investments is strongly related to the company and it de-

pends on the nature of the business. At the group level the focus is on strategic business matters. Managers can be responsible for investment issues of independent business activities. Also horizontal groups, for example steering groups, can operate in order to develop the business activities. (Puolamäki & Ruusunen 2009, 122–123.)

The implementation of the case project was well planned and organised. The case company has project instructions that include presentations about the following subjects: the description and goals of the project, a project organisation chart, safety and environmental protection, the distribution of the project, the pre-timed control of the project, cost control, ADP-usage, meeting practices, reporting, the specification of planning and the other technical documentation, a procurement specification and a commissioning specification. The purpose of these instructions was to guide the investment process and advice the people involved in it.

3.2 Start-up of the investment process

Investment process launch is the first stage in capital investment projects. Outokumpu Harjavalta Metals Oy's goal was to expand the copper production that based on growth. The idea was to maintain profitability when volume grows and unit costs reduce. There were a lot of expansion plans the Outokumpu era, but the company went on rocks because they wanted to concentrate on expanding the steelworks in Tornio and there were not enough investment funds for both investments. This was a strategic choice, because the main target was to invest on stainless steel. (Interview with the Vice President, Development 17.6.2008)

Ideas can be stored for later use. According to Puolamäki & Ruusunen (2009, 123–124) additional information or support from the key persons can also utilise. When the idea stage has been accomplished, a project organisation will be created. The project leader is in charge for the organisation's capability to execute the investment project. In this case, the investment proposal was left in idea warehouse to wait for a more suitable time and in 2004 the idea was brought up again. After arrangements, the business transactions in 2004, New Boliden was established and it had new strategic alignments. There was a strong need to expand the metal production. Based on this strategy, the management of this investment area expressed that an expansion of copper production

is reasonable from the viewpoint of the whole Boliden Group. (Interview with the Vice President, Development 17.6.2008)

Efficiency is a key factor when organising activities and implementing investments. Investment plans are derived from the company's strategy. The Board makes decisions according to the strategic investments and strategic investments are prepared in the Group level. After the approval, the Head Office of the Group controls the implementation. Projects are organised and each project has an owner, a steering group and a project manager who leads the project group in order to achieve the set goals. (Puolamäki & Ruusunen 2009, 120.)

During an investment project, the acquisition approval process advances in accordance with certain routines and regulations. Each function that is accountable for costs and expenditures can accept investments that do not exceed a certain sum. In practice, signatures in the investment proposal conclude the approval chain and there can be quite a long list in case of a major investment. The acquisition instructions complete the investment instructions. This ensures that there has been an adequate amount of alternatives and that the estimations are accurate. (Puolamäki & Ruusunen 2009, 130–132.)

In Boliden Harjavalta Oy, the need or idea is accepted according to the authority of the organisation level. For instance operation and development departments have good conditions to make investment ideas when working closely with the production. Then there may be new business ideas that can come from somewhere else, for example from the top management or the commercial organization. (Interview with Vice President, Development 17.6.2008) Critical factors at this stage are problem solving and fulfillment of the development demands. When launching the pre-study, correct basic data is in a significant role. Table 1 shows the authorities in organization according to changes to project.

Table 1 The authorities of the organisation levels (Projektiohje, organisaatiotasojen valtuudet 6.2.2006)

Subject	**Proposer**	**Acceptor**
Changes to budget	Project manager	Project leader
Changes to extent of project	Project manager	Project leader
Changes to head schedule	Project manager	Project leader
Acquirements over 1 000 t €	CEO	Business area manager
Acquirements over 1 00 t €	Project leader	CEO
- invitation for bids	Project manager	Project leader
- orders	Project leader	CEO
- contracts	Project leader	CEO
Acquirements less than 100 t €	Project manager	Project leader
- invitation for bids	Managers	Project manager
- orders	Project manager	Project leader
- contracts	Project manager	Project leader
Acquirements less than 30 t €	Project engineer	Project manager
Acquirements less than 10 t €	Project personnel	Project engineer

Table 1 indicates that the significance and acquirement record type affect to the authorities of organizational levels. The authorised stages are in a simplified form: project engineer, project manager, project leader, CEO and President of the Business Area. The system is organized so that usually the superior stage accepts the proposer's action.

At a personal level, the start-up of the investment process is dependent on the individuals' creativity and motivation. The core of the process management is to continuously improve teamwork. Every member in the organisation is expected to make initiatives, even though this can be encouraged financially. Consequently, many people have contributed to the final investment proposal by giving their ideas and opinions. (Puolamäki & Ruusunen 2009, 122.)

A critical factor in the start-up was to constitute the project and nominate the persons involved to this project. After this the operation modes and the routines to organize the project were defined, and the responsibilities and authorities were established. Building up the project organisation involved both planning the human resources as well as the Group's political decision-making. (Interview with the Vice President, Development 17.6.2008)

In the beginning of the project, the official project start-up, kick off meeting, was held on February 6th 2006. In this meeting, the participants went through the whole project: its goals, responsibilities and liabilities, costs, partition, schedules, securities and education affairs etc. This kick off is very important in every project, when the defini-

tions and the guidelines are established. When this data packet is defined, it is easy to proceed. (Interview Vice President, Development 17.6.2008)

In the beginning of the project, the schedule was defined, the biggest equipments were purchased and negotiated with the suppliers. In addition, an invitation for bids and the biggest procurement deals were made. Time schedule was carefully prepared (appendix 5), which indicated that every stages of the project had deadlines, for example the slag concentrator had to be ready before proceeding to the next target. The project budget was also finalized in the beginning of the project. All in all, the planning and purchases were tightly connected already from the beginning of the project.

In general, the main activities in respect of investment proposals are internal work within the sites as well as the business area. It is the responsibility of the President of the Business Area to prioritise between various sites in order to arrive to a suggested total that would be reasonable and in line with what the company could afford to during the coming year. The last strategy plan does not give the level on what can be spent in the coming year, as the economic outlook might have changed.

The final list of investment proposals, separate for each site, sorted under the above types in order of priority shall be submitted together with the business plan and budget & long term plan in accordance with the time schedule for the strategic planning process.

After the approval of the respective investment budget, a start-up permission was admitted in accordance with the authorization policy. During the execution of the project, if it is foreseen that the amount approved for the investment will be exceeded by >200 TSEK, an additional allocation must be requested for. The same person must authorize the additional amount, if the sum does not exceed the limit they are entitled to approve. If this is the case, the amount must be approved at the next level. (Boliden, corporate investment manual 9.7.2007, 6–7.)

3.3 Definition of the investment target and data acquisition

The investment idea is evaluated if it fits to the company's strategy and profitability. If the proposal does not accomplish the requirements, it is rejected and no resources are allocated to the project. This so-called pre-feasibility study consists of the main points of the actual feasibility study. At this point the following issues researched from a strategic point of view:

- the global development of business field
- products and their stage in life span
- the geographical development of markets
- the development of end-users and customer segments
- the development of competition
- the development phase of technology
- the risks and opportunities
- the strategic evaluations
- the investment description
- the feasibility
- other necessary acquisitions
- the time table
- the investment cost and rough investment calculations

The feasibility study is a so-called investment plan, which presents the adequate and realistic commercial, technical and economical information to help the decision-making. It consists of objective evaluations and studies from every critical sector related to the project. The investment instructions usually consist of the content of the feasibility study and a definition about its sectors. The contents of the feasibility study are adapted flexibly according to the company and the investment. (Puolamäki & Ruusunen 2009, 140–141.)

The decision to implement the project is based on the pre-study. If the target does not confirm to the set requirements, the project will not go forward and the accumulated material will be archived. Otherwise, the compilation project with the feasibility study

will be organised and the project leader and the steering group are named. (Puolamäki & Ruusunen 2009, 138–139.)

In this case project, the copper market and the marketing possibilities of copper cathodes from the extended cathode production were investigated in the pre-study. Expansion potentialities of copper production were settled together with Rönnskär and possible synergies were explored in the pre study. This study included an investigation of investment possibilities of in Pori, Harjavalta and Rönnskär. The possibilities in the smelters were Harjavalta stand alone, Rönnskär stand-alone and both stand-alone. The study revealed that the most profitable and reasonable investment was to invest only in the smelter in Harjavalta and in the copper refinery in Pori. The highest NPV and IRR and the lowest unit cost suggested Harjavalta. (Interview with Vice President, Development 17.6.2008)

The expansion investment was investigated and compared with three different cases. Two cases concerned with Boliden Harjavalta Oy and Rönnskär common project and one Boliden Harjavalta Oy stand-alone:

- 210 kt expansion at the smelter (i.e. the smelter's copper production will be 210 kt), no changes in the copper refinery in Pori and in Rönnskär (base case). However, the copper refinery's +80 kt in cathode production and the Boliden Harjavalta Oy's anode surplus will be sent to the electrolysis in Rönnskär
- Smelter expansion 230 kt, electrolysis +100 kt and no changes in copper refinery nor at the smelter in Rönnskär
- BOHA stand alone i.e. smelter 210 kt and copper refinery 153 kt

The last alternative was implemented, because it was investigated and found to be the most profitable. (Interview with the Vice President, Finance 16.6.2008)

Nevertheless, the feasibility study has to be so complete that, in that form, the investment can be either accepted or rejected. The data for the pre-study was perceived from deliverers. The critical factors in this step are correct basic data and implementation eligibility. The staff of BOHA according to their authority does the actual pre-study or accepts it. Critical in this point is investment identification. (Toimintajärjestelmäkuvaukset, Projektien hallinta –prosessin vaiheet)

3.4 Evaluation of the investment project

After the properties of the investment idea are characterised, it is possible to start looking for alternative investments to solve the situation. In the evaluation stage, financial and technical components are put into specific terms before a clearer understanding of the investment alternatives is achieved. As stated above, the expansion investment was investigated and compared with three different cases.

A realistic investment evaluation requires many kinds of evaluations, e.g. of the size of the investment, its type, location and timing, the taxing and the different finance alternatives. To facilitate the investment decision, different calculations are prepared. The basic calculation methods used in investment evaluation are a net present value (NPV), an annuity method, an internal rate of return and return on investment (ROI) and a payback period method.

In this case, all economical evaluations including the pay back time and sensitivity analysis will be done using the same investment calculation program “Invest for New Boliden”. NPV calculations shall be done for each of the discount rates; 8 %, 10 % and 12 %.

The sensitivity analysis should be in the form of a diagram showing NPV resp IRR on the vertical axis and Metal prices resp TC/RC on the horizontal with graphs for the concerned exchange rate one each for long-term plan rate, plus 20 % and minus 20 %.

The assumptions for the financial calculations were:

- Exchange rate: EUR/USD 1,00
- TC, RC: 80 USD/t conc., 8 Usc/lb Cu
- Copper price: 1,00 USD/ lb Cu
- Cathode premium 70 USD/t
- Blister RC: 90 USD/t

The following calculation models[2] were not used in the FoCus-project but in smaller replacement investment projects. The case company has established a model to evaluate the profitability of these smaller investment projects (table 2).

[2] Table 2–3, Figure 7

Table 2 Profitability evaluation model (Menettelytapaohje: Investoinnit ja investointilaskenta, investointiohje)

Year	Revenue	Costs	Investment costs		Cash flow
			Fixed assed	Other	
1	20	-2	-500	0	-482
2	100	-10		0	90
3	100	-10		0	90
4	100	-10		0	90
5	100	-10		0	90
6	100	-10		0	90
7	100	-10		0	90
8	100	-10		0	90
9	100	-10		0	90
10	100	-10		0	90
Total	900	-90	-500	0	328

This profitability evaluation model is filled with example figures. The model requires that the financial holding time and the cash flow provided by the investment are completed (The cells in columns B-E). The above calculation gives numerical internal rate of return (table 3).

Table 3 Calculation of payback period, using IRR (Menettelytapaohje: Investoinnit ja investointilaskenta, investointiohje)

		Interest rate
		8 %
time	cash flow	NPV
year	t€	t€
1	-482	-446
2	90	-369
3	90	-298
4	90	-232
5	90	-170
6	90	-114
7	90	-61
8	90	-12
9	90	33
10	90	74
IRR	12 %	

The table shows that the investment's net present value is positive i.e. profitable after nine years when the annual cash flow is 90 thousand euros. Consequently the internal rate of return is 12 %, which means that with the interest rate of twelve, the NPV is zero for a series of future cash flows.

Profitability evaluation model provides graphical payback period (figure 7).

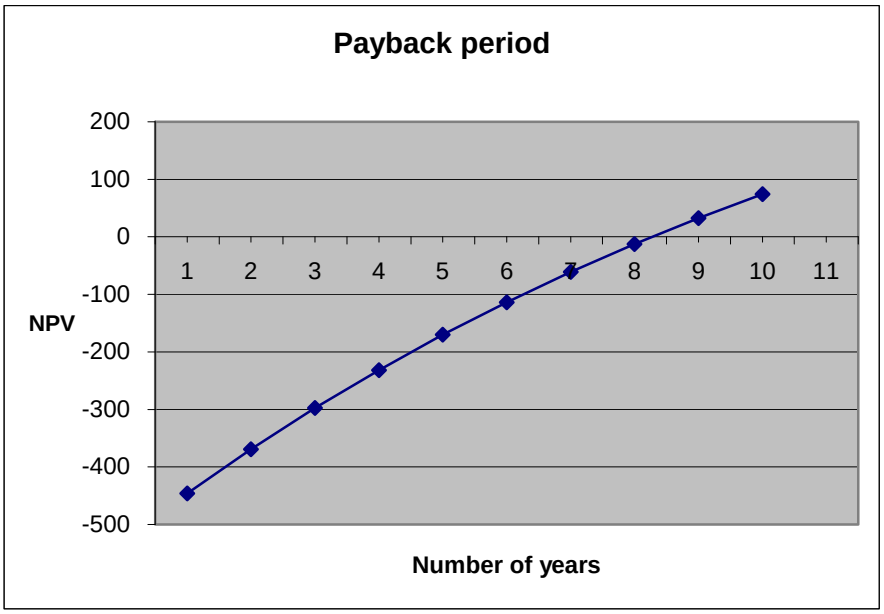


Figure 7 Calculation of payback period, using NPV (Menettelytapaohje: Investoinnit ja investointilaskenta, investointiohje)

The figure reveals that NPV is positive after eight years. The negativity of the first years is derived from the high acquisition cost; planning and installation costs etc. when the project has not been able to produce cash flow yet.

The calculation model that was used in the FoCus was developed already in the 1980's, when the expansion plans were made. This procedure model of Outokumpu Oy is continuously updated. Consequently, it is used both short and long term planning. With the help of basic data and production parameters, the model calculates cash flow, NPV and IRR. Presumptions are confirmed numbers of long term plan. The model calculates automatically relevant discountable cash flows after the information about the project is inputted. The finance manager is responsible for the validity of the data, but Veli Salmi, Vice President, Development does the primary development work. (Puolamäki & Ruusunen 2009, 188.)

3.5 The preparation of investment proposal

The first document according to the investment project is the description of the investment target. This is presented in one A4-form and it starts the actual investment process. This consists of central factors such as what is proposed and why as well as of the proposer and the date. In companies that are growing, the need to expand is part of the normal planning process. In big groups, the expansion investments lead to massive alternative analyses and re-allocating of the manufacturing. (Puolamäki & Ruusunen 2009, 136.)

Actual investment proposal was the pre-study. The Board of Directors made their investment decision and accepted the investment project on December based on that study. A formal investment proposal was made, because it was needed by the system (appendix 3). It included financial ratios, investment calculations results and the site manager's acceptance. Consequently, an investment proposal was made but it was just in another form and more comprehensive way than usually.

Factors that are taken into account in the investment proposal are the type of investment, the target's profitability (IRR, Payback period) and breakdown of the investment costs e.g. fixed assets and working capital during its duration of action, estimated project start-up, necessity and other basis, e.g. arguments about its necessity. This "summary" of the essential part of investment is made by investment proposer and is given to the authority to decide for further procedures. (Toimintajärjestelmäkuvaukset, Projektien hallinta –prosessin vaiheet)

Capital budgeting emphasises financial factors, but non-financial quantitative and qualitative factors are also very important. In this case, qualitative information was acquired by investigating the principal content for Metallurgical Plant Project. The case company establishes this model and it includes qualitative and quantitative subjects in a comprehensive way:

1. Executive summary

Background

Expansion of Copper production

The capacity of the Harjavalta smelter can be increased by minor debottlenecking investments, by replacing the two present concentrate dryers by one new dryer and by replacing the oldest copper converter by a new larger capacity converter. As a result of these, the annual anode production will be raised from 165 000 to 210 000 tones. By modifying the plant to utilize modern technology, the Harjavalta copper refinery's capacity and performance can be increased and the annual cathode production will be raised from 126 000 to 153 000 tones.

Summary of financial implications

The total capex needed is 34,3 MEUR and the change of working capital is 11,6 MEUr, together 46 MEUR. IRR of the project is over 30 % and payback time is less than 5 years from the beginning of the project. The average five-year ROCE is 33 %

Time schedule

The project start-up was in January 2006 and the connection of the new installed equipment will be in the summer of 2007. The expanded capacity is assumed to be available from 2008 onwards.

2. Raw material supply

The additional copper production is based on the import of concentrates. The need for additional copper concentrates of BOHA is 150 000 tones from the year 2008 onwards.

3. Product marketing

There are many possibilities to sell the increased copper metal production:

- The additional Cu-cathode production of 25 000 tones from the year 2008 onwards will be sold to central Europe at normal benchmark terms.

- The capacity of the Rönnskär refinery capacity will be filled with 37 000 tonnes of Cu-anodes
- The balance of the Cu-anode production i.e. 20 000 tonnes will be sold to central Europe at normal benchmark terms.

4. Environmental issues

The environmental permits allow the planned production to increase both in the smelter and in the refinery. Dust emission of the new concentrate dryer off-gases will be in accordance with the new environmental permit and the expanded production will meet the requirements of the new limit for SO2 emissions.

5. Human resources – EHS

The tank house modernization will result in the reduction of 26 persons in the refinery. An increase of five persons will be needed at the smelter, so the total labor effect is a reduction of 21 persons.

6. Technology

Changes in technology will take place both at the smelter and at the copper refinery. In the smelter, the existing two dryers will be replaced by one new type of dryer resulting in larger capacity, better performance and lower maintenance costs. A new converter whose capacity is double of that of the old one will replace the smallest converter. In the copper refinery, the existing tank house will be modified to utilize modern permanent cathode technology. Anode dimensions will be the same in Pori and in Rönnskär, which allows both refineries to use the same anodes.

7. Infrastructure and services

In this section, the case company explores the following issues: water/power supply, maintenance workshops, transport facilities and housing.

8. Project implementation

The implementation of the project includes organisation, scheduling/cost control, engineering design, procurement, training and time schedule of implementation.

9. Costing

The investment proposal includes detailed information about the capital, operating and capitalized cost and the working capital of the project.

10. Economical calculations

Economical calculation includes the following information about the project: profitability, key figures, assumptions, cash flows, risk assessments and sensitivity analysis.

11. Other factors

At the end of the investment proposal, the other factors according to the project should be brought up. These factors can be for example: independent verification and statutory requirements.

With the help of this above investigation, the official investment proposal was prepared, which is presented in one A4 form. This is one kind of summary application for getting the budgetary appropriation for the proposed project. The proposal includes all the most relevant factors in a comprehensive way, as well as the most essential calculation results and ratios. This summary goes to the next stage in the investment process. The preparation of the investment proposal should be made carefully and accurately, because it can resolve the progress of the project.

However, the relationship between quantitative and qualitative information in decision-making was predominantly quantitative. Qualitative factors like technology, environment, personnel effects, were investigated but the decision to implement the project was based on purely financial ratios.

3.6 The implementation of the investment project

Implementing a strategy is related to the decision-making about an investment. The duty of the top management is to continuously find and recognise new business opportunities to implement the strategy. In practice, the decision-making happens in advance by lobbying the top management in all possible situations and, consequently, by creating a positive atmosphere. (Puolamäki & Ruusunen 2009, 171.)

An adequate and carefully prepared plan makes up a good foundation for a successful project implementation. Tasks are limited in order to draw up a consecutive and functional big picture. In practice, the project leader personally and the steering group are in central roles in the decision-making. After the investment is finally approved, the task of the project leader is to provide the key persons with process guidance. This so-called project manual consists of all the relevant factors that are required to implement the project successfully, among other things the project's definition and goals, the organisation, the schedule and the documentation. (Puolamäki & Ruusunen 2009, 173.)

The project group can be convened from the line organisation and, consequently, the responsibility and authority issues are simple: the person works only with the project. Substantially, the way of the execution depends on the experience and resources of the company. The duty of the project leader is to coordinate the project. It is the responsibility of the steering group and of the project leader to handle the termination in a goal-oriented way. (Puolamäki & Ruusunen 2009, 174)

The different stages in implementation are documented by comparing it with the original approved investment proposal. Deviations and their reasons have to be estimated in an objective way. The accumulated knowledge is a valuable ground for new projects. (Puolamäki & Ruusunen 2009, 174–175.)

It is the duty of The President of the Business Area Smelters (CEO) to decide about the investment proposal implementation. Critical at this point is to verify the profitability, necessity and other basis of the investment. According to Puolamäki & Ruusunen (2009, 173), decision-making is based on knowledge, experience or intuition, usually on all of these together with a different emphasis depending on the prevailing situation. The Board of Directors makes decisions about strategic investments and, consequently, the Chairman of the Board has a central role. In the decision stage, the latitudes have to be carefully taken care of and attention has to be paid to frontiers that are not part of the

project. Special timetables have to be prepared to part-projects that require separate decisions.

Person in charge of the project prepares the project plan. Investment identification plays an important role at this phase. The supervisor gives an accepted implementation decision before the person in charge of the project implements the actual start-up. A critical task at this point is naming of the persons in charge. The FoCus project organization is presented in appendix 4.

The person in charge of the project is responsible for instance planning, calculations and naming the project persons[3]. The project managers of smelter and of the copper refinery were familiarized with the task beforehand, naming the other project persons required at conversations and negotiations. Naming the persons was not the easiest task because they had to manage the task in addition to their own regular duties and they had to be qualified enough. Accordingly, time schedules, technology and start up issues had to be taken into account. (Interview Vice President, Development 17.6.2008)

The duty of the supplier is to implement the actual project plan. Critical at this step are the correct basic data and cooperation. The project organization implements the project, where the critical factor is to monitor its progress.

The supervisor approves the implementation or closes down the project. Characteristic to this is the realization of the investment plan.

Cooperation is very important when initialising investments along with the production. Production distractions have to be minimised, even though compromises are possible (Puolamäki & Ruusunen 2009, 121).

3.6.1 Collecting cost information

SAP, Excel and Project Wise control system are essential instruments in project monitoring and collecting cost information. In the beginning of the project, the tied up costs are recorded in SAP. Accordingly, the investment costs are received from SAP, purchasing (orders), invoicing, and bookkeeping departments. The person in charge accepts the invoice and is responsible for the invoice correctly registered and for which investment it is connected to.

[3] Group recruited the acquisition manager

The investment proposal is necessary to get budgetary appropriation for the proposed project. The Group accepted the total amount of the investment budget 36 million MEUR to FoCus. A precise budget was made within this frame. (Interview with the Vice President, Development 17.6.2008)

The budgeted and actual costs were in the database of the SAP-software and these were controlled with Excel. The person in charge for the appropriate project monitored and updated his own sub area in the Excel file, where every project person had the right to access: He/she monitored if the forecast was realistic (realised costs were tied up) and if the budget was close to be exceeded, he/she checked the forecast.

The finance assistant collected the cost information and reported these issues to the project organisation. The finance assistant sent inquiries to the person responsible in order to create job order costs to the appropriate target. Consequently, she established the basic data of the project. Accordingly, the book entries and the activations had to take into account from the beginning of the project. (Interview with the finance assistant 11.6.2008)

Accordingly, realised and tied up expenses were monitored abreast and the order book was controlled as well. Orders in every work number were available through the report were the tied up and realized cost were seen. It was the responsibility of the person in charge of the project to report possible deviations to the project group. Accordingly, forecasts and the actual cost were monitored with graphs that revealed how the project had proceeded. It also included possible explanations if the actual and forecasted case was different from what was expected.

A critical factor with the job order costs was order monitoring and cooperation with the purchasing department as it was important that completed orders did not remain in tied up cost i.e. in history. Possible deadline changes had to be taken into account, too, otherwise report give false information. However, it is important that distortion and relapses are not arisen.

3.6.2 Reporting

A good way of administration requires adequate reporting. In successful projects, the reporting is matter-of-fact and it works as a powerful tool for the project leader and for the steering group. The most important reports about the investments are:

- investment programme according to strategy plans
- investment plan according to annual budget
- feasibility study or investment proposal
- monthly reports about the implementation
- implementation project
- monitoring report after a investment is compete

The deviations, their reasons and planned revision methods are evaluated in the reports. Simultaneously, the forecasts are compared with the original plan. The implementation project is usually prepared straight after the start-up. After the investment is finished, the monitoring report is usually prepared after the investment has been in use for example for two full budgeting years. (Puolamäki & Ruusunen 2009, 179–180.)

The interactive controlling was rapid during the project. In every two weeks, the project leader organised meetings for the group, which was responsible for controlling. General and critical affairs were discussed in meetings between the FoCus project group every other Monday. The meetings included discussions about the following subjects: the smelter, the copper refinery, time schedule, electricity, procurement, working site and erection supervision, utilization, project costs, order checking, authority affairs, environment and other affairs. The appointed person in the project organization introduced within his/her own subject. (Interview with the finance assistant 11.6.2008)

The interviews revealed that regular meetings were beneficial and everybody felt that they were held often enough. Communication, information exchange and project follow-up were the most important benefits from the meetings. Otherwise, for example, the finance assistant would have to predominantly rely on SAP-software, because it was brought up in the meetings if the work numbers had to be closed or when the project sub area was received or when it started to be ready. (Interview with the finance assistant 11.6.2008)

Every month, reports were made about what had happened and the situation was with regard to the costs and the time schedule (appendix 5). The person in charge of the pro-

ject made follow-up reports every month and drafted summary reports and evaluations about the events, cost monitoring and the time schedule. The project evaluation afterwards was made afterwards when the actual investment was launched. After that different reports and analyses were needed because the case company had not been able to utilize the available capacity.

All in all, FoCus-meetings were held monthly and when necessary. Monthly reports included the following issues:

- General information
- Major events at the smelter and in the copper refinery
- Safety issues e.g. occurred accidents
- Environmental issues
- Progress and schedule
- Project costs
- Resources
- Sub-project status
- Changes and deviations compared to the project plan
- Major events during the next month

The monthly report was distributed to the steering committee, Boliden Harjavalta Oy's management group, the project managers, the procurement managers, as well as the smelter and the copper refinery managers. (Interview Vice President, Development 17.6.2008)

The Vice President, Finance reported about the project to the head office. The project costs were interconnected with other reporting. Having a link between bookkeeping numbers and the excel-file did this reporting. (Interview Vice President, Finance 16.6.2008) The real-time capex curve was attended in every report. At the end of the project it looked like this (figure 8):

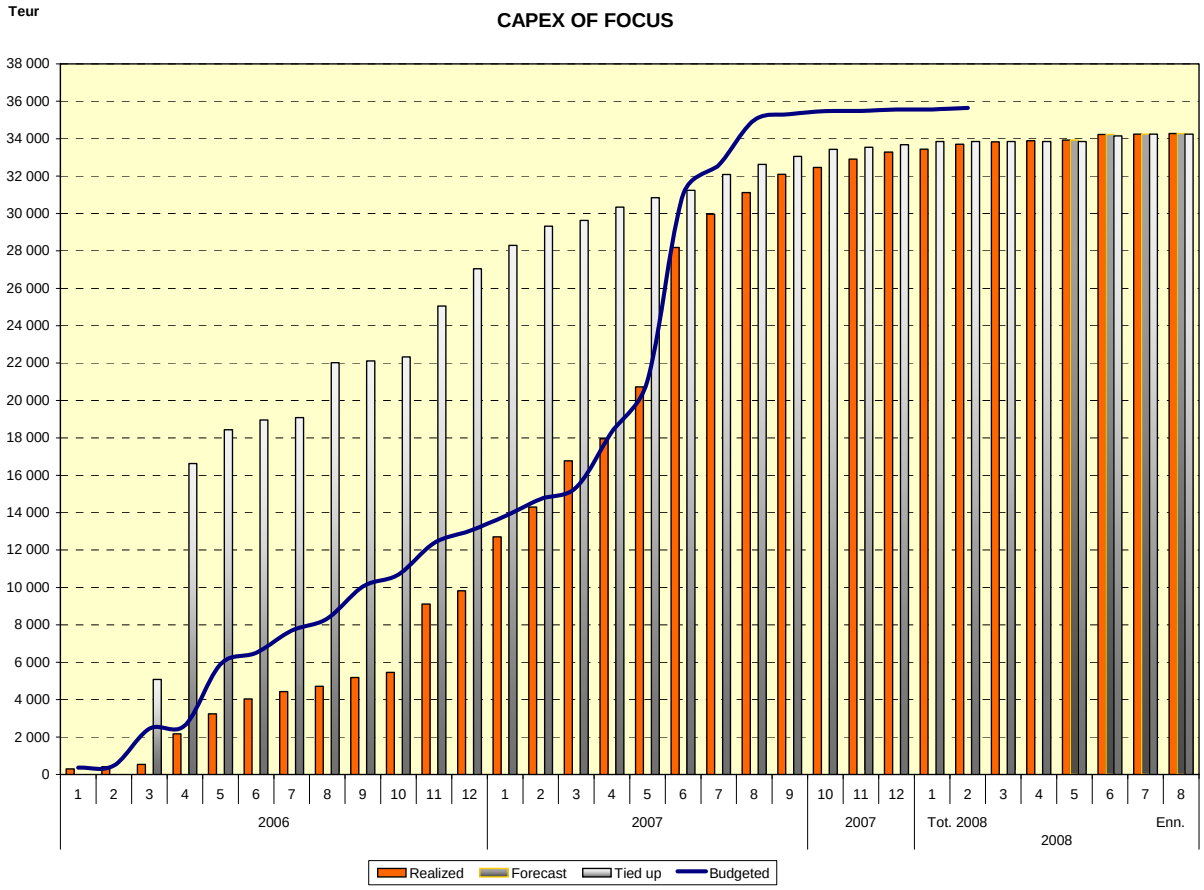


Figure 8 Capex curve (FoCus project's final revises, e-mail Veli Salmi 26.11.2008)

The curve shows the cumulative development of the costs. The figure starts from the very beginning of the investment project and continues until 8/2008 when the project was planned to be finished. The curve was continuously updated and it presents the realized, forecasted as well as tied up and budgeted costs. It seems that most of the costs were tied up from the very beginning of the process. The actual costs from the beginning of the project are pretty well in line with the budget.

An example of the actual cost calculation in smaller replacement investments is shown below. The model is divided into two parts: forecast and realised. The forecasted part is linked into the profitability design (table 4). After the investment is implemented and the use is established, the forecasted cash flow has to be filled. In order to make the forecast and realised amounts comparative, the cash flow can be assumed as the same in the coming years, if there is no precise information. If there are essential deviations in profitability between the forecast and the realised, an analysis had to be prepared.

Table 4 Actual cost calculation, example (Menettelytapaohje: Investoinnit ja investointilaskenta, investointiohje)

INVESTMENT PROPOSAL, FORE-CAST						**REALIZED**					
Calendar year	Revenues	Production costs	Investment expenditure		Cash flow	Revenues	Production costs	Investment expenditure		Cash flow	NPV
			Fixed assets	Other				Fixed assets	Other		
1	20	-2	-500	0	-482			**-480**		-480	-444
2	100	-10		0	90	**90**	**-12**		**0**	78	-378
3	100	-10		0	90	90	-12		0	78	-316
4	100	-10		0	90	90	-12		0	78	-258
5	100	-10		0	90	90	-12		0	78	-205
6	100	-10		0	90	90	-12		0	78	-156
7	100	-10		0	90	90	-12		0	78	-111
8	100	-10		0	90	90	-12		0	78	-68
9	100	-10		0	90	90	-12		0	78	-29
10	100	-10		0	90	90	-12		0	78	7
Total	900	-90	-500	0	328	810	-108	-480	0	222	

The blue numbers are realized costs. The revenues and production cost are assumed to remain the same. The forecasted internal rate of return is 12 %, realized 8 %, and the forecasted payback time is 8,25 years and the realized one about 10 years. The realized payback time is essential, which requires an analysis about the deviation factors.

All in all, reporting was regular and comprehensive during the FoCus project. In general, the case company has got special mention about good reporting methods when the current evaluation was made. These evaluations are made two times a year to ensure that the company carries out its operations according to certificates. (Boliden intranet, Liekki n:o 14, 4.)

3.6.3 Project controlling during the investment project

Project evaluations and analyses were made in the project meetings, which were held every two weeks. Project evaluation during the project included also meetings between the project steering groups. Besides, the project managers of the smelter project and of the copper refinery project had their own meetings with their sub organization. The concentrator, the anode casting plant, the smelter project etc. had their own persons respon-

sible, who conveyed their messages to the project group. The secretary drew up records in the project meetings and these records were available in Boliden's intranet.

The financial control was based on monthly reports. The Vice President, Development received the reports about the investment. The reporting was made with the help of a spreadsheet (Excel). The realised costs were received from the SAP enterprise resource planning system and conducted to the spreadsheet. Instead, the persons responsible update the forecasts. The report consisted of two head columns: the figures at the beginning of the project and those during the project. Again, the first column was divided into three columns: realised, budgeted and tied up costs. The other head column was divided into two sub-columns: forecast and budget. The data in every column was reported by cost centre in the report that is specified in separate rows. The cost centre data counters the company's normal cost centre structure. (Puolamäki & Ruusunen 2009, 197–198.)

The books according to investment have been closed in February in Harjavalta and in September 2008 in Pori. When the costs are on record, a final report will be prepared. The purpose of this report is to help the investment projects in the future. The financial final inspection will probably be done when the actual cash flow and production produced by the FoCus-project is on record. A summary report about the project has already been given to the management of the company. Certain risks were realised in the project, when the start up did not go as planned. This problem is unpleasant in the eyes of the owner, because it seems that the investment was not profitable or at least the cash flow was not accumulated like planned. (Interview with the Vice President, Development 17.6.2008)

The case company accomplished different activities to solve the production problems. Support groups for production were established and they met even three times in one week in the most critical time. These support groups did not meet no longer when they saw that there was any more need for meetings. Accordingly, some organizational changes were made, when the case-company wanted new strength and experience to the smelter.

When the project was complete, it was the duty of the person in charge of the project to file the project information, as well as the deliver recorded its own necessary data. The quality engineer files the original project plan reports and follow-up reports and collects information for a summary.

4. CONCLUSIONS

4.1 Summary of the study results

This study is a qualitative case study and the research approach is action-oriented. The broad empirical data bases on the theoretical framework. In this chapter, the results for all the sub-problems are summarised. The purpose of this study was to find answers to the following questions:

- What components does the investment process consist of?
- What are the constitutive functions at every stage of the investment process?
- What factors influenced the case-project positively and negatively?
- How can the case company improve the efficiency of the investment process?

The study was approached from two directions:

1. A theoretical framework was developed
2. An empirical investigation of the investment process of the case company was undertaken using the developed framework as a starting point

The theoretical framework consisted of four stages. First, an investment idea is expressed or a need is realised in the start-up stage. Second, data is acquired in the definition stage. Third stage is the evaluation stage where this data is utilised. These stages support the fourth stage, the investment implementation, which is the most crucial part in the investment process (the decision to invest).

This theoretical framework helped to implement the empirical study, when the researcher was aware of this ideal investment process and consequently was able to observe how the investment process was carried through in practice. The information was collected mainly by interviewing the vice president, development, the finance manager and the finance assistant. These persons selected, because they have central roles and an overall picture of this investment project. The researcher conducted the theme interviews in June 2008 and each interview took 1–2 hours. The researcher's another significant information source were different documents about the investment project established by the case company.

The investment process in Boliden Harjavalta Oy can be described in a flow chart (Figure 8). This flow chart presents the constitutive functions at every stage of the investment process. On the right side, one can see the organisation level, which is responsible for the matter in question.

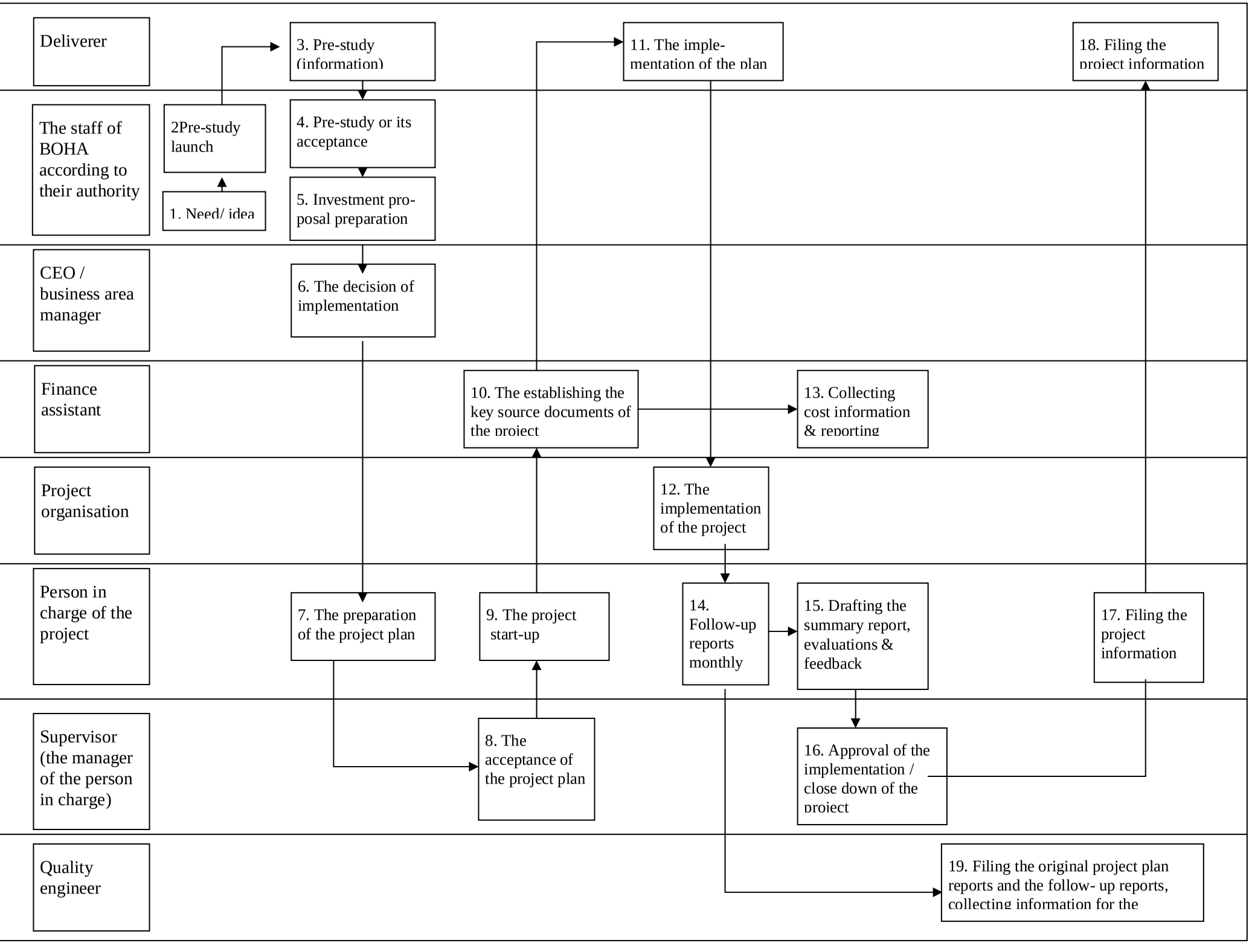

Deliverer
The staff of BOHA according to their authority
CEO / business area manager
Finance assistant
Project organisation
Person in charge of the project
Supervisor (the manager of the person in charge)
Quality engineer
1. Need/ idea
2Pre-study launch
3. Pre-study (information)
4. Pre-study or its acceptance
5. Investment proposal preparation
6. The decision of implementation
7. The preparation of the project plan
8. The acceptance of the project plan
9. The project start-up
10. The establishing the key source documents of the project
11. The implementation of the plan
12. The implementation of the project
13. Collecting cost information & reporting
14. Follow-up reports monthly
15. Drafting the summary report, evaluations & feedback
16. Approval of the implementation / close down of the project
17. Filing the project information
18. Filing the project information
19. Filing the original project plan reports and the follow- up reports, collecting information for the

Figure 8 Project control (adapted from Toimintajärjestelmäkuvaukset, projektien hallinta, prosessikaavio 29.9.2004)

In the following, the results of the empirical study are recapitulated, and the focus is more on the whole than on single answers. Some stages presented in the flow chart are presented more precisely because of their nature, e.g. the implementation does not require as detailed an analysis as the investment proposal preparation because of the nature of the study. The central phases of the process that are investigated are the initiation of the process, the definition, the evaluation and the decision-making.

The first stage the investment process is *the start-up stage*, which deals with the initiation of the investment process and producing investment ideas. The case company supports the production of ideas by offering financial compensation for taking initiatives and it has established a certain system for initiatives. Established authority stages at different organisation levels ensure that the initiative is properly handled, i.e. the acceptor is at the superior level.

Factors influencing the initiation of the process were new strategic alignments after the arrangements made by Boliden and the kick off meeting. In this meeting, the project was set up: its persons in charge were nominated and the project's goals, schedule and budget were prepared. After this the case company was able to find out different deliverers and ask for offers in order to make necessary contracts.

The second stage of the investment process is *the definition stage*, where the project is defined and information is collected. Central functions in this stage are the pre-study and the preparation of the investment proposal. The data used in the pre-study was received from the deliverers. With the help of this pre-study, the copper market and the marketing possibilities of extended cathode production were investigated. Alternatives for this expansion investment were the Harjavalta standalone, the Rönnskär standalone and the both standalones. The study suggested that the most profitable solution is to invest in the smelter in Harjavalta and in the copper refinery in Pori. The pre-study also constitutes the actual investment proposal in this case.

However, the formal investment proposal study was made afterwards when the investment approval was approved by signature. This investment proposal includes the central elements of the investment: its costs and profitability calculation results as well as its classification and the estimated production start-up. Arguments for the implementation were attached to the investment proposal including both quantitative and

qualitative factors like raw material supply, product marketing, environmental and human issues and technology.

The third stage is *the evaluation stage*, which includes different quantitative and qualitative evaluations. The formal information that the traditional calculations yielded was decisive and completed the picture of the project that the informal information had outlined. Boliden has established clear instructions for the profitability evaluation of certain investments. All economical evaluations are made with an investment calculation program. NPV calculations shall be done for the discount rates of 8 %, 10 % and 12 %. Sensitivity analysis is required showing NPV resp IRR on the vertical axis and Metal prices respective TC/RC on the horizontal with graphs for long-term plan rate, plus 20 % and minus 20 %. The most used capital budgeting methods are NPV, IRR and payback period. These are evaluated with the help of a profitability evaluation model, which gives numerical internal rate of return and graphical payback period when certain cells are filled.

The final stage is *the implementation stage*, which is the high point in the capital budgeting process. It was the business area manager's authority to decide on the FoCus project implementation. The CEO of Boliden Harjavalta Oy made the initiative in the group's meeting, and after certain arguments were presented in the pre-study, the initiative was approved.

4.2 Reliability and validity of the study

According to Yin (1987, 18) the case study investigator should examine the quality of any empirical social research from four aspects: construct validity, internal validity, external validity and reliability. Construct validity means that the researcher should establish correct operational measures for the concepts being studied. Internal validity means establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from incorrect relationships. External validity, on the other hand, means establishing the domain to which the findings of the study can be generalised. Reliability in case studies demonstrates that the operations of a study can be repeated with the same results. (Yin 1987, 33.) The following table 5 shows how the researcher can take these aspects into account and in which phase:

Table 5 Case study tactics for four design tests (Yin 1987, 33)

Tests	**Case study tactic**	**Phase of research in which tactic occurs**
Construct validity	- use multiple sources of evidence - establish a chain of evidence - have a review of key information - draft a case study report	- data collection - data collection - composition
Internal validity	- do pattern matching - do explanation-building - do time series analysis	- data analysis - data analysis - data analysis
External validity	- use replication logic in multiple-case studies	- research design
Reliability	- use a case study protocol - develop a case study database	- data collection - data collection

The first test, construct validity, is usually problematic in case studies when the investigator should develop a sufficiently operational set of measures, but subjective judgements are used for collecting the data. To meet the construct validity, the researcher must deal with two steps about the subject studied: in relation to the original objectives of the study and the specific types of changes. (Yin 1987, 34.)

In this study, the first step is satisfied when stating that the aim of this study is to describe an investment process. The second step demands a justification why the researcher has used Wikman's theoretical framework as a measure for describing the investment process. This framework was selected because it is comprehensive and flexible enough. After all, it has been studied that structural and stringently stage-based process models do not describe the investment process in practice. The background of the study was gathered from specialised literature, and the empirical study was conducted using documents provided by the case company and through theme interviews.

The second test, internal validity, is a concern only for causal or explanatory case studies, and it may be extended to the broader problem of making inferences. This test

is accomplished in this study by developing a chart (figure 9) where the researcher has tried to determine whether the event x led to the event y. (Yin 1987, 35.) Data analysis was conducted with the help of pattern matching and explanation building: the investment process seemed to proceed in a logical way through different stages, where every person has an essential role.

The third test concerning external validity deals with the problem of knowing whether the findings of a study are generalisable beyond the case study. This external validity has been a major barrier in doing case studies, because case studies rely on analytical generalisation. (Yin 1987, 35–36.) In this study, the question is "are the results applicable to another investment process?" However, the generalisation is not automatic. A theory must be tested through replications of the findings in a second or even a third investment process. However, it is known that different investment types have different processes. The case company has established instructions on how to handle different projects; this study was a description of an expansion investment, and consequently the results are applicable to equivalent expansion investments implemented in Boliden Harjavalta Oy.

The objective of the last test, reliability, is to be sure that if a later researcher follows exactly the same procedures as described by an earlier researcher and conducted the same case study all over again, the findings and conclusions are the same (Yin 1987, 36). This study is reliable because of the comprehensive documentation and the established guidelines: every project person has clear job descriptions and their authorities and liabilities are well known in the whole process. The purpose of this study was to describe the process and the findings are predominantly based on the company's documents and recorded interviews.

The researcher worked on the payroll of the case company during the whole investment project, and consequently, with the help of bulletins and handouts, was aware of the biggest events of the project. Accordingly, the intranet was updated in real time on the FoCus-project. The researcher conducted the interviews in silent conference rooms and the interview with the Vice President, Development was conducted in his office. The atmosphere was relaxed and trustful. The interviewees spoke freely about the themes, and further details were asked when needed.

4.3 Concluding comments

The aim of this study is to describe the FoCus investment process in Boliden Harjavalta Oy. The study is descriptive and interpretive by its nature. This study has three independent sub-problems, which are based on four different themes: the project start-up, the definition, the evaluation and the implementation. The method is qualitative and considered a case study. This study was conducted by interviewing the finance assistant, the finance manager and the vice president, development (who was also the project leader). The interview method is half-structured theme interview.

This study is based on Wikman's theoretical framework about the investment process. This model was selected because it includes the personnel authority utilisation and commitment, which have strong effect on investment projects. According to the theoretical framework, the stages of the investment process are a start-up, a definition, an evaluation and an implementation stage.

At the *start-up* stage, the investment idea launches the investment process, and it is basically an individual action. Empirical studies have shown that investment ideas can be produced at every stage of the organisation. The accumulated amount of the internal and external information stimulus and the threshold of the decision-maker affect the progress of the investment idea.

When the accumulated amount of information stimulus has exceeded the threshold of the decision maker, the investment target is defined and data required. In the *definition* stage, the investment idea is completed into a concrete form by preparing an investment proposal. It is one kind of summary application for getting the budgetary appropriation for the proposed project. The proposal includes all the most relevant factors in a comprehensive way, as well as the most essential calculation results and ratios. This summary goes to the next stage in the investment process. The preparation of the investment proposal should be made carefully and accurately, because it can resolve the progress of the project.

Next, a realistic investment *evaluation* requires many kinds of estimations. To facilitate the investment decision, different calculations are prepared. When the properties of the investment idea are characterised, it is possible to start looking for alternative investments to solve the situation. Long-term money tied-up and revenues scheduled in a long

holding time should be noticed when evaluating investment profitability. However, in the investment selection situation, the company may concentrate too much on the investment calculations and the risk analysis. These are very important issues to explore, but what is more important for the success of the project is to understand the whole investment process in a comprehensive way.

At the *implementation* stage, the official acceptance of a project is admitted. This is the culmination of the investment process, and getting to this point requires a lot of choices and part decisions. The goals, the evaluation technique and the project's duration affect the investment decision-making. The decision usually matures gradually, because many small decisions about selection and eliminations precede it. When the different investment alternatives have been set up in an equivalent form, the implementation decision can be made. At the implementation stage, the final investment targets are selected and approved, and the investment budget is confirmed.

This study showed that the capital budgeting process is not complex but quite easy to understand. However, in order to carry out the whole investment process successfully in the organisation, full understanding of the process and its outcomes is required. If this understanding is missing, the core processes and the activities in the organisation are prioritised over the activities of the capital investment process in daily management. This will lead to the situation where the continuous process development of the organisation will end, and the future competitiveness might suffer significantly. However, it can be said that the personnel in the FoCus organisation were quite well aware of the organisational goals, which helped them to carry out their assignments. The company's investment policy and investment instructions guided the company's investment process.

The guidance of the investment project is precise and the project manual can be found in intranet. The rules and routines about the monitoring are highlighted in the contents of the project manual. The guidance consists of for example accurate job descriptions of the key persons and guidance to evaluate the whole acquisition process.

The study confirmed the Puolamäki's and Ruusunen's (2009, 135) view about the description of the investment project as a phased process; it works only as an administrative and an analytical viewpoint. In practice, an investment process cannot be split clearly into separate stages. They can operate at the same time or they can strongly be dependent on each other. The process models do not show the creativity and motivations according to the investment ideas, which are also important strategic factors.

This study reveals that the commitment of the project's individuals and the communication between every stage are crucial factors in implementing the project according to schedule and budget. The decision makers and the originators of a project discussed and negotiated with each other. In addition, the personnel commitment and the clear job and project descriptions allowed the project to progress efficiently, in accordance with the schedule and the budget. This study also reveals the importance of project preparation and documentation. The interviewees were of the opinion that working with the project was interesting and instructive.

All in all, the investment process met on the schedule and the budget. There was no need for readjustment while some issues were exceeded and in commensurately underspent (the total budgeted amount remained constant). However, the actual investment start-up was problematic. When problems arose in the commissioning, the company took actions to improve the situation by having crisis meetings and making reorganisations.

Some risks realised in the investment commissioning when the raw material situation changed unexpectedly and there were technical problems with the equipments. Accordingly, the personnel was partly incompetent operate new machines. Some preventive methods could be implemented, even though investment project was unique and its consequences were unknown in advance. Consequently some reform proposals can be given.

Firstly, it is important to give personnel training before commissioning –stage, so they are familiar with the investment before they use it. Secondly, it would be beneficial to show concrete investment targets to project organisation in order to commit and be familiar with the project. For instance the finance assistant would know what to activate, when the project is ready. Thirdly, SAP should be more used in investment projects instead of Excel-programs. Especially it would be beneficial to create budget to the SAP, because if an investment is taken into account and this investment do not realize, it remain to budget. The table should be like monitoring table in Excel so it would be easy to adopt. Fourthly, it is important to monitor the investment project afterwards, because different analyses help the organisation to improve equivalent investment projects in future.

The study revealed that process models did not brought up personal affairs, like creativity and motivation. Accordingly, it is not possible to divide the investment proc-

ess in clearly separate stages, because stages can operate at the same time and be strongly depended on each other.

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APPENDIX 1

THEME INTERVIEW MODEL

Theme: The start-up of the investment project

1. How did the idea/need for the expansion investment project come up, and how was this supported by the group?
2. How were the persons selected to the FoCus-organisation?
3. Who conducted the pre-study, and what factors were taken into account in this study?
4. What are the critical factors in the start-up stage?
5. Where investment ideas are usually created? (the production, the top management)?

Theme: The definition of the investment target and investment alternatives

6. What methods are used when acquiring information about investment alternatives (quantitative, qualitative)?
7. Besides calculations, what other factors are important when evaluating investments?
8. Who implements the identification of the investment target, and what factors are taken into account when identifying the investment?
9. What other investment alternatives came up, and why were these not selected?
10. Who draws up the investment proposal, and by whom will it be approved?
11. What are the critical factors in the definition-stage?
12. Who compares the investment alternatives, and who will make the selection?
13. What kind of investment evaluation methods does Boliden Harjavalta Oy use and why?

Theme: The evaluation of the investment project

14. How accurately is the effectiveness of the project analysed during the project and after it?
15. Who is responsible for the evaluation and monitoring during the project? What kind of methods does this kind of monitoring include?

16. After the project is completed, how is the control planned to be implemented?
17. What are the critical factors in the evaluation-stage?

Theme: The decision to implement the investment project

18. The decision to implement the investment project, which factors influenced most for it?
19. Who accepted the investment proposal, the investment budget and the project plan?
20. How was the investment financed?
21. What is the relationship between the quantitative and the qualitative information in the decision-making?
22. What are the critical factors in the decision-stage?
23. How is the execution of the investment monitored, and what kind of reporting is used?
24. Are there some kinds of limits, which lead to consequences when they have been exceeded?
25. What kind of reacting methods are used when necessary?

Other issues:

26. In general, how content are you with the controlling of the FoCus-project?
27. What factors influenced the problems in the initialisation, and what procedures were undertaken to remedy the situation?

APPENDIX 2

INVESTMENT PROPOSAL STUDY

Principal content for Metallurgical Plant Project

1. Executive summary

- Background
- General description
- Important aspects
- Strategic issues
- Summary of financial implications (investment cost, NPV and pay-back)

2. Raw material supply

- External/Internal source – quantities
- Logistics
- Long-term price trend – forecast
- Competition

3. Product marketing

Market overview

- Customer structure
- Supply-demand relation, historical and projected
- Pricing trends
- Competition – competitiveness
- Market plan

Sale of products

- Sales volumes and customers
- Prices
- Delivery terms
- Payment terms
- Currency risk

4. Environmental issues

- Emissions and limits
- Environmental impact assessment
- Permit
- Monitoring

5. Human resources – EHS

Human resources

- Organization
- Manning structure
- Training
- Personnel costs

EHS

- Policy
- EHS-organization, construction/operation
- Training

6. Technology

- Chosen technologies – alternatives
- Flow-sheet
- Capacity plan
- Layouts
- Equipment
- Utilities
- Buildings and structures

7. Infrastructure and services

- Water/power supply
- Maintenance workshops
- Transport facilities
- Housing

8. Project implementation

- Organization
- Scheduling/cost control
- Engineering design
- Procurement
- Training
- Time schedule of implementation

9. Costing

- Capital cost
- Operating cost
- Capitalized costs
- Working capital

10. Economical calculations

- Profitability
- Key figures
- Assumptions
- Cash flows
- Risk assessments
- Sensitivity analysis

11. Other factors

- Independent verification
- Statutory requirements
- Labour relations and political risk in foreign countries

APPENDIX 3

INVESTMENT PROPOSAL

BOLIDEN

BOLIDEN HARJAVALTA OY **INVESTMENT PROPOSAL** Nr

Department/Author Date 11.7.2008

NAME OF INVESTMENT

AUTHORITY TO DECIDE	CLASSIFICATION						
☐ Group	☐ Mandatory	☐ Replacement	☐ Rationalization	☐ Expansion	☐ Other		
☐ Smelters	CALCULATION METHOD		PROJECT START-UP		ESTIMATED PRODUCTION START-UP	
☐ Harjavalta	Internal rate of return					
	IRR	Payback period	Month	Year	Month	Year

SPECIFICATION OF INVESTMENT COSTS, EUR thousand

ARGUMENTS

BREAKDOWN OF INVESTMENT COSTS, EUR thousand

Year	Fixed asset	Working Capital	Total	Monthly breakdown of fixed asset for the first year		second year	
				1	7	1	7
				2	8	2	8
				3	9	3	9
				4	10	4	10
				5	11	5	11
				6	12	6	12

PROPOSER

Date

Signature

DECISION

☐ Accepted ☐ Rejected

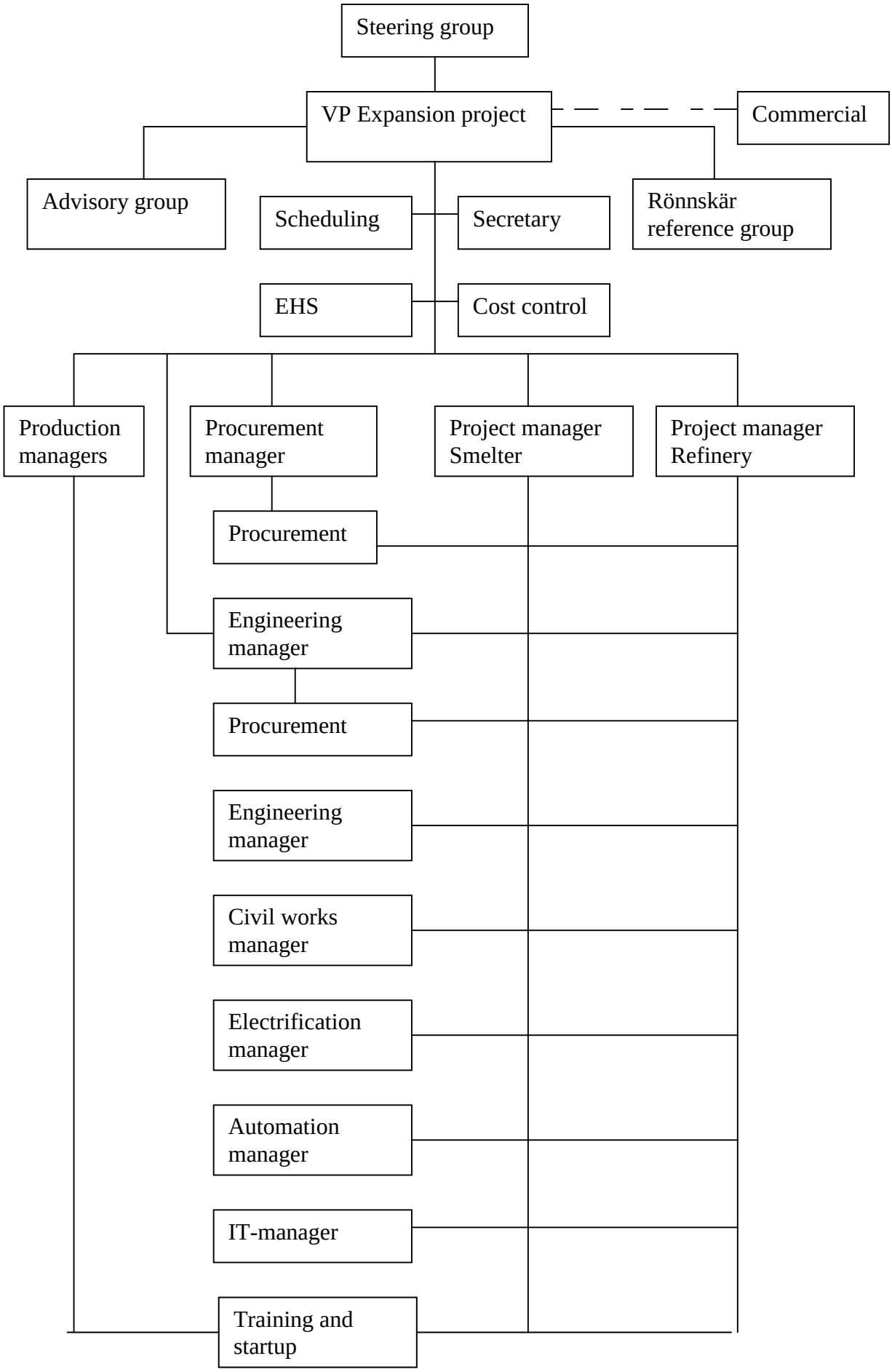
☐ Postponed ☐ Other

Date

Signature

APPENDIX 4

FOCUS-PROJECT ORGANIZATION



APPENDIX 5

THE TIME SCHEDULE OF FOCUS