HELSINKI UNIVERSITY OF TECHNOLOGY
Faculty of Electronics, Communications and Automation

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DEVELOPING A STRATEGIC EVALUATION FRAMEWORK FOR TECHNOLOGY AND ARCHITECTURE ASSET INFORMATION MANAGEMENT PROJECT

Master's Thesis

Espoo, October 25th, 2009

Supervisor: Professor Thomas Keil

Instructor: Kari Sahlman, M.Sc.

HELSINKI UNIVERSITY OF TECHNOLOGY

ABSTRACT OF THE MASTER´S THESIS

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Organization's ability to assess investment related costs, benefits, and estimate the investment outcomes before investing is one of the determinants of successful business. This has become increasingly difficult as during the era of what we widely refer as "knowledge economy", the investment project related factors are often of intangible nature. Complex project environment with multiple stakeholders and increasingly more important role of IT systems further complicates the situation. This is why most of middle and large sized corporations are dealing with intangible issues, such as valuing of knowledge assets, in their pursuit for organizational effectiveness. The implications are that in addition to traditional tangible benefits justifiable in financial terms, a new set of intangible benefits appear in project business cases. A new approach to evaluate such investment projects is needed.

As a result of theoretical review and empirical studies, this thesis introduces a framework for assessing single investment project's feasibility. It is assumed that this investment project involves intangible issues and cannot be easily justified with traditional financial measures. The investment project assessment is done by identifying related stakeholder concerns and benefit expectations, analyzing them, and using the findings to converge on an investment decision. The stakeholder concerns are related to issues such as risks, costs, and uncertainty.

The goal of this thesis is to provide a practical framework tool for project managers, decision makers, such as portfolio managers, and analysts to evaluate a single project's business case which captures the reasoning for the initiating project. The evaluation results can be used to formulate a decision whether investment should be made. The results can also be used to further improve the business case as the project context is known better after utilizing the framework.

Keywords: strategic management, technology management, strategic investment, intangible assets, intangible valuation, performance measures, cost–benefit analysis, portfolio management, stakeholder analysis, ERP, case study

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TEKNILLINEN KORKEAKOULU DIPLOMITYÖN TIIVISTELMÄ

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Organisaation kyky arvioida investointeihin liittyviä kustannuksia, hyötyjä ja lopputuloksia ennen investointipäätöstä on yksi menestyksellisen liiketoiminnan ratkaisevista tekijöistä. Aikana jolloin informaation ja tietämyksen merkitys on korostunut, edellä mainittujen asioiden arvioiminen on yhä vaikeampaa. Tämä johtuu siitä, että nykyisin investointiprojekteihin liittyvät tekijät ovat luonteeltaan yhä aineettomampia. Monimutkainen projektiympäristö, useat sidosryhmän jäsenet ja IT-järjestelmien ajan myötä tärkeämmäksi muuttunut rooli vaikeuttavat tilannetta entisestään. Tämä johtaa siihen, että yritysten on kehitettävä uusia metodeja liiketoimintasuunnitelmissaan esiintyvien immateriaalisten hyötyjen arvioimiseksi.

Teoreettisen ja empiirisen tutkimuksen tuloksena tämä lopputyö esittää arviointikehyksen jolla voi arvioida yksittäisen investointiprojektin soveltuvuutta ja toteutettavuutta. Oletuksena on, että tämän investointiprojektin arvioiminen perinteisillä metodeilla johtaa vääristyneisiin tuloksiin, koska immateriaalisia tekijöitä ei ole otettu huomioon. Investointiprojektin arviointi tehdään määrittämällä projektin sidosryhmän jäsenten huolenaiheet ja odotukset, analysoimalla niitä ja käyttämällä löydöksiä investointipäätöksessä. Sidosryhmän jäsenten huolenaiheet liittyvät asioihin, kuten riskeihin, kustannuksiin ja epävarmuuteen.

Tämän lopputyön tavoitteena on tarjota käytännöllinen projektisuunnitelman arviointikehys projektijohtajille, projektiportfolion hallinnoijille, päätöksentekijöille ja analyytikoille. Arvioinnin tuloksia voidaan käyttää projektisuunnitelman kehittämisessä tai investointipäätöksen tekemisessä.

Avainsanat: strateginen johtaminen, strateginen investointi, aineettomat hyödyt, kustannus-hyöty-analyysi, portfolion hallinta, viiteryhmäanalyysi, ERP, tapaustutkimus, teknologiajohtaminen	Julkaisukieli: Englanti

Preface

Writing this thesis has been an edifying journey. First and foremost, I am grateful to my beloved Sini Kivelä for her support during the writing process. I thank Thomas Keil for supervision and Kari Sahlman for instruction. They provided me wonderful ideas when I thought I had run out of them – I'm in debt of gratitude. I would also like to thank my colleagues Miikka Kemppinen, Veli Turkulainen, Otto Mäkeläinen, Andres Arjona, Tapio Partti, Marcos Tong, Ossi Pöllänen, and Kimmo Hätönen at Nokia Siemens Networks for very interesting conversations on vast amount of subjects which inspired me while producing this thesis. I am endlessly grateful to my parents for supporting me during the years that prepared me for the thesis project. A thankful word goes also to my sister Meri Kupiainen, Hannu Verkasalo, and Antti Snicker.

Espoo, October 25th, 2009

Juha Kupiainen

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Abbreviations

BPR	Business Process Reengineering
BRM	Benefit Realization Management
BSC	Balanced Scorecard
CBA	Cost-Benefit Analysis
DSS	Decision Support System
ERP	Enterprise Resource Planning
IC	Intellectual Capital
ICT	Information and Telecommunication Technology
IT	Information Technology
KPI	Key Performance Indicator
MSP	Managing Successful Programmes
NSN	Nokia Siemens Networks
OECD	Organization for Economic Co-operation and Development
PDM	Product Data Management
PLM	Product Lifecycle Management
PPM	Project Portfolio Management
TAAIM	Technology and Architecture Asset Information Management
TAM	Technology and Architecture Management

1 Introduction

1.1 Introduction

The cultural and industrial development of modern economies has been rapid in the 20th century. Before, the business was believed to be based mainly on tangible resources and it was sufficient for strategic management to consider only these to succeed in investments. The paradigm shift from industrial age to knowledge-driven economy results in need for firms to identify, measure, and manage the intangibles in their investment projects. Nonetheless, intangibles are not a new concept – only the recognition of their importance has changed. Today it is widely accepted that the intangibles are the major driving forces in firms' value creation process. Business rationale based only on traditional fundamentals, most often financials, may lead to losses as the intangibles are neglected. This is why the traditional financial aspect needs to be augmented with intangibles including uncertain future expectations which are hard to assess. As knowledge is costly to produce and very cheap to reproduce, it is clear that firms are willing to protect their valuable intangibles that they have developed or acquired. Sometimes these intangibles are combined to form new intangibles, so in the new economy the firms are expected to form weak and strong relations with their environment to share their precious intellectual assets.

An old quote from business area says:

"If it's not being measured, it's not being managed"

This might be true in many cases when information is reliable and is straightforward to interpret with different metrics. Having more data and information is often considered positive, but in knowledge economy we are faced with 'information overload' which increases the decision making complexity. Managers recognize that there exist too many frameworks and methodologies for measuring operations and strategy. This has been the case for at least past twenty years. The information overload is noted e.g. by Kaplan and Norton (1992) who introduced their balanced scorecard concept which "forces" managers to concentrate on measuring a handful of critical areas. A firm seeking opportunities to improve its performance on different areas has to establish its investments on a solid base of rationale consisting of financial and other strategic arguments. The problem arises when managers have to interpret the data as information, and later on have knowledge to use as rationale for investments.

Many different analysis methods and frameworks for assessing investment projects inside a firm exist, including financial methodologies (e.g. NPV, ROI), benefit realization management (BRM), and traditional cost-benefit analysis. The costs can be estimated with multiple different methods. This is tightly linked with the quote above as project manager's

objective is to measure project implementation as accurately as possible. While investments involve costs, the resulting state of the organization is enhanced in a form of new routines, a new organizational form, a new set of supplier relations which are difficult to measure and for other firms to duplicate (Brynjolfsson & Yang, 1997). The investment benefits are often more of intangible nature and are more complex to measure. How to manage when measurement is uncertain? Managers working at strategic decision making, R&D project selection, new product development (NPD), marketing, HR, and innovation management are facing issues with the vast number of technology management methods and practices; which should they use? Firms need solutions for assessing these questions regarding intangibles.

Sometimes intangibles are considered to be immeasurable. One might say that "you can't measure that without spending a million dollars". Carter (1996) pointed the difficulty by stating that "when measuring knowledge we are not even wrong". As many managers think that intangibles such as "value of information", "productivity of research", or "risk of failure" are immeasurable, there is a considerable gap to the certain reasoning of business rationale. It would certainly be beneficial to be able to quantify these as they account for a large portion of today's business value. Moving from a mindset situation where "we know *nothing* and *couldn't* even guess" to where "we know *something*" makes it possible to challenge the underlying assumptions of what is immeasurable. Nevertheless, there is light at the end of the tunnel as considerable amount of research has been done on the field of intangible measurement since Carter's quote.

As business pressure obliges to estimate intangibles in investment projects and formal processes are not available, the results are often adequate. Kyte (2008) found four pitfalls that can be found in today's project plans. The first is that managers "estimate the right answer for a personal agenda", meaning that example, if the sponsor needs the activity to be completed by Christmas, then the estimator supporting the sponsor will be biased toward estimates that suggest this is achievable, whereas an estimator who wants to scuttle the project will suggest that it's impossible. Another common theme is that benefits are overstated for example because of a project with "pet" status (Kyte, 2008). Kyte's list continues with elaboration on the role of inexperienced estimators who cause plans to fail. Finally, the list concludes with a notion that estimates are often misleading since experiences from one domain are applied to another, e.g. local experience is applied in global domain.

A primitive example related to the world of intangible valuation is given by Nobel Prize winner physicist Enrico Fermi (1901-1954), who challenged his students to estimate the amount of piano tuners in Chicago (Hubbard, 2007, pp.10-11). At first, the students responded that it was impossible for them to estimate such quantity. This is common for human mind as many problems seem too complex at first. What information should we have in order to answer to question? This is where Fermi started asking questions, such as "how many people are there in Chicago?", "Does every individual own a piano?", "what is the average size of a household?", and "how many times a piano is tuned a year on average?" Fermi started listing numbers that he could estimate, including population

estimates and share of households with regularly tuned pianos. Eventually he presented a model:

Tuners in Chicago = Population/people per household
x percentage of households with tuned pianos
x tunings per year/(tunings per tuner per day x workdays per year)

Depending on the values chosen for the variables we get some 20-200 piano tuners. With a simple deduction we have upper and lower limit for Fermi's question. This opened the eyes of many students about the problem. Although Fermi's example is not quite a measurement, it is a good contradict to what is presented as immeasurable. Fermi's questions are popular in the world of physics and mathematics but the same logic can be followed in the business world to estimate investment project related intangibles.

What does this all practically mean in the context of investment projects? Given that you are a manager for projects or programs in a firm, probably a CTO, CFO, or CIO, you are most likely required to justify new project investments by indicating that the acquired benefits will be larger than the costs involved. Examples situations involving managers in cost-benefit analysis include:

- Evaluation of the installed operating systems in the corporation. Is it reasonable and beneficial to upgrade the whole installed base? How should the upgrading be implemented? Which vendor should be used? Does this benefit our business?
- Assessing costs and benefits for a new organizational function changing the firm's operational mode.
- Deciding between two or more alternative technology business cases when only one strategic path can be chosen.
- What are the future strategic options we would gain by investing in a product lifecycle management (PLM) IT system?

As with the Fermi's piano tuner question, these might seem to be hard to quantify at first because of complexity or intangibility. Especially different types of IT investments to enterprise resource planning (ERP), product lifecycle management (PLM), etc involve hard-to-quantify elements. IT systems are essential to modern business as they are used to enhance business efficiency in many ways. Whereas they are very complex to plan and implement, they also need a solid business case to justify benefit realization.

Investment projects are not always justified by facts. Boards responsible for investment decisions are often influenced by the personal characteristics of those project managers who reason and aggressively "sell" their investment ideas. This can be a pitfall in situations where there are many investment alternatives and not all of the portfolio can be approved. For example, the person having characteristics of "screamer" often receives unnecessary amount of attention from the investment decision makers leaving other projects with solid business case and background research unimplemented (Iacovou & Dexter, 2005). Sanwal

(2007) underlines the importance of data-driven and rational decision making and warns about the risks related to decibel-driven decisions.

Managerial capabilities and leadership style of the project manager leading the execution of the investment project are among the most influential factor. Decisions are rarely based just on calculations. Projects steered by managerial decisions lead to different outcomes as many personality profiles can be identified for project managers. Sanwal (2007, pp. 17-19) distinguishes six different characteristics for project managers committing a sin of "decibel-driven" project management style:

- *The closer*. This is the charismatic salesperson within and organization who though a combination of charisma, relationship management, and pretty PowerPoint presentations receives funding for projects without a solid underlying business case, metrics, milestones, and so on.
- *The screamer*. This is the person (or group) who most forcefully declares the need for funding.
- *The end-arounder*. This is the person who will get request for funding denied but will then approach CFO, CEO or CIO directly and use those relationships with senior decision makers to make a case and receive funding.
- *The strategist*. Many times strategy is the rationale for investment that you cannot convey the benefit of. This person justifies the investment by putting in it strategic category.
- *The doomsdayer*. Doomsdayers do not have rigorous milestones or metrics associated with their investment but instead rely on fear as a justification for their investments.
- *The optimist*. This is the person who has not grasped the idea of sunk costs and is consistently guilty of taking ill-advised projects entirely too far.

In addition to project managers, the skills of employees and consultants implementing the project are often prerequisites for success. Meaningful attributes here include motivation and goal-orientedness of the project team, teamwork efficiency, technical knowledge, and communication efficiency.

So far in this thesis it has become clear what kind of challenges there exists in investment project evaluation. The goal of this thesis is to provide a practical approach for taking into account the context of this introduction chapter in addition to traditional project assessment methodologies.

1.2 Research question

This thesis focuses on assessing different methods for intra-firm strategic investment project evaluation and utilizing the findings to construct a framework for assessing Nokia Siemens Network's (NSN) strategic investment in technology and architecture asset information management (TAAIM). The research question of the thesis is formulated as follows:

Q: How to assess the investment in technology and architecture asset information management at Nokia Siemens Networks?

1.3 Research objectives

The outcome of this thesis will be a framework for investment project evaluation that is derived from academic literature and empirical studies. The framework is constructed by:

- Discussing relevant concepts and managerial approaches to strategic investment assessment
- Discussing what investment project related benefits are with focus on intangibles and finding a solution for their classification and measurement in intra-firm strategic management context
- Developing a strategic investment project evaluation framework based on stakeholder perspective and previously formulated intangible benefit classification and measurement elements
- Testing the previously formulated framework by evaluating Nokia Siemens Networks technology and architecture asset information management project

1.4 Research method, design and scope

Constructive research approach will be used as research method. Constructive research approach starts by introducing the practical problem area and then links the area to existing theory. After this, a construction is presented as the solution to the research problem. Finally, practical applicability and theoretical newness value of the solution are discussed. Constructive research can be described as a process to build a new artifact that is based on existing knowledge and/or new technical, organizational etc. advancement (Kasanen et al, 1991). To ensure practical utility of the solution artifact, researcher should aim to build the innovative construct as meaningful, simple, and easy-to-use as possible (Kasanen et al, 1991). The method of constructive research is visualized in Figure 1.

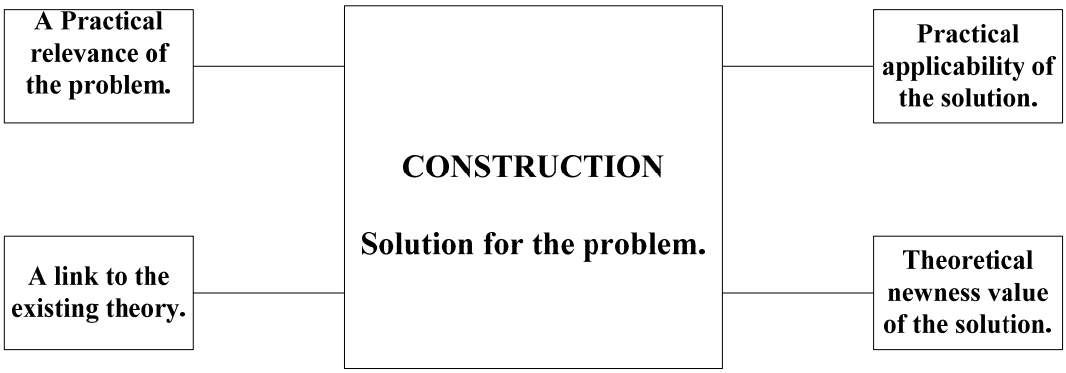

Figure 1. The essential parts of the constructive research
Adapted from Kasanen et al (1991)

The structure of the thesis will follow the constructive research method and is divided into five distinct and consecutive parts (adapted from Kasanen et al, 1991).

1. A practical relevance of the problem

This part explores the background for the research problem and aims to justify the practical relevance of conducting research on the area. This part is formed by chapters 1, *Introduction,* and 2.1.1, *Background*.

2. A link to the existing theory

Chapters 2.1, *Business context and key concepts*, and 2.2, *Concepts of investment project assessment*, will establish link to the existing theory.

Chapter 2.1 introduces key concepts and theoretical background to support motivation of the research problem area. Topics discussed in this chapter include investment project process, what investment project related benefits are, and what is the intangible aspect to the benefits.

Chapter 2.2 discusses three elements to support framework construction. Chapter 2.2.1, *Stakeholder concerns and benefit expectations,* discusses the stakeholder perspective to investment projects – what project stakeholders are concerned about, what benefits do they expect, and how the concerns and benefit expectations can be identified. The second element 2.2.2, *Project related cost and benefit*, discusses how the costs and benefits can be evaluated after they have been identified. Chapter 2.2.3, *Project feasibility evaluation*, discusses how the feasibility of the project is evaluated when the stakeholder concerns and benefits are known.

It is known prior to the literature review that the amount of different management approaches (frameworks, best practices, scorecards, etc) on the thesis subject is ample; choosing will be based on how well the specific methodology supports the framework construction.

Different perspectives to the strategic investment projects inside a firm exist. *Internal* and *external* perspectives are distinguished as concepts and strategic investment projects are frequently related to both. In chapter 2, the approach is how to justify investments from investor's point of view in intra-firm context. Intra-firm context is used as an artificial boundary for projects' effects, i.e. most of the project outcomes are measured internal to the firm although some external effects may exist.

It is known prior the research that several concepts are relevant to discuss in order to prepare for construction. The NSN case includes intangible benefits which are needed to evaluate with respect to relevant risks and costs. Stakeholder needs and benefit expectations are required to determine – this is why stakeholder analysis will be discussed. Scorecards, project and portfolio management methodologies will be used to further assess the overall feasibility of the investment project under evaluation. The discussion context of chapter 2 is presented in Figure 2.

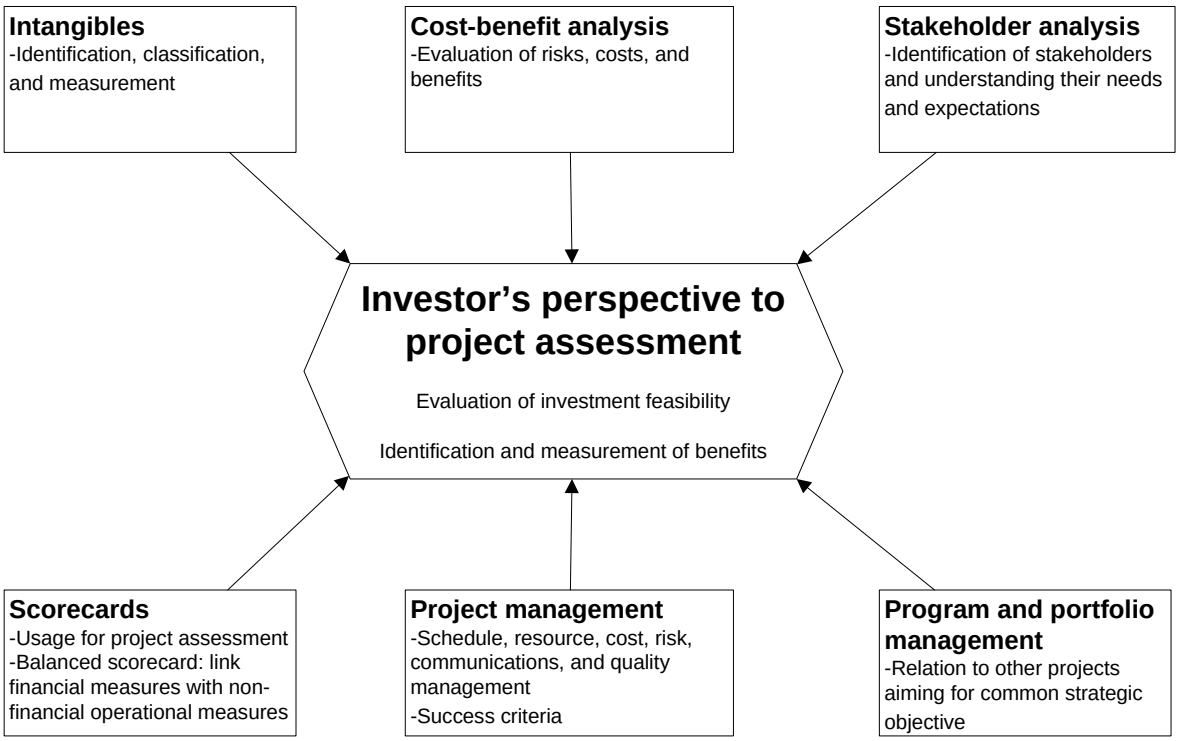

Figure 2. Research context

3. Construction – Solution for the problem

A solution to the research problem is a framework for strategic investment project assessment and it will be presented in chapter 3, *Construction of strategic investment evaluation framework*. Preliminary framework will be based on literature review and it will be improved by conducting interviews with experts at Nokia Siemens Networks.

The goal of the framework is to provide practical usefulness to project managers, decision makers such as portfolio managers, and analysts to evaluate and/or improve a single project's business case which captures the reasoning for the initiating project. The framework should help the previously mentioned roles to justify their projects better by determining the key stakeholder concerns and establishing key selling points on them.

4. Practical applicability of the solution

In chapter 4, *Case Nokia Siemens Networks*, the practical applicability of the solution is evaluated by testing the previously formulated strategic investment assessment framework to a case of Nokia Siemens Networks technology and architecture asset information management concept development and establishment project. The framework is used to evaluate how well the project concept is performing in terms of costs, benefits, risks, and stakeholder requirements and how NSN should proceed. The testing is implemented by conducting the phased actions described in the framework.

5. Theoretical newness value of the solution

The theoretical newness value, relevance value, and generalization of the solution framework will be discussed in chapters 5, *Discussion,* and 6, *Conclusions*. Possible defects, shortcomings, and future directions for research will be also elaborated in this part.

2 Theoretical background of investment project assessment

2.1 Business context and key concepts

2.1.1 Background

Common reason for firms to execute internal investment projects is to induce a beneficial change by solving a problem or by exploiting an opportunity. Different resources serve as inputs for projects whose outputs can be considered as *assets* such as buildings, manufacturing plants, computer systems, organization structures, and new designs. These outputs can be further utilized to achieve *desired performance improvement*, such as improved flexibility or reduced risk, which are the *outcomes* of utilizing an asset. Furthermore, the use of the outcome leads to tangible financial business *benefits* such as decreased costs or increased profit. Further, a long-term usage of a project outcome can lead to fulfillment of *strategic goals*, e.g. improved market position. Figure 3 illustrates this setting. (Turner, 2008)

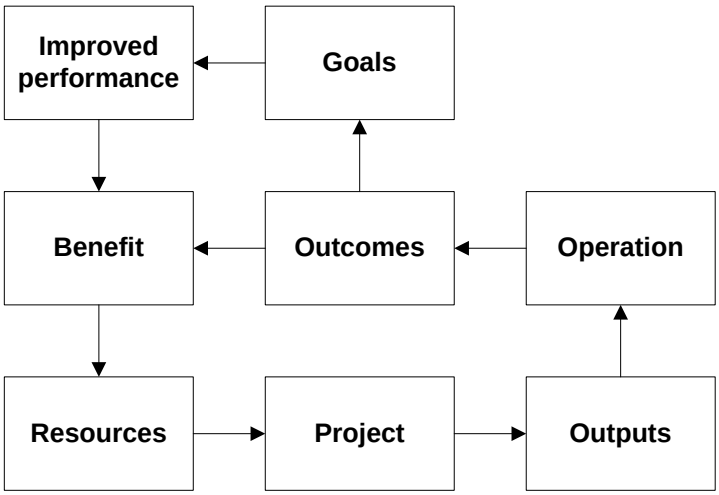

Figure 3. Project implementation outcomes, benefits, and goals
Adapted from Turner (2008, p.3)

Investments require considerations on many areas in order to deliver beneficial changes. This is where we must include the aspects of projects, portfolios, costs, risks, tangible and intangible business benefits, organizational change, technology management, and innovation capabilities to the overall assessment of investment projects. The success of an

investment project relies on the fact that whether there is desired change in the metric or metrics that are used for assessing the investment's performance. Analogously, benefit *is an outcome of change which is perceived as a positive by a stakeholder* (Bradley, 2006). Although e.g. Turner (2008) distinguishes the concepts of outcomes and benefits, they are used indifferently in the scope of this thesis.

Intra-firm investments are made in different organizations regardless of their industry, size, public or private, profit or nonprofit. Although the actual scope and benefits sought after differ varies across industries and companies, commonalities can be found and the investment benefits can be identified, classified, and measured with multiple generic methods. Approaches such as benefit realization management (Bradley, 2006) help in ensuring to get the maximum output and governance over project related benefits. Benefit identification, classification, and measurement are further discussed in forthcoming chapters. The functional areas for strategic investment projects can be divided the following way:

Enterprise. The investment concerns the whole organization on strategic level. Examples include corporate restructuring, business process redesign (BPR), strategic change in business type (e.g. shift from supplier business to services business)

Technology. E.g. an investment is made to install a new IT system or to integrate existing systems.

R&D. E.g. investment projects aiming for incremental and radical innovations in product development is an example that falls into this category.

Marketing. E.g. an investment is made to enhance firm's brand value in the market.

Manufacturing. E.g. introduction of a new manufacturing process or installation of new equipment.

The overall performance analysis of investment projects requires assessing valuation of different tangibles and intangibles. The division can be made also between financial and non-financial assets. The valuation of tangibles is traditionally based on quantitative financial techniques dividing between expenses and income. Today, a substantial proportion of investment projects are dealing with intangibles and the main concern is how to measure their performance. Qualitative methods can be, and often must be used in situations where quantitative methods do not apply. The main focus on this chapter is on qualitative methods and intangibles.

Examples of relevant questions regarding strategic investment project assessment can be included in different categories:

Strategy

- Is the proposal compatible with corporate strategy (vision and mission)?
- Does the investment improve our strategic position in the market?
- Does the proposal have a solid business case?
- Which are the success conditions?
- Should we implement a change or remain at the present strategic state?

Resources

- How many resources should we invest?
- Do we have access to required resources (finance, technology, skills)?
- What are the motives of the people managing the project?
- Is the idea technically feasible?
- What are the benefits compared to other projects competing for the same resources?

Environment

- Public or private sector?
- Will it change the business environment we are operating in?
- What are the risks involved?

Planning

- How the intangibles related to the investment should be identified, measured, and monitored?
- Is the project plan designed according to guidelines?
- What is the correct timing for the project?
- Do synergy effects exist with ongoing projects or investment candidates?
- What methods and metrics will be used for project steering and monitoring purposes?
- Does the project need further development?

Organization

- What is the scope (enterprise, middle-size, small)?
- Which is the size of project group and right organization form?
- Will the people inside the organization change their behaviour?
- How to deal with organized resistance?
- Do we adapt or try to enforce change?
- Does the investment increase our level of innovativeness?

This thesis searches for answers to the previous guiding questions and takes the findings into account when formulating the framework for strategic investment project evaluation.

2.1.2 Strategic investments

Different investment approaches exist. *Financial investments* consider portfolios consisting of different asset classes, such as equities, fixed-income securities, and real assets (real estate, commodities, and other assets) (Bernstein & Damodaran, 1998). Financial investment results are easily quantified on monetary basis as they relate to financial assets. Absence of an investment can lead a company to lose a business opportunity, which would qualify the investment benefits as *strategic* (Ganly, 2008).

Feibel (2003, p.1) simply defines investment as an *initial forfeit of something we value in exchange for the anticipated benefit of getting back more than we put in*. Butler (1993) defines investment decisions as the *decision to commit firm's resources (capital, people, know-how, and so on) to particular projects with the intention of achieving greater and other benefits in future years*. The resources, or assets, committed may be tangible (land, buildings, plants, equipment, and inventories) or intangible (patents, brands, know-how, and people) (Butler, 1993). Another definition is by American Express, which describes investment as anything that is discretionary (Sanwal, 2007, p.119). Virtually anything qualifies into this category, including marketing, sales, operations, reengineering, IT, CapEx, and R&D/Innovation. Amex has also decided that there is no minimum dollar amount for an investment to be qualified, as there is varying sizes of business units within the company. Additionally, Amex leaves the level of materiality also undefined.

Strategic investment decision making in a firm must consider the aspects of strategy, finance and risk. These areas can be underlined as critical – leaving one out of consideration might lead the investment to fail. Common problem areas related to investment decisions include that they are often made in silos, led with intuition, they are much politicized, or their effect is very short-lived as after the decision the investment is not executed according to the actual decision (Sanwal, 2007). The last mentioned problem concretizes especially when investment portfolio decisions are made once-a-year. Other "sins" that managers commit are harnessing "decibel-driven" decision making instead of justifying decisions based on data (Sanwal, 2007).

The strategic investment process provides means to firm management to increase control on investments. Many different stepwise process descriptions can be found from literature, e.g. Sanwal (2007, pp.117-118), Butler (1993, pp.51-62), Bernstein & Damodaran (1998), Karel (2008), and Feibel (2003, pp.1-2). The following stepwise process presented in Figure 4 adapts the process elements presented by these authors and relates the investment process to the framework context of stakeholder concerns and benefit expectations.

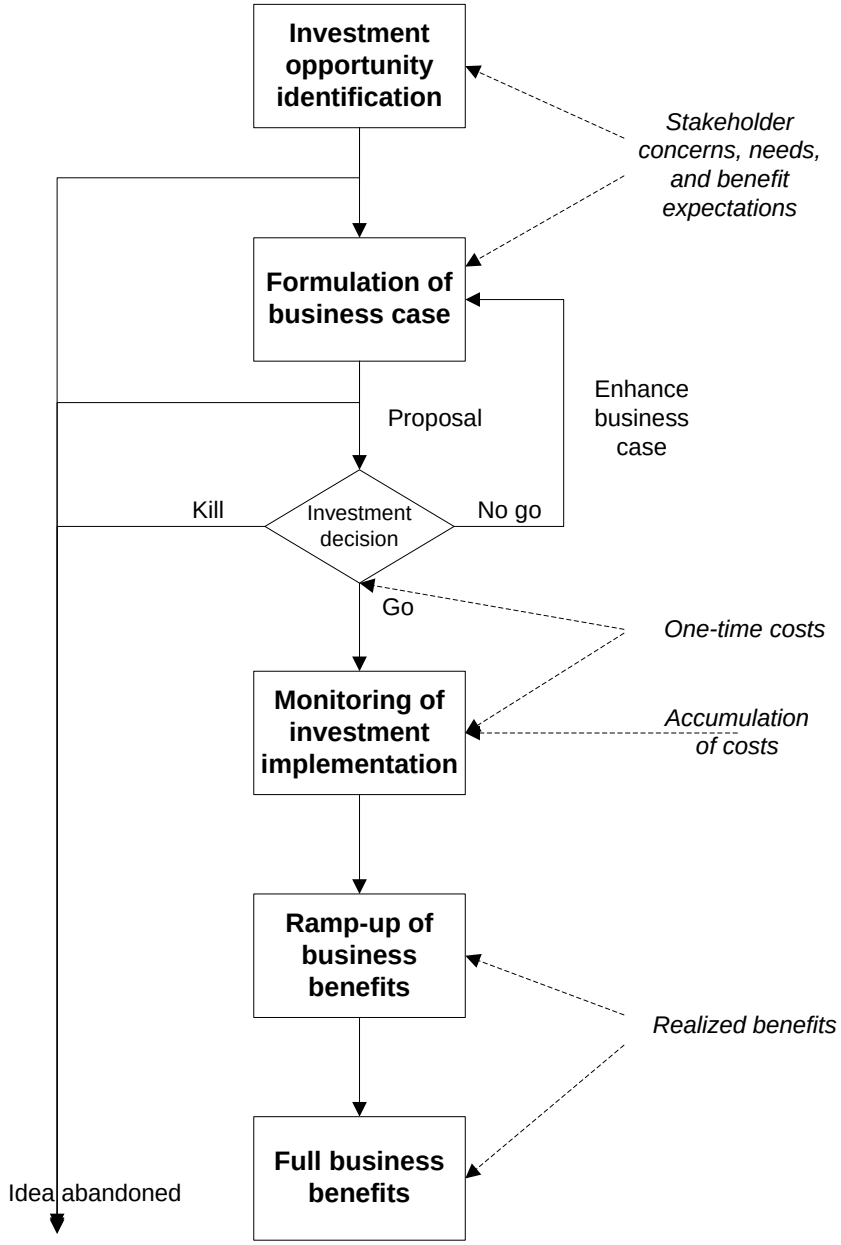

Figure 4. Strategic investment process and benefit realization

Step 1: Investment opportunity identification

- The first phase starts by scanning of different investment options and the underlying business needs. Realistic assumptions should be formed to use as investment rationale. During preliminary phase, relevant methods for doing background research include e.g. stakeholder analysis and expert interviews. At this point it should be known how much there is available to spend. Pilot project and proof-of-concept implementations can often be used to test the investment rationale.

Step 2: Formulation of business case including costs and benefits

- A business case will be drafted upon the business needs. Key business drivers to be included to the case include e.g. revenue projections, cost savings, and number of customers. Also the growth projections for these drivers should be assessed. A bundle of different methodology for project owner exists including financial approach techniques (discounted cash flow methods, ROI, payback time etc.), risk analysis methods (sensitivity analysis, risk criteria, stress test etc.) or simulation techniques (computer simulation, critical path analysis etc.). The business case will be presented to the person or board making the investment decision.

Step 3: Investment decision (go, no go, or defer)

- At this point the party having the power to approve, disapprove, and defer the project implementation evaluates the feasibility of different alternatives in terms of risks, costs, and benefits. The decisions are often done in cross-functional manner to ensure to ensure ownership and requisite scrutiny of investments. This is why the business case must consider different stakeholders in multiple organizational functions.

Step 4: Monitoring of investment implementation

- During the implementation of the investment project, a wide variety of methods and metrics for monitoring purposes can be used. Project owners should track and report ongoing project success and issues. Long-term projects can include checkpoints and milestones which involve further decision making (e.g. invest more or even to cancel the project).
- The benefits do not necessarily appear instantly after the investment so the realization can be divided to investment implementation, ramp-up and full benefits phases (Karel, 2008). At stages 4, 5, and 6, the results of the investment project are evaluated based on observed changes and documentation provided by project owner. The investment project implementation has fulfilled the requirements set in the business case formulation phase or it has failed. Relevant questions at these stages include: Was the original business need fulfilled? Are the acquired benefits larger than the costs involved? How to proceed if the investment failed? Recovery from a failed project requires often managing the aftermath as some 15 % of IT projects are canceled before completion, some with disastrous effects (Iacovou & Dexter, 2005).

Step 5: Ramp-up of business benefits

- During ramp-up phase, the organization gradually adopts the changes incorporated in the investment in question. Organizational, political, and process changes affect the adoption pace (Karel, 2008). At this stage, a specific percent amount can be set for the realized benefits (e.g. 70 %).

Step 6: Full business benefit realization

- As time passes, 100 % of the strategic business benefits should realize depending on the success of the investment project implementation and whether the relevant risks

concretized. At this stage, monitoring of the investment is still essential as often the organizational environment changes and costs keep accruing.

This thesis concentrates on project assessment with focus on benefit estimation, so the steps 2, 3, 5, and 6 of investment project process are the most meaningful. As different methodologies for assessing investment rationale exists including frameworks, metrics, and decision support systems, it should be noted that it is not always possible or feasible to conduct a traditional cost and benefit analysis. In this case the investment deciders have to count more on their intuition increasing the personality-driven and non-objective practices. The emphasis here is on the methods and frameworks that support managers in fact-based decision making.

2.1.3 Investment project costs and benefits

This chapter includes discussion related to investment project costs and benefits: how they are defined and which kind of examples can be found from literature.

Several definitions for benefits exist. Bradley (2006) defines benefit as *an outcome of change which is perceived as a positive by a stakeholder*. Another definition is by Managing Successful Programmes (MSP) which gives more detailed for a benefit as (OGC, 2007):

The quantifiable and measurable improvement resulting from an outcome which is perceived as positive by a stakeholder and which will normally have a tangible value, expressed in monetary or resource items. Benefits are expected when a change is conceived. Benefits are realized as a result of activities undertaken to effect the change.

Collins dictionary defines a benefit as *something that improves or promotes*. This definition is extended by King and Schrems (1978) who define benefit as *the consequence of an action that protects, aids, improves, or promotes the well-being of an individual or organization*.

From the definitions above, several conclusions can be made. First, the stakeholder aspect is important as benefits always induce positive change for a specific stakeholder or stakeholder group. Second, MSP's definition underlines the tangible side of benefits which is interesting as today many of the benefits are intangible.

There are three categories of business benefits: "hard", "soft", and strategic. Hard benefits can be justified with financial methods and these include cost savings, cost avoidance, and improved operational performance. Examples of hard and tangible benefits include "reduction of lead time by 30 percent" and "doubled market share". Soft benefits such as "reduced strategic risk", "better decision making", "improved word-of-mouth advertising", and "premium brand positioning" are harder to valuate; they are often seen even as

impossible to measure (Hubbard, 2007, p. 4). Strategic business benefit can be attained as a hard or soft benefit is exploited for a sufficient amount of time (Ganly, 2008). Absence of an investment can lead a company to lose a business opportunity, which would qualify the investment benefits as strategic (Ganly, 2008).

It depends on the investment project context that which are the benefits that are sought after. For example, Stark (2005) lists hundreds of benefits of introducing a product lifecycle management (PLM) practice in an organization. Some of the benefits include:

- Capture customer requirements better
- Create more innovative ideas
- Improve the sales process, wherever the customer is located
- Develop products faster
- Develop products in an international collaborative development environment
- Manufacture in-house, or outsource manufacture to low-cost suppliers
- Deliver the product required product at the required time in the required place
- Provide superb support of product use
- Prevent future product failures through knowledge of past failures
- Schedule maintenance effectively based on knowledge of the actual use of the product
- etc

As with costs, benefits can be divided on direct and indirect basis. Indirect benefit occurs when a stakeholder didn't have commitment for the investment project but gains from it. Mishan and Quah (2007, p. 122) define an example of indirect benefit as a form of railroad building project and its stakeholders. The existence of railroad is a form of insurance to those who didn't involve their assets in the investment project, as they might need to travel by train in case other transportation methods fail.

The benefits of intra-firm investment projects are often concretized when existing resources complement each other in a novel way. For example, computers and software work as complementary assets to each other. Another example scenario is the impact of organizational restructuring project on employee knowledge sharing.

Several approaches for management of benefits exist. One is benefit realization management (BRM) that Bradley (2006) defines as *the process of organizing and managing, so that potential benefits, arising from investment in change, are actually achieved*. As discussed above in research objectives chapter, many different managerial approaches and disciplines are needed when assessing investment project benefits. The relationships between BRM and other managerial disciplines are presented in Figure 5.

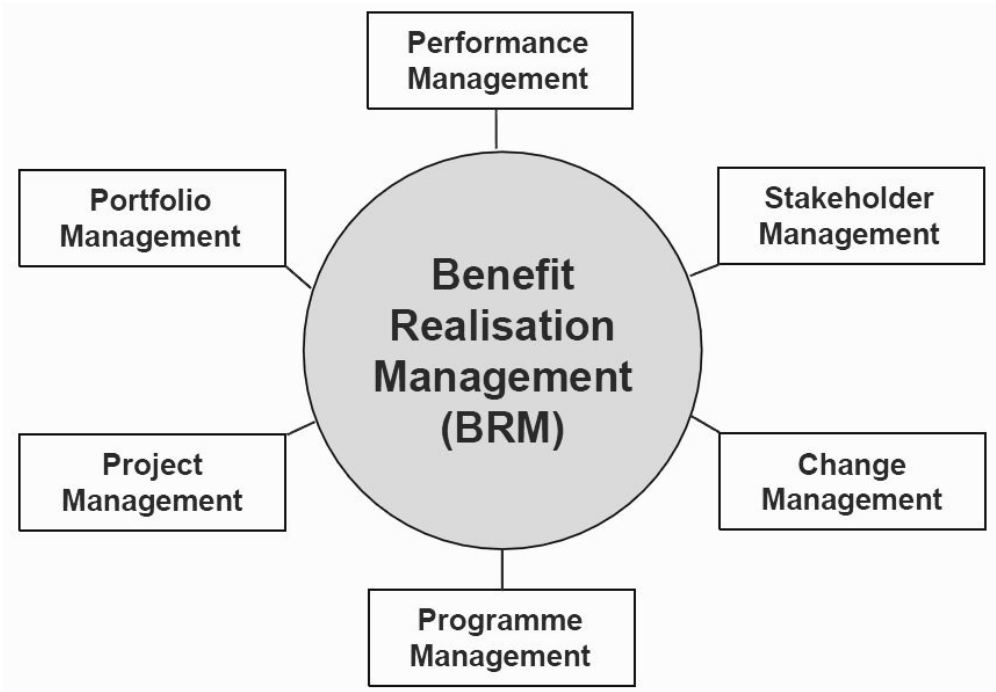

Figure 5. The relationship between BRM and other management disciplines
Source: Bradley (2006, p.25)

2.1.4 Intangible aspect to investment project benefits

Before western economy moved to what is widely referred as "knowledge economy", the concept of economic growth was mainly based on accumulation of physical capital. This viewpoint was prevalent at the time when potential markets were still growing and when competition was mainly based on economies of scale and specialization (Ducharme, 1998). Tangible assets are related to concrete and physical resources, such as product artifacts, technology embodied in computer hardware, land, and labor. Although the focus on this thesis is not on assessment of tangibles, they are always somehow present in investment projects. This is due to the fact that tangible artifacts are often used as tools to create intangibles. For example, knowledge is often generated on top of physical structure of information technology hardware, whose malfunctioning directly disrupts the knowledge creation process.

Strategic intangible resources differ from their tangible counterparts in that they do not appear on company's balance sheets and financial statements (Guthrie and Yongvanich, 2004; Sveiby, 1997, p.152). Investment in intangible asset such as research program appears as a cost item and negative cash flow, but the value of the investment is not recorded on the balance sheet. As before the indicators to measure operational performance were related to tangibles such as freight-car loading rates, the shift has moved the focus towards how to measure the impact of intangible knowledge assets.

Intangible assets have become an important source in firms' economic value creation as compared to tangible counterparts. This is mainly due to shift from industrial age to knowledge-driven economy, where competition is largely based on intangibles. This shift and the related characteristics are illustrated in Table 1. The industrial-to-knowledge paradigm shift is recognized in human capital theory, technical change theory, and new growth theories (Durcharme, 1998). Since mid-1950's it has been noted that physical capital aspect didn't explain how economic structures of countries performed (Ducharme, 1998). This viewpoint can also be extended to the level of competition between firms and intra-firm capabilities. Later on, technological advances in information technology infrastructure supporting knowledge creation and management affected significantly increased the interest towards intangible asset creation.

Shift industrial-knowledge shift is mainly due to a couple of structural changes (Meritum, 2002). First, knowledge is increasingly considered as a commodity and, as such, is subject to economic transactions. Second, the degree of connectivity among knowledge agents has increased dramatically. Third, Information and Communication Technologies (ICT) are considered as the main vehicle for knowledge diffusion, facilitating the emergence and development of new and intensive global networks of knowledge agents (European Commission, 2000). The shift involves companies in a constant and complex learning process on how to utilize the knowledge from R&D, marketing, manufacturing, strategic alliances, and innovation networks in enhancement of competitiveness.

Table 1. Comparing the characteristics of industrial and knowledge economies

Industrial economy	**Knowledge economy**
Production driven	Customer driven
Functional	Process (Integrated)
Single business model	Multiple business models possible
Tangible Assets	Intangible Assets
Emphasis on efficiency	Emphasis on flexibility
Top Down	Bottom Up
Management	Leadership
Vertical integration	Multiple alliances

The interest to intangible knowledge assets has been growing since the beginning of the 90's (Marr & Adams, 2004). This is indicated by the increase in amount of published papers on the subject. The development of research on intangible assets is illustrated in Figure 6. The importance of intangibles is indicated also by Guthrie and Yongvanich (2004), who came to conclusion that 50-90 percent of the value created by a firm in today's economy, is estimated to come from the management of the firm's intellectual capital (IC) rather than from the use and production of material goods. In 1978, intangible assets were estimated to constitute 5 % of assets, while today the number is at least 78 % (Chareonsuk & Chansa-ngavej, 2008). Another indicator for the increased interest level to the subject is a study from authors Brynjolffson and Yang (1997), which highlighted the grown importance of intangibles. The authors surveyed over 1,000 firms in the United states and found that an increase of one dollar in the quantity of computer capital (which they relate to the concept of intangible assets) installed by a firm is associated with an increase of up to

ten dollars in the financial markets' valuation on the firm. However, most of the large firms are lacking a consistent way of measuring and reporting their IC capabilities (Guthrie &Yongvanich, 2004).

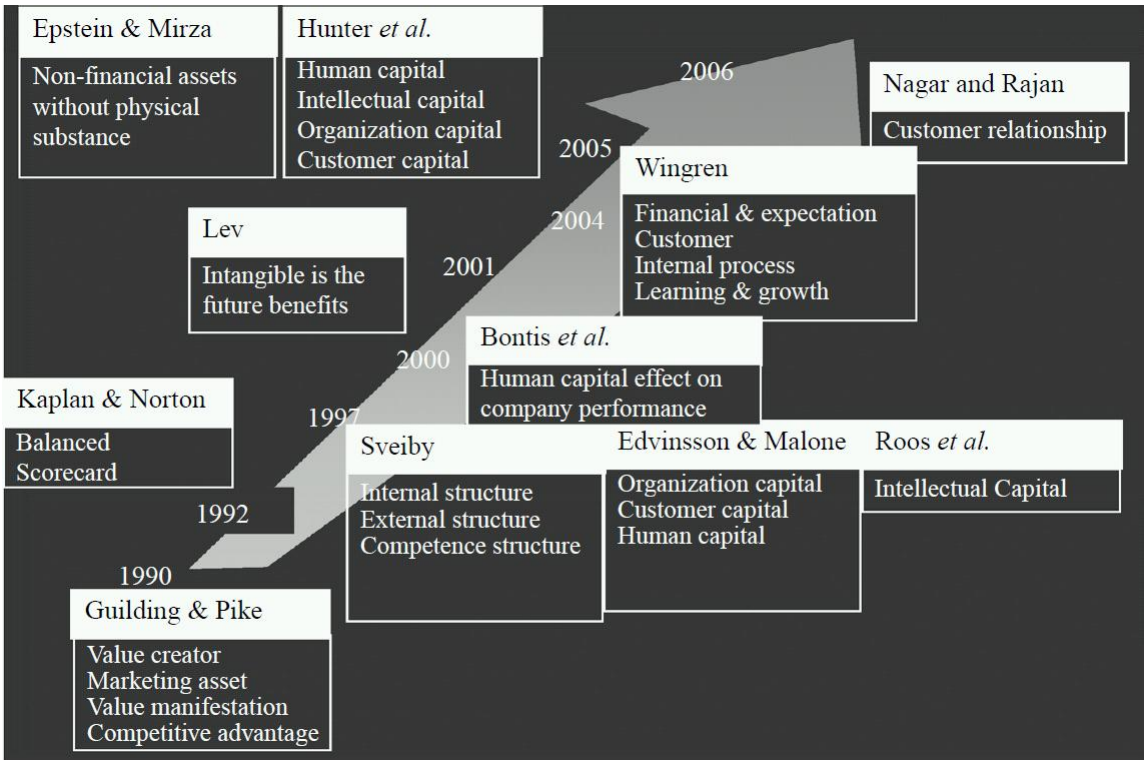

Figure 6. Research development on intangible assets
Source: Chareonsuk & Chansa-ngavej (2008)

IT-aspect is growingly important in today's knowledge economy, where information availability and Internet are disrupting sustaining business models. Brynjolfsson and Yang (1997) discuss this viewpoint and state that investments to software, training and organizational change are means to create intangible assets. Firms' investments to "computer capital" (large scale IT systems for knowledge management support) include organizational costs and risks, but these investments also create barriers to competitors seeking to match the investments. Another viewpoint is by Ganly (2008), who estimates that enterprises' not adopting IT benefit realization processes (which include intangibles) will continue to struggle with the business value.

One of the notions in the Meritum (2002) guideline report is that *managers may find incentives not to invest in intangibles as, although they may contribute to value creation, according to accounting standards they must be immediately expensed and result in a decrease in current earnings and book values*. This is a signal of that common practice for intangibles management is not in place and corporate culture is still driven by traditional accounting methods. Because of this, the intangible benefits are many times not concretized. This aspect is also supported by King and Schrems (1978) who note that many

analysts consider the quantification of benefits to be the greatest obstacle to a cost-benefit analysis.

Generally, investment projects involving intangibles can be divided into two types:

a) Internal development or acquiring of new intangibles
b) Increasing the value of existing intangibles

Training and education of employees is an example of investment possessing intangible components of both types a) and b). This kind of investments will not only benefit individual employees, but also the whole firm. This is supported by human capital theory author Bartel (1991) who found a positive link between the implementation of training programs and labor productivity growth. In another study, Bartel (1992) found that training has a "positive and significant effect on wage growth which translates into a company rate of return of at least 13 per cent".

Intangibles in general have two common understandings (Hubbard, 2007). The first category consists of things that are literally not tangible, touchable, and solid objects, but still can be measured. Time, budget, and patent ownership are examples of intangibles belonging to this category. The other category relates to intangibles that are believed to be immeasurable. The services often referred as "public goods" offered by public sector agencies are often intangible and hard to valuate, e.g. "the value of community library" or "the value of a public park".

A commonly agreed and formal definition for intangibles has not been developed. The intangibles concept appears in numerous forms such as *intangible resources, activities, assets*, etc. Ducharme (1998) founds intangibles over the concepts *human capital theory* and *innovation theory*. This viewpoint is further extended by Brynjolfsson and Yang (1997), who relate concepts of *human capital, social capital, organizational capital,* and *relationship capital* to intangibles. Meritum guidelines (2002, p.11) discuss intangibles as close, or even synonymous concept to *intellectual capital* concept that includes elements such as R&D, technology, human resources, skills ("know-how"), training, education, organizational structures, marketing, customer and supplier networks, and software (OECD, 1999). *Intangibles, intellectual capital* and *knowledge* are often used indifferently in various contexts although the term *intellectual capital* originates from human resources literature and *intangibles* is originally an accounting term (Meritum, 2002, p.11).

Intangible asset is more restrictive, representing the set of intangibles or elements of intellectual capital that are susceptible of being recognized as assets in accordance with the current accounting model (Meritum, 2002, p.11). OECD (1999) defines intangible asset as *non material factor that contributes to the growth and performance of firms without being included in the traditional category of fixed (or monetary) assets*. Another definition is from Epstein and Mirza (2005). They defined intangible assets as *non-financial assets without physical substance that are held for use in the production or supply of goods or services or for rental to others, or for administrative purposes, which are identifiable and are controlled by the enterprise as a result of past events, and from which future economic benefits are expected to flow*.

Many different examples of intangibles related to private sector firms can be presented. In these firms, different parties (boards, steering committees, leadership teams, taskforces etc.) have to make decisions related to intangibles in real-life that are often considered to be immeasurable (directly or indirectly). Hubbard (2007) presents examples of these:

- The flexibility to create new products
- The risk of failure of an information technology (IT) project
- The productivity of research
- The value of information
- Quality
- The public health impact of a new government environmental policy
- The chance of one political party winning the White House
- Public image

Further examples are by Chareonsuk and Chansa-ngavej (2008) and Meritum (2002, p.14)

- Worker competences
- Customer loyalty
- Brand names
- Mastheads and publishing titles
- Computer software
- Licenses and franchises
- Copyrights, trademarks, patents and other intellectual property rights
- Recipes, formulas, models, designs and prototypes
- Tacit knowledge
- Contracts, e.g. logistics

2.2 Concepts of investment project assessment

2.2.1 Stakeholder concerns and benefit expectations

''Effective project managers require keen analytical and intuitive skills to identify stakeholders and work with them to understand their expectations and influence upon project success. This facilitates managing a process that maximizes stakeholder positive input and minimises any potential detrimental impact'' (Bourne & Walker, 2005)

To identify stakeholder concerns and benefit expectations, analysis of the relevant stakeholders is needed. The quote from Bourne and Walker (2005) captures the principal idea of stakeholder analysis, which is often the starting point for projects. The main purpose of doing a stakeholder analysis is to enable the project manager to take action in relation to the stakeholders of the project and their interests in a timely manner (Jepsen & Eskerod, 2009). When drafting a business case of a relatively unknown area, stakeholder analysis helps to sort realistic and unrealistic assumptions about the investment.

Stakeholder analysis aims to know the project stakeholders in order to receive their support for the project. Regarding investment decisions, it is relevant to have sponsors able to influence positively the investment's probability to succeed. Furthermore, it is vital to know a wide set of stakeholders, as the law of diminishing returns suggests that efforts are better expended spread across a range of stakeholders than concentrated on a few, because initial efforts yield a higher benefit than will later efforts (Jepsen & Eskerod, 2009). Traditionally stakeholders are categorized in dimensions of power, legitimacy, urgency, primary, and secondary, and should receive varying amount of attention based on this categorization (Jepsen & Eskerod, 2009).

Stakeholder analysis focuses the following activities (Schawlbe, 2008; Jepsen & Eskerod, 2009):

Activity 1: Determining who the relevant stakeholders are.
The identification of stakeholders can be done by scheduling brainstorming sessions, asking from other people inside organization, or using a generic stakeholder list. The stakeholders are single individuals or groups in firm internal and external environment. The relevant stakeholders include project managers, project team, functional management (HR, finance, manufacturing etc.), strategic & top management, client, and other stakeholders from internal and external environment.

The stakeholders inside a firm can be classified in a generic form as large firms are always structured to some extent. Internal stakeholders include project sponsors, project team, support staff, and internal customers for the project (Schwalbe, 2008). External stakeholders are project's customers outside the organization, competitors, suppliers, and

other external groups that are potentially involved in or affected by the project (Schwalbe, 2008). Different roles for strategic management and functional management (manufacturing, marketing, operations etc.) can be also distinguished. The focus in this thesis is on internal stakeholders who exist inside an organization.

Activity 2: Characterizing the stakeholders pointing out their

- ***a) needs, concerns and benefit expectations***
- ***b) needed contributions***
- ***c) power and interest in relation to the project***

This activity starts with identifying the underlying needs and concerns that the stakeholders have regarding the current state. Also the benefits that are expected from the investment must be identified by stakeholder. The need and concern areas will serve later on as requirements for the investment project design, which will provide solutions to the identified areas in the form of benefits. Techniques such as surveys, interviews, and expert advices can be used for this part.
After determining the needs and concerns of the stakeholders, the needed contributions to support the investment project must be identified. Needed contributions from the stakeholders include e.g. general positive attitude and supportive actions.

Finally, the stakeholder influence power and interest level in relation to the project is assessed. Most of the internal stakeholders want to see the success of the project while some may think it's irrelevant or even negative about it. No direct method for estimating influence and power exists, but one can assess the based on her knowledge about the stakeholders and organizational context.

Activity 3: Decision about which strategy to use to influence each stakeholder.
One of the key purposes of stakeholder management is to influence the relevant stakeholders to contribute to the project as needed. The chosen influence strategy depends on the required contributions from a specific stakeholder.

The problems related to stakeholder analysis include that the stakeholder's characteristics are often not identified correctly and the stakeholder coalition is not stable across as time advances. This means that project managers or other roles do not often have required resources, skills, or time to conduct a truthful stakeholder analysis or the environment is too complex to have all relevant stakeholders to be included in the analysis. Another problem is that project managers might be reluctant to explicitly express the stakeholder information as the information might be seen by the "wrong" people. Further, powerful interviewees might be difficult to interview and they might give too high expectations for the project. (Jepsen & Eskerod, 2009)

Despite the identified problems, stakeholder analysis often adds value to relationships between project management and relevant stakeholders. This is important from investment point of view as the goal is often to influence the environment to support the investment decision.

Stakeholder analysis is useful method for finding stakeholder concerns, which are often needed to know by project planning teams in order to build inclusive business cases. In addition to the concerns, stakeholder benefit expectations are needed to know. Collins dictionary defines a concern in many ways. The definition of a concern as *something that affects or is of importance to a person* is used here. A concern can be e.g. a risk with specific importance level or a requirement that the project should fulfill. In the context of stakeholder concerns, requirement is a property that the project outcome must have in order to provide value to a stakeholder. Analogously, concept of stakeholder benefit expectation can be used to describe the value that is provided by a required property. Kulkarni (2008) proposed a model concentrating on stakeholder concern perspective which highlights the following:

- Common platform for different stakeholders for better understanding of requirements
- Identifying the key stakeholders
- Prioritizing the requirements
- Stakeholders' relevance to the requirements
- Impact of quality on stakeholders' requirements

After the stakeholder concerns and benefit expectations are identified, classification helps to further understand the nature of them. If further processing is needed, classification can be useful as the classes bring structure to the concerns and benefits.

Bradley (2006) provides five different ways to classify benefits. These are classification by stakeholder, category, business impact, sigma value type, and change type.

- *Stakeholder classification* means distributing benefits across various stakeholder groups. This approach helps identifying problem areas and stakeholders to understand what they should expect.
- *Classification by category* (general, activity based, etc) is useful for benefit identification and consolidation of large number of benefits. Examples of general benefit categories include "cost reduction", "revenue generation", and "productivity". Activity based categories include e.g. "decision making", "problem resolution", "risk", and "costs". Later on, the categories can be used for finding duplicate benefits.
- *Classification by business impact*. This is helpful when checking strategy alignment and balance and when comparing the relative significance of benefits. One example classification is as follows: "productivity or internal improvement", "risk minimization or survival", and "growth".
- *Classification by Sigma value type*. The categories included here are "definite financial", "expected financial", "logical financial", "qualitative", and "intangible".
- *Classification by change type*. The categories included here are "doing new things", "stopping doing existing things", and "doing existing things a bit better".

The Sigma value type classification concentrates on the concepts of quantification and monetary. A framework for mapping across these dimensions is presented in Figure 7. Deprez et al (2001) called this framework "community benefit matrix" and intended it to be used for assessing benefits of establishing an ICT enabled virtual community.

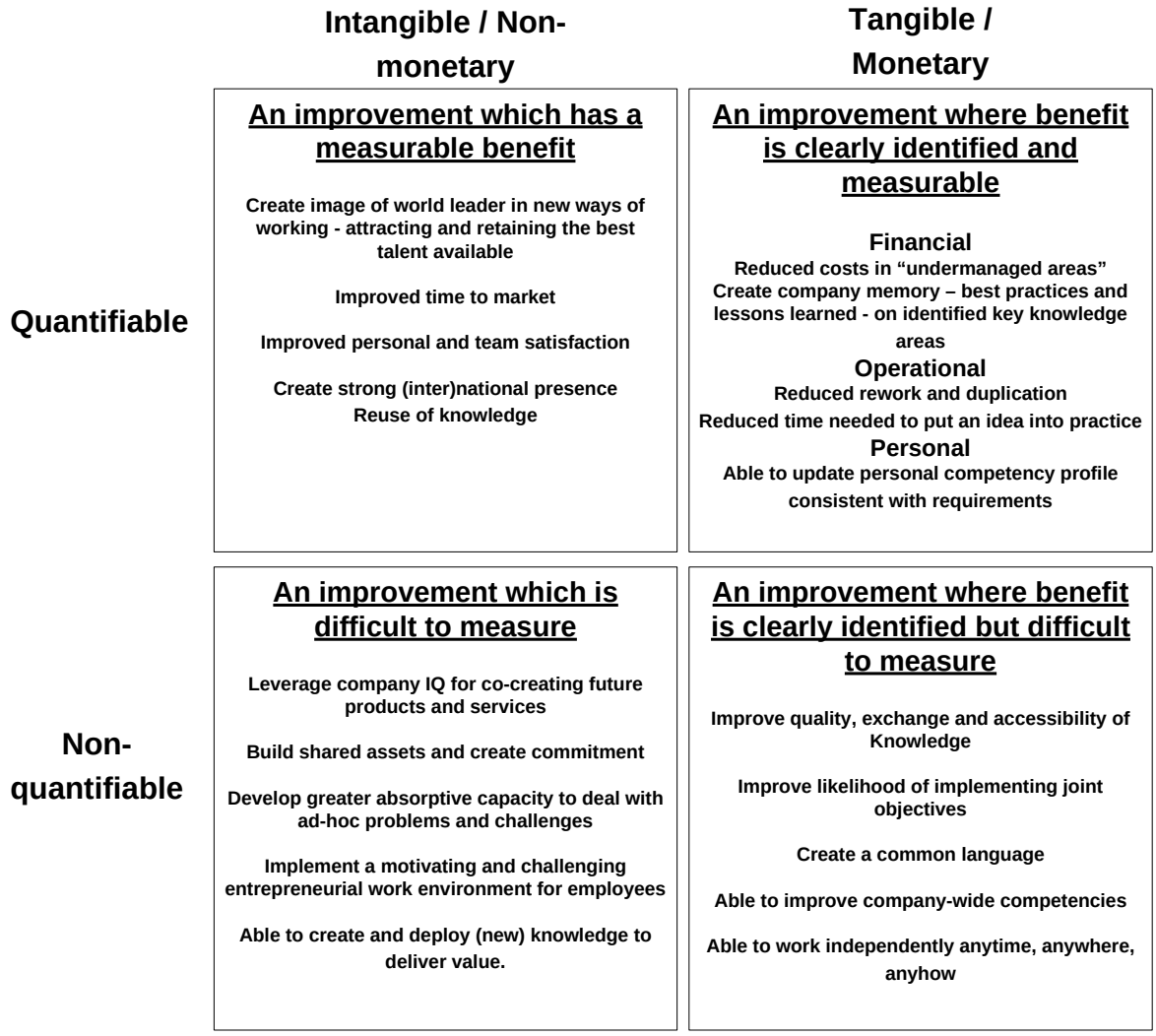

Figure 7. Benefit classification based on monetary and quantification dimensions Adapted from Deprez et al (2001)

Another viewpoint to classification is by Shanks et al (2003). They propose a classification framework, which divides information technology investment benefits to operational, managerial, strategic, IT infrastructure, and organizational dimensions. Operational dimension relates largely to firm's cost efficiency, cycle times, productivity, quality, and customer services. Managerial benefits might help firm to achieve better resource management, improved decision making and planning. Also benefits of strategic nature rise from the use of IT systems. Examples of strategic benefits include improvement in differentiation, alliance support, and external linkage support. IT infrastructure benefits

include business flexibility, IT cost reduction due to re-usability, and increased IT capability. The last dimension of organizational benefits consists of organization structure support, employee learning and empowerment, and common vision building. The dimensions are presented in Figure 8.

Dimensions	Sub-dimensions (21 in total at this stage)
Operational	1.1 Cost reduction
	1.2 Cycle time reduction
	1.3 Productivity improvement
	1.4 Quality improvement
	1.5 Customer services improvement
Managerial	2.1 Better resource management
	2.2 Improved decision making and planning
	2.3 Performance improvement
Strategic	3.1 Support business growth
	3.2 Support business alliance
	3.3 Build business innovations
	3.4 Build cost leadership
	3.5 Generate product differentiation (including customization)
	3.6 Build external linkages (customers and suppliers)
IT Infra-structure	4.1 build business flexibility for current and future changes
	4.2 IT costs reduction
	4.3 Increased IT infrastructure capability
Organizational	5.1 Support organizational changes
	5.2 Facilitate business learning
	5.3 Empowerment
	5.4 Built common visions

Figure 8. IT benefit dimensions
Source: Shanks et al (2003)

In addition to various benefit classification approaches discussed above, the concept of intangibles brings in a different approach to classification. A thorough review of intangible classification is by Guthrie and Yongvanich (2004) who compared different frameworks that can be used for intellectual capital performance reporting. The frameworks included those of Brooking (1996), Edvinsson and Malone (1997), Roos et al. (1997), and Sveiby (1997). The summary is depicted in Table 2.

Table 2. Comparisons of intangible classification frameworks
Source: Guthrie & Yongvanich, 2004

Brooking (1996)	Edvinsson and Malone (1997)	Roos et al. (1997)	Sveiby (1997)	Common features and components
Market assets Brands, customers and their loyalty and good distribution channels, favourable contracts, and various agreements such as licensing and franchises agreements.	**Structural capital –Customer capital** Customer satisfaction, longevity, price sensitivity, financial wellbeing of long-term customers	**Structural capital-Relationships** Relationships with customers, suppliers, alliance partners, shareholders, and other stakeholders	**External structure** Relationships with customers and suppliers and encompasses brand names, trademarks and the company's reputation and image	**External/ customer capital** Various IC frameworks concentrate on relationships between the company and its customers. However, Roos *et al*. (1997) extend relationships to cover relationship with various stakeholders.
Infrastructure assets Technologies, methodologies and processes which enable the organisation to function, which include management philosophy, corporate culture, information technology systems, databases of information on the market or customers, methodologies for assessing risk, methods of managing a sales forces, financial structure, networking systems, communication systems such as email, teleconferencing, and the ability to use the internet to sell goods, and financial relations	**Structural capital – organisational capital - Process capital** Work processes, techniques (such as ISO 9000), and employee programs that augment and enhance the efficiency of manufacturing or the delivery of services	**Structural capital -Organisation** All intellectual property assets, any activity inside the company that contributes to the creation of organisation capital and organisational culture	**Internal structure** Patents, concepts, models, computer and administrative systems, and corporate culture	**Internal/ infrastructure capital** Various IC frameworks similarly classify internal work processes as one source of company value. Mainly this category captures work processes, information technologies system, corporate culture, management philosophy.
Intellectual property Patent, copyright, design rights, trade secrets, knowhow, trade marks, service marks	**Structural capital – organisational capital - Innovation capital** The renewal capability and the results of innovation such as protected commercial rights, intellectual	**Structural capital -Renewal and development** All the items that have been built or created and that will have an impact on future value, but have not manifested that impact yet such as new patents filed.		Most authors incorporate intellectual property assets into the internal/infrastructure capital. Roos *et al.* (1997) differentiate between those that are being developed and those that were developed.

	property, and other intangible assets and talents used to create and launch new products and services			
Human-centred assets Education, vocational qualification, work related knowledge, occupational assessments, psychometrics, work related competencies	**Human capital** The combined knowledge, skill, innovativeness, ability of employees, company's value, culture, and philosophy	**Human capital** Competence, attitude, and intellectual agility	**Employee Competence**	**Human capital** Various authors commonly classify employee's knowledge and skills of employees into this category.

Chareonsuk and Chansa-ngavej (2008) provide another comparison of different categorization attempts for intangibles. This comparison is presented in Table 3. There are many similarities as the authors Sveiby, Edvinsson, Malone and Roos et al. are covered in both comparisons. In addition, Wingren's (2004) and Kaplan and Norton's (1992) categorization is presented but Brooking (1997) is missing.

Table 3. Approaches for the categorization of intangible assets
Source: Chareonsuk & Chansa-ngavej, 2008

Kaplan and Norton (1992)	Sveiby (1997)	Edvinsson and Malone (1997)	Roos et al. (1997)	Wingren (2004)
Balanced scorecard	Intangible assets monitor	Skandia value scheme	Intellectual capital	Balanced scorecard with intellectual capital
Financial				Financial and expectation
Customer	External structure	Customer capital	Structural capital	Customer
Internal processes	Internal structure	Organizational capital		Internal process
Learning and growth	Competence structure	Human capital	Human capital	Learning and growth

By observing Table 2 and Table 3, it can be seen that human, structural, and relational capital keep constantly appearing as classifications. Meritum guidelines (2002, p.13) uses also this classification scheme including the aspects of previously discussed frameworks. Meritum (2002) provides the following definitions for intellectual capital, which is used synonymously to intangibles:

- ***Human capital*** is defined as the knowledge that employees take with them when they leave the firm. It includes the knowledge, skills, experiences and abilities of people. Some of this knowledge is unique to the individual, some may be generic. Examples are innovation capacity, creativity, know-how and previous experience, teamwork capacity, employee flexibility, tolerance for ambiguity, motivation, satisfaction, learning capacity, loyalty, formal training and education.
- ***Structural capital*** is defined as the knowledge that stays within the firm at the end of the working day. It comprises the organizational routines, procedures, systems,

cultures, databases, etc. Examples are organizational flexibility, a documentation service, the existence of a knowledge centre, the general use of Information Technologies, organizational learning capacity, etc. Some of them may be legally protected and become Intellectual Property Rights, legally owned by the firm under separate title.

- ***Relational capital*** is defined as all resources linked to the external relationships of the firm, with customers, suppliers or R&D partners. It comprises that part of Human and Structural Capital involved with the company's relations with stakeholders (investors, creditors, customers, suppliers, etc.), plus the perceptions that they hold about the company. Examples of this category are image, customers loyalty, customer satisfaction, links with suppliers, commercial power, negotiating capacity with financial entities, environmental activities, etc

Another aspect to the stakeholder concerns rises from the concepts of costs and risks. Investment project related costs and risks are always manifestations of stakeholder concerns. Many attempts to classify investment costs in different contexts of knowledge management, IT, and corporate restructuring have been made (Li & Yuan, 2008). Some financial costs including components of tangible and intangible nature include:

- Organization costs
- IPR expenses
- R&D cost
- Training expenses
- Marketing costs
- Purchased technology cost
- IT expenses (hardware, software, networks)
- Corporate restructuring costs

Närman et al (2009) formulated a framework for assessing IT investment costs. The cost taxonomy included in the framework is presented in Figure 9. Project management costs involve all administrative work performed to specify, plan and coordinate the IT project itself according to some project model. The costs of maintaining and operating a system include costs for licenses and agreements; overhead; support, monitoring; maintenance and security costs; and costs for upgrades. (Närman et al, 2009)

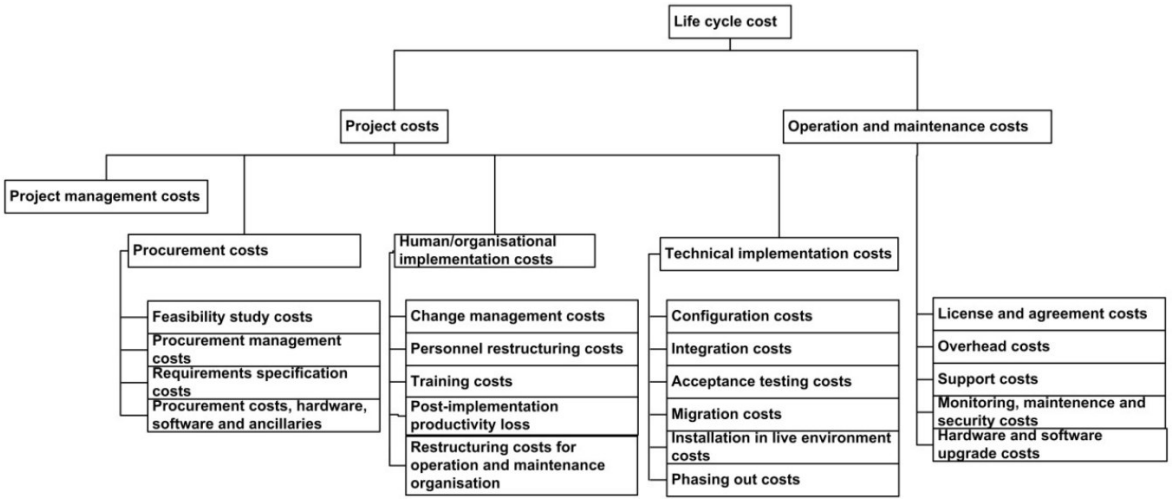

Figure 9. IT investment cost taxonomy
Source: Närman et al (2009)

Costs can also occur when business critical projects, such as implementation of a large-scale ERP system, involve risks that can disrupt the business (Monk & Wagner, 2008, p.34). For example, the time that is used to implement the project might hurt sales. Other factors that affect ERP system costs include the size of the software, new hardware, consultants' and analysts' fees, and training (Monk & Wagner, 2008, p.34).

When evaluating the costs of a project, it is essential to take into account *sunk costs* which originate from pre-investment work on the subject. This work might relate to e.g. R&D and pre-processing activities. If a company is choosing between investment options, uses financial method such as IRR as selection criterion, and chooses to invest in a project with high sunk costs, it might fail to attain the financial goals or even fall into bankruptcy (Turner, 2008, p.31).

The costs involved in intangible investments are not always expressed in financial terms (Meritum, 2002, p.18). It is noted that the development and acquiring of intangible resources is costly, but because of lack of reporting culture on intangibles, they are not visible in corporate financial reports.

A risk is another manifestation of stakeholder concern. MSP (OGC, 2007) defines risk as *things that may happen at some point in the future and require positive management to reduce their likelihood of happening*. When concretized fully or partially, the risks involved in investment projects may result in failure. This is why the risks involved should be taken into account when building the business case for the investment. Identifying risks helps managers involved in the investment decision to better understand the weaknesses and threats arising from the surrounding environment and the investment itself. Many risks can be identified on single basis, but the underlying base consists of complex mix of external environment and organizational structures which makes the identification process harder. Examples of risks which are common to investment projects include budget short or not approved at all, communication problems due to e.g. corporate culture reasons or network

outage, and schedule risk. Additional tools such as risk matrixes (e.g. probability - impact) can be used for visualization. Common to PMI's and ISO's guidelines to risk management are the following:

- ***Risk identification.*** Identifying risks through expert consultation, brainstorming, checklists, and other methods. Both qualitative and quantitative analysis methods can be used here. Each identified risk should have at least a risk number, title, description, impact estimation on resources, probability estimation, and triggering event. Depending on the scenario also other attributes can be used to further assess the risks.
- ***Risk planning.*** This step involves setting up pre-emptive actions that the risks could be avoided. For each risk, an owner should be assigned to ensure that the risk is managed according to the occurrence level.
- ***Risk action.*** The actions related to the occurrence of the risk should be described at this phase.

Shanks et al (2003) identified common risk factors related to ERP projects. The authors divided the risks into categories of organizational fit, skill mix, management structure and strategy, software system design, user involvement and training, and technology planning/integration. Some of the risks were seen as unique to ERP projects ("inability to avoid technical bottlenecks", "failure to adhere to standardized specifications which the software supports", etc) whereas some were common to enterprise-wide projects ("lack of senior management support", "ineffective communications", etc).

2.2.2 Project related cost and benefit evaluation

Identifying the costs and benefits that an investment project can deliver is merely the starting point of an evaluation process. To further understand the relationships between costs and benefits and in order to estimate them, various methodologies are needed. This chapter focuses discussion on how costs and benefits can be evaluated.

Benefits are often interlinked and dependent on each other and many of them are concretized by a route of other benefits. Benefit map or benefit dependency network is a tool to present different benefit elements and relationships between them. An example of benefit dependency network is presented in Figure 10. An IT project benefit map consists of drivers, primary investment objectives, benefits, business changes, enabling changes, and IS/IT enablers (Wilson et al, 2006). A *driver* is a view by top managers as to what is important for the business, such that the business needs to change in response *Investment objectives* are a clear statement of what the project is trying to achieve. Changes in organization's working practices are captured in *business changes* whereas the establishment of new organizational mechanisms e.g. steering groups are captured in *enabling changes*. Technology changes are listed under *IS/IT enablers*. Bradley (2006) sees benefit maps useful for:

- managing benefits realization, especially dependent changes
- assessing the impact of unexpected changes – internal and external
- communicating expectations
- tracking benefits
- avoiding double counting of benefits
- attributing benefits to their source
- maximizing benefit realization

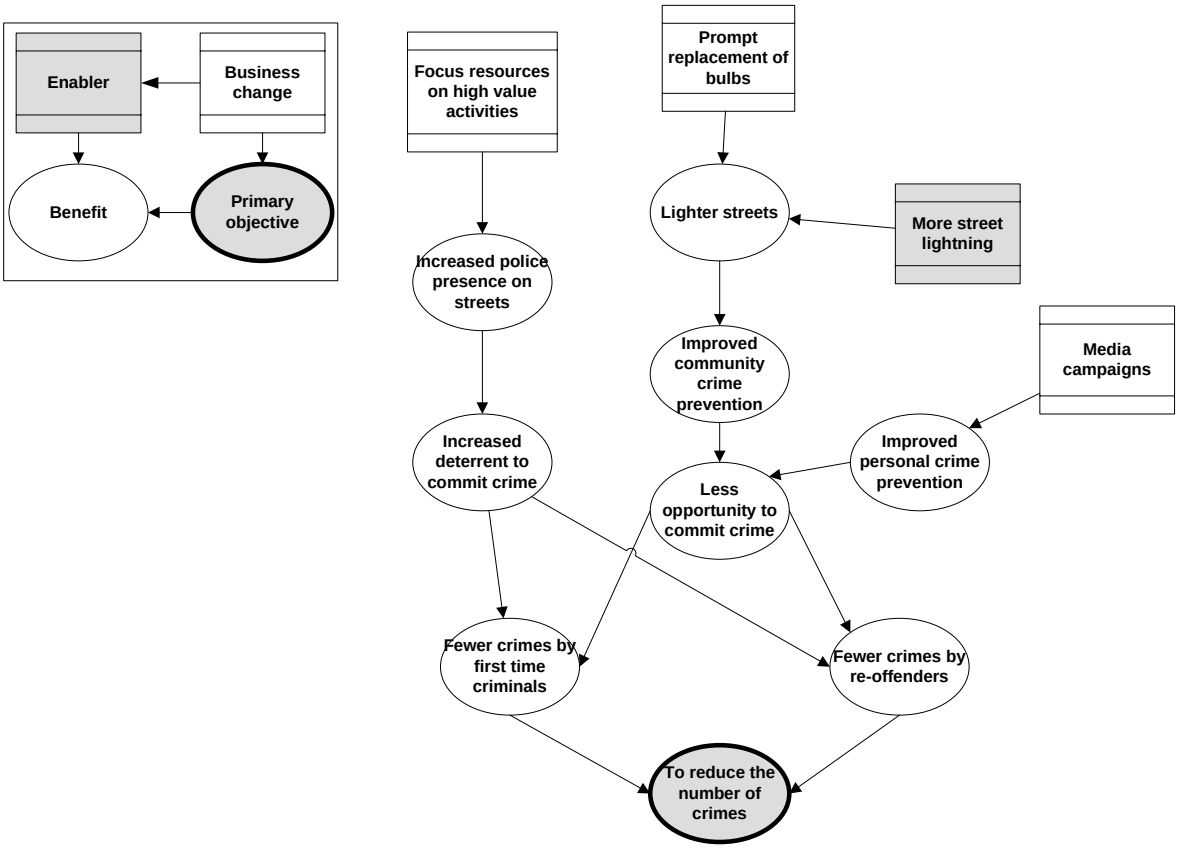

Figure 10. Example illustration of benefit dependency map
Adapted from Bradley (2006)

Historically the measurement and valuation of intangible benefits has been a challenge, but due to increased importance of intangibles in firms' value creation the topic is very current also in the practitioner field. The difficulty of measuring intangibles is due to several reasons and these are discussed e.g. by Monk and Wagner (2008, p.36). The benefits and costs accrue on a long period making them hard to track. As the time-span is long also other business factors affect the same metrics that are used for tracking investment performance. Sometimes the company which does not invest in intangibles is forced out of business – how do you calculate the monetary advantage of remaining in business? As many intangibles have high strategic importance for a firm, it is no longer valid to consider them as immeasurable.

Bradley (2006) defines benefit value as *the magnitude of the improvement associated with the benefit*. The benefit value needs not to be financial, although many times monetary value is certainly sought after. Benefits are often measured after the implementation, but while creating a business case for a project, they must be estimated. Strategic management and project managers must be able to evaluate the financial costs and returns of such systems in concrete numbers to justify the rationale behind investments. While level of production and return on assets are of quantitative nature, intangibles such as motivation of employees, environmental performance, or satisfaction of customers are qualitative (Turner, 2008, p.29). Sometimes the performance measures are both quantitative and qualitative, such as number of complaints (Turner, 2008, p.29).

Aside of creating new intangible resources, an investment may enhance the co-operation of existing intangibles with other resources. This raises a new challenge of measuring such enhancement. For example, increased information sharing between functional departments may result in shortening of lead times. These kind of vague and complex examples of intangible benefits bring no value, but should rather be broken down into a series of simple concrete benefits (King & Schrems, 1978). In the case of previous example, these simplified benefits would be such as fewer faults in operations, faster manufacturing procedures, removal of a wasteful process etc. This is how a complex intangible benefit can be assessed by measuring the constituting benefits. King and Schrems (1978) provide means to evaluate intangibles while conducting a cost-benefit analysis:

- Set best and worst boundaries on the intangible values
- Find similar or alternative tangibles that are easier to valuate
- Conduct sensitivity analysis using pessimistic, realistic, and optimistic assumptions
- Perform a break-even analysis

Kyte (2008) also discusses ranging used during evaluation and elaborates possible pitfalls as the upper and lower boundaries are also estimates. Kyte (2008) considers that this should not be a problem since seeking the "one number" is an attempt to oversimplify a complex topic.

Wehrs (1999) and Murphy & Simon (2001) differentiate between ex ante and ex post evaluation. In ex ante evaluation the focus is on justifying the investment before it is made, and in ex post evaluation the goal is to justify costs that have been incurred so as to guide future IT expenditures.

Ganly (2008) discusses that in order to measure intangible business benefits post implementation a current-state baseline must be set which will be used as the reference point for measurement. This may require a lot of effort, but is essential part of measurement process and should be established prior to the implementation. Late establishment of the baseline is a common flaw and may ruin the measurement process as the earlier state is not known. The baseline documents the current performance level, which may be related to benefit metrics, such as head count, current costs, process, profit, and time spent on

activity. After the investment project implementation, the benefits should be reviewed to see what benefits have been realized and compare these against the benefits identified in the business case (Ganly, 2008). Related to the measurement aspect, the review process should include (Ganly, 2008):

- Measuring current values of the agreed-on KPIs
- Measuring recurring operating costs for the applications and identify opportunities for cost reduction
- Revalidating and re-quantifying the business benefits from the current KPI values

Return on investment (ROI) is a common financial measure to calculate project's value. Some consulting firms even refuse to do ERP implementations if their clients do not commit in calculating ROI (Monk & Wagner, 2008, p.36). Several examples can be provided to assist calculating ROI for an ERP investment (Monk & Wagner, 2008, p.36):

- Eliminated duplicated data generates savings in operations expense
- Increased sales volumes due to faster production of goods and services
- Better communications between customers that lead to better relationships and increased sales

As part of calculating the ROI, evaluation of time savings is often needed. The time saved by employees after introducing a new process or production method can easily be determined (Mishan & Quah, 2007, p. 179). For example, if productivity is increased by X% and the production time is reduced by Y%, the valuation for the saved time is trivial. In knowledge work, the valuation of saved time is not straightforward as it is more complex to measure the outputs. This is noted also by King and Schrems (1978), who see that one of the greatest problems regarding intangibles is how to assign value to information. King and Schrems (1978) perceive all information having value potential which is unknown until a decision is made and the results can be measured. Furthermore, King and Schrems (1978) discuss that the value of information can be calculated as the difference in the expected value of the decision with and without the information.

Intangible benefit valuation has great significance in corporate context, as was discussed Chapter 2.1.4. MERITUM (Measuring intangibles to understand and improve innovation management) was the first extensive research project that aimed to formulate a set of guidelines for identifying, measuring, and monitoring intangible sources of corporate value. The project was executed between 1998 and 2001 with six European countries involved. The guidelines include a framework for organizations willing to report their intangible strategic resources of value creation. These reports should help the providers of capital to estimate the future payoffs and the risks associated with their investment opportunities. The scope of the guidelines is broad, as they can be utilized regardless of organization type. The guidelines are not assumed to be followed strictly, but instead each organization should develop their own process for intangibles management. This is because intellectual capital tends to be unique in each organization. Nevertheless, providing guidelines is an attempt to

encourage firms to produce information on intellectual capital by providing a common conceptual framework. (Meritum, 2002)

The report presents a three-phase process for firms willing to manage their intangible assets. The management process starts with identification of intangibles, continues with measurement, and concludes with action. The starting point of the identification part is the vision statement of the firm. The intangibles to be identified are aligned with firm's future strategic goals and these are visible in the vision statement. Table 4 presents the Meritum intangible indicators for organization-wide assessment. (Meritum, 2002)

Table 4. Meritum intangible indicators
Source: Meritum (2002)

INTANGIBLE	INDICATOR	Type*
Highly trained staff	% of employees with higher education, intermediate, grammar school	NFI
Training Activities	a) Total number of training hours received by managers relative to total training hours b) Total training cost per key employee c) Average satisfaction of the employees with competence development	NFI FI NFI
Employee Survey	a) Average satisfaction of the employees with training activities b) Cost of the survey c) Average satisfaction with leadership	NFI FI NFI
Patents	Number of patents filed over the last year	NFI
R&D activities	R&D expenditures	FI
Analysis of R&D rate of return	R&D as a percentage of turnover	FI
Flexibility-Structural Capital	a) % of projects that are based on interdepartmental co-operation b) Average employee satisfaction with the work organization	NFI NFI
Increase codified routines	% of critical processes that have a Manual	NFI
Use of codified routines	% of critical processes that follow the Manual	NFI
Flexibility-Relational Capital	Average order response time, from customer order until final delivery	NFI
Select and act on key customers	a) % of sampled customers in the customer satisfaction survey b) Average satisfaction among key customers	NFI NFI
Loyal customers	a) % of long-term customers (5 years or more) to total number of customers b) % of turnover related to long-term customers	NFI FI
Direct marketing	Direct marketing expenses as a percentage of total costs	FI
Customer survey	a) Average satisfaction of the customers with the firm's products and services b) Cost of the survey c) Average satisfaction with meeting firm representatives	NFI FI NFI
Flexibility-Human Capital	a) % of workforce with above-average working hours b) Cost of tele=work as a percentage of total labor costs	NFI NFI
Job Rotation	% of workforce with yearly job rotation	NFI

*NFI: Non-Financial Indicator; FI: Financial Indicator

The scope of the Meritum is organization wide, whereas single investment project is in the focal point of this thesis. Nevertheless, there are some relevant findings which make the discussion on Meritum guidelines worthwhile. First, the separation of financial and non-financial categories highlights the fact that although the indicators can be quantified, they cannot be expressed in monetary terms. Second, Meritum divides intellectual capital in terms of human, structural, and relational capital, which is also applicable in the scope of a single investment project.

Another theory which includes assessment of investment related costs and benefits is the theory of real options. There exist two families of *financial options* - American and European options, which can be "put options" or "call options". An option is simply the right to obtain an asset at later time, at a pre-specified price (call option) or the right to sell an asset at a later time, at a pre-specified price (put option). The price of the options is largely influenced by the future uncertainty related to the underlying asset. In a narrow definition sense, *real option* is the right to trade a physical asset at a future time at a predetermined price. The concept of real options has largely developed from the financial options theory. In addition to two previous options, *strategic option* can be distinguished. A strategic option represents capability to deploy a selected strategy.

Real options analysis has been successfully and widely utilized in financial sector and it has also been applied to various types of investment projects on e.g. IT, electronics, and real-estate industries. Uncertainty of real options asset values is clearly an issue, especially in IT projects. The traded asset values of financial options are known exactly but real options involve estimation errors whose magnitude can be significant. In order to make sound decisions, real options analysis requires constant monitoring of analysis related data and updating the model accordingly.

According to Mun (2006, p.1), real options can be used in different industries such as oil and gas exploration, pharmaceutics, e-commerce, IT infrastructure investment justification, prioritization of venture capital investments, mergers and acquisitions, research and development, Internet-startup valuation, and so forth. He continues that "*investment strategies with high risk and uncertainty or irreversible corporate decisions coupled with managerial flexibility provide the best candidates for real options*". As before investment decisions were straightforward such as "buy more machinery, produce more, and make more profit". Real options are needed as more complex scenarios where multiple strategic paths exist. Mun gives examples of these scenarios with questions such as "which path do you choose?", "if you choose the wrong path, how do you get back on the right track?", and "what is the optimal timing to a second or third round of financing?" These are the questions that real options are used to search answers for. Alongside with the strategic decision making, real options are useful for capital investment decisions, such as "should a firm invest millions in a new e-commerce initiative?"

When traditional methods such as discounted cash flow are used for assessing investment decisions, the outcome of identified benefits and implementation costs is negative indicating that the investment should not be done. Real options take into account the future

strategic options for the firm, instead of just focusing on the current savings. Mun (2006, p. 19).

2.2.3 Project feasibility evaluation

To construct a holistic picture of evaluation of investment projects, it is relevant to discuss the concepts of project and project portfolio management (PPM), scorecard evaluation methods, and cost-benefit analysis (CBA). Being part of operational management area, project management is not discussed extensively. Project portfolio management is part of strategic management area (Archer & Ghasemzadeh, 2004) and is closer to the focus area of this thesis.

Project is a *temporary endeavor undertaken to create a unique product or service* (PMI, 2000). Turner (2008) highlights the importance of corporate change by defining a project as a *temporary organization to which resources are assigned to work to deliver beneficial change*. A project portfolio is *a group of projects to be carried out under the sponsorship of a particular organization* (Archer & Ghasemzadeh, 2004). Another definition is from Tikkanen et al (2007) who define project portfolio as *a collection of projects that are carried out in the same business unit sharing the same strategic objectives and the same resource pool*. In addition to projects and project portfolios, project programs can be distinguished. Murray-Webster and Thiry (2000) define a program as a *collection of change actions (projects and operational activities) purposefully grouped together to realize strategic and/or tactical benefits*. Typical project and project portfolio processes are presented in Figure 11.

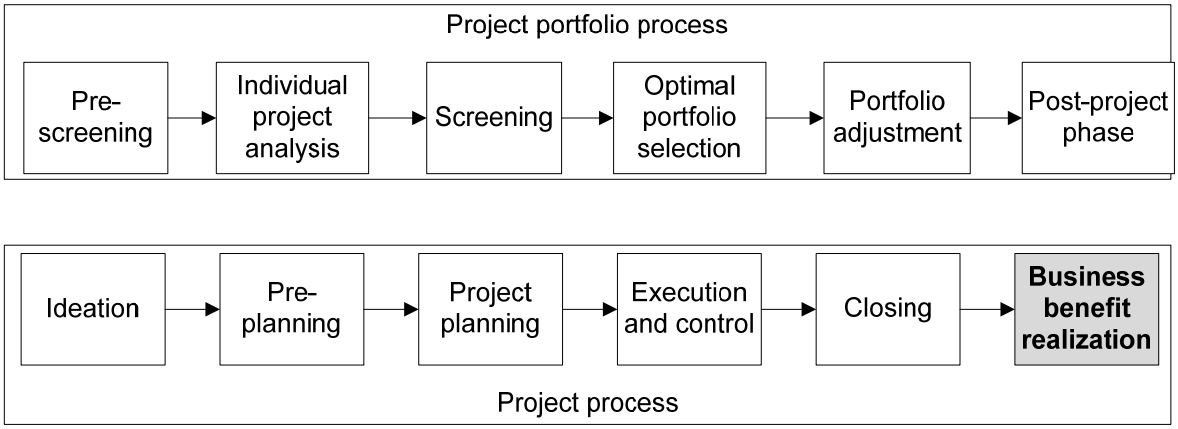

Figure 11. Product and portfolio processes
Source: Adapted from Archer & Ghasemzadeh (2004); Turner (2008)

Project portfolio selection is the periodic activity involved in selecting a portfolio from the set of available project proposals and from projects currently under way. Common metrics for portfolio selection include technology and market risk, completion time, and return on investment, and typical values for these vary between industries. (Archer & Ghasemzadeh, 2004)

Traditional approach to project management considers projects as a collection of activities that need to be completed within triple constraint: time, resource budget, and performance goals. From guideline point of view "one size first all" has been dominant in project management practices. Shenhar and Dvir (2007) considered traditional approach inadequate and developed practice of adaptive project management. The shift in the mindset concerning project management is illustrated in Table 5.

Table 5. From traditional to adaptive project management
Source: Shenhar & Dvir, 2007

Approach	Traditional project management	Adaptive project management
Project goal	Getting the job done on time, on budget, and within requirements	Getting business results, meeting multiple criteria
Project plan	A collection of activities that are executed as planned to meet the triple constraint	An organization and a process to achieve the expected goals and business results
Planning	Plan once at project initiation	Plan at outset and replan when needed
Managerial approach	Rigid, focused on initial plan	Flexible, changing, adaptive
Project work	Predictable, certain, linear, simple	Unpredictable, uncertain, nonlinear, complex
Environment effect	Minimal, detached after the project is launched	Affects the project throughout its execution
Project control	Identify deviations from plan, and put things back on track	Identify changes in the environment, and adjust the plans accordingly
Distinction	All projects are the same	Projects differ
Management style	One size fits all	Adaptive approach; one size does *not* fit all

To extend the traditional triple constraint, Shenhar and Dvir (2007) provide multidimensional success criteria for evaluating project performance. The authors establish the criteria on the idea that "what you measure is what you get" and on investment benefit analysis. In addition to the success criteria, Shenhar and Dvir (2007) developed "The Diamond Approach" for project risk and benefit assessment. The four dimensions in the diamond model are novelty, technology, complexity, and pace (NTCP). The five criteria for creating business-focused and success-oriented project and the NTCP-model are presented in Figure 12 and Figure 13, respectively.

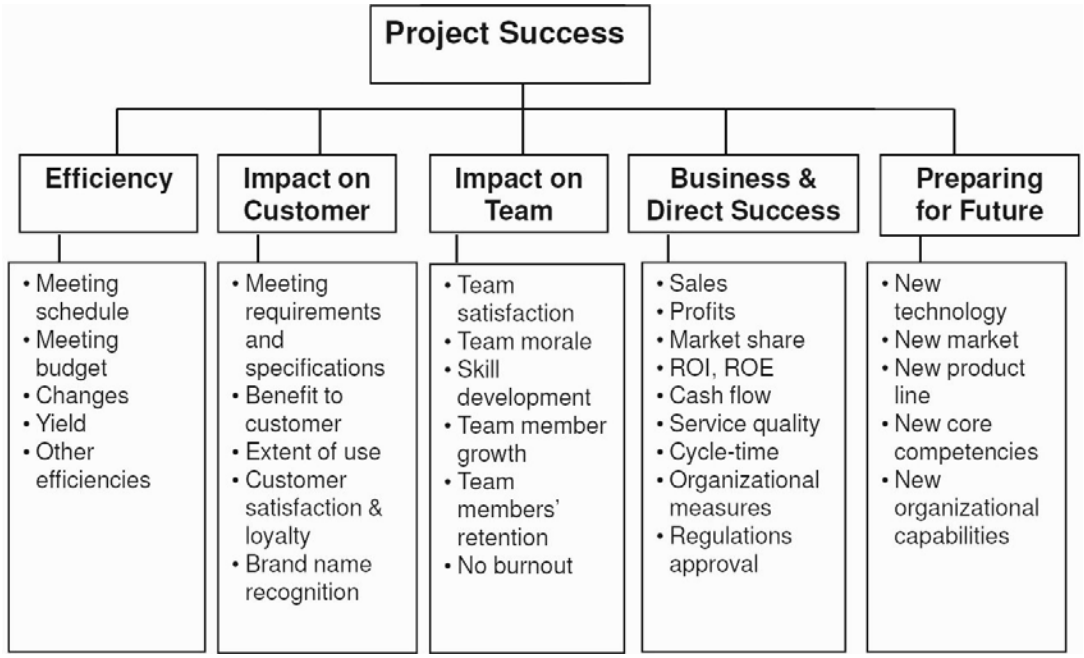

Figure 12. Project success criteria
Source: Shenhar & Dvir (2007)

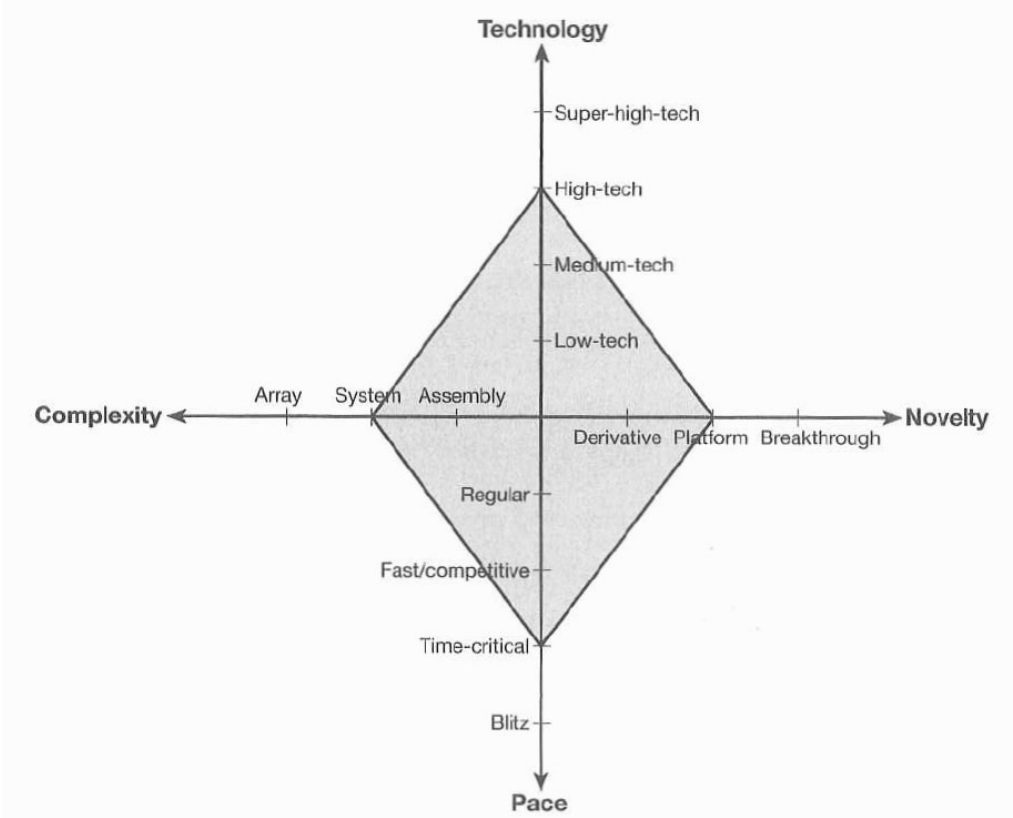

Figure 13. NTCP model
Source: Shenhar & Dvir (2007)

In addition to Shenhar's and Dvir's (2007) success factors, Young & Jordan (2008) provided evidence that top management support is the most important critical success factor for project success and is not simply one of many factors. Other important success factors included user involvement (from low to high), project methodology formality, high-level planning (realistic or not), and project staff competency.

Cooper et al (2001) studied the usage of different portfolio management practices in large sample of firms. In addition, Bitman and Sharif (2008) provide a comprehensive list of perspectives, criteria, and models used by scholars for assessing R&D projects. The findings are presented in Table 6.

Table 6. Project portfolio assessment perspectives
Adapted from Cooper et al (2001) and Bitman and Sharif (2008)

Perspectives	**Portfolio management practices**	**Criteria**
Finance Customers Growth Innovation Competitive advantage Attractiveness Business strategy fit Probability Efficiency Effectiveness	Financial methods Business strategy Portfolio maps (bubble diagrams) Scoring models Checklists	Profit Sales Technical Capabilities Risk Market share Quality Cost Success probability Internal processes Competitors Political

Cooper et al (2001) came to conclusion that *financial methods, although most popular and rigorous, yield the worst results overall, while top performing firms rely more on non-financial approaches – strategic and scoring methods*. Scoring models involve evaluators to give scores to projects on different scales, e.g. low-medium-high, 1-5, or 0-10, and after this the scores are weighted to produce final score. Check lists project evaluation includes collecting a set of Yes/No answers to questions and analyzing the results to converge in decision. In bubble diagrams (portfolio maps), projects are plotted on an X-Y plot and categorized e.g. as pearls, oysters, white elephants, and bread-and-butter projects. Other project assessment methods include strategically driven process (choosing is based on strategy), using multiple criteria (profitability, strategic, customer appeal etc), or simply using intuition and experience. (Cooper et al, 2001)

Scorecards are useful tools for a specific business situation and they are often used to evaluate projects on different dimensions. Scorecards are helpful to clarify project scope and spot weaknesses and strengths. They also provide assistance in e.g. strategic decision making, R&D project selection, new product selection, capturing customer's needs, designing new products, promoting creativity, monitoring and controlling development projects (Brady, 1997).

The balanced scorecard (BSC) method was originally introduced by Kaplan and Norton (1992) as a framework to link financial performance with non-financial operational measures: internal process, learning and growth (innovation and improvement), and customer perspectives. The latter ones with non-financial characteristic are seen as the sources for firm's future financial performance. The BSC concept is presented in Figure 14 (Chareonsuk & Chansa-ngavej, 2008). According to Kaplan and Norton (1992) the rationale behind balanced scorecard concept is that *traditional financial accounting measures like return-on-investment and earnings-per-share can give misleading signals for continuous improvement and innovation*. This is why the authors provide the BSC concept to link the financial performance with other measures to see a broader view of specific business situation. *Strategy maps* is Kaplan's and Norton's (2000) concept that is used to visualize the causal relationships between BSC's perspectives. BSC is one of the most used methods for valuating intangibles, although it was not meant originally for this purpose (Marr & Adams,2004; Mouritsen et al, 2005). The strategy maps framework (Kaplan & Norton, 2004) is a mean to connect intangible assets to strategic value creation processes.

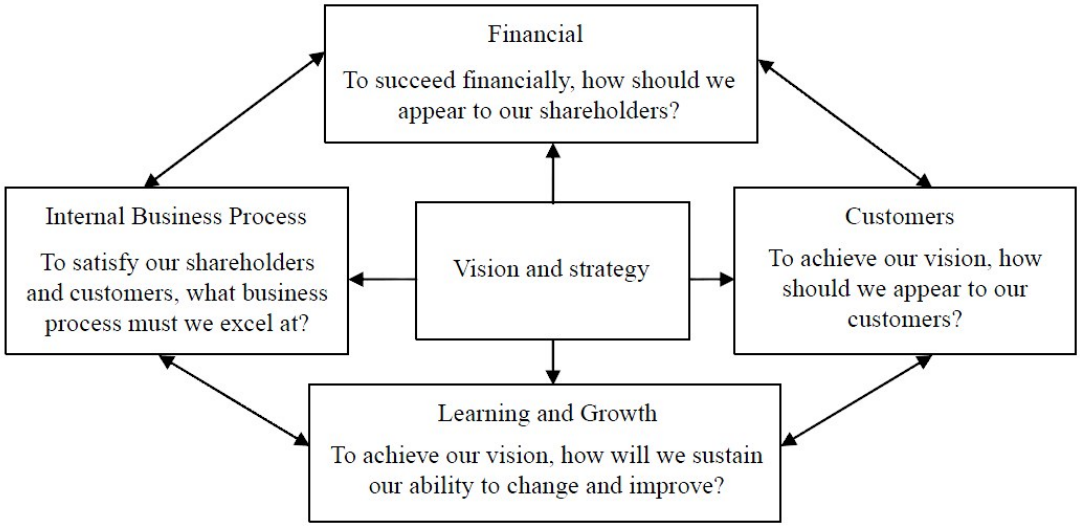

Figure 14. Balanced scorecard concept
Source: Kaplan & Norton (2004)

One example of utilization of BSC is by Mirani and Lederer (1998). They provide a balanced scorecard framework for assessing IT investment opportunity benefits on three dimensions: strategic, informational, and transactional. The framework is presented in Table 7.

Table 7. Balanced scorecard framework for assessing IT investment opportunity benefits
Source: Mirani & Lederer (1998)

Strategic benefits	Informational benefits	Transactional benefits
Competitive advantage	*Information access*	*Communication efficiency*
Alignment	*Information quality*	*System development efficiency*
Customer relation	*Information flexibility*	*Business efficiency*

Another utilization of BSC is by Chareonsuk and Chansa-ngavej (2008) who used the balanced scorecard strategy map method for intangible asset management framework development. They introduce a two-phase framework of phase 1 involving the intellectual asset identification in the functional departments and phase 2 for establishing the cause-effect relationships between the intangible assets of the various functional departments and the financial performance of the organization.

BSC's aim to connect different business domains is vital for project assessment. This is common for many scorecard approaches. Cross-domain evaluation is provided also by Bitman and Sharif (2008), who introduced a form for R&D project evaluation. They divide the evaluation domains into five different perspectives of reasonableness, attractiveness, responsiveness, competitiveness, and innovativeness that are presented in Figure 15. The five perspectives are split into multiple criteria that are used for scorecard evaluation. Examples of the criteria used include "Tools needed to perform the project", "Strategic fit of this project within the firm", and "Ecological implications of performing this project". The evaluation results can be used to form radar diagrams similar to Shenhar's and Dvir's NTCP-model which are useful for comparing different projects.

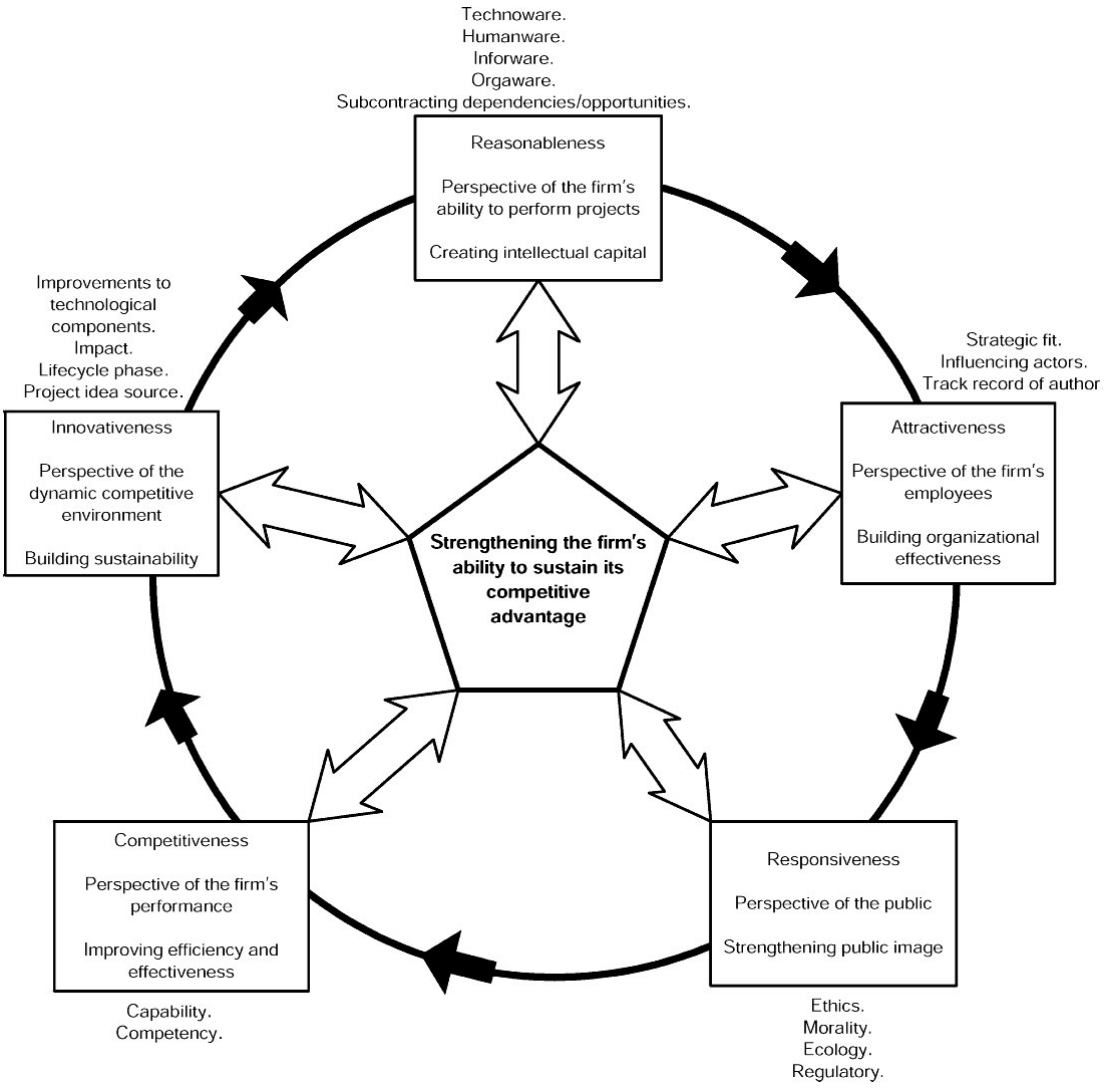

Figure 15. Project evaluation perspectives
Source: Bitman & Sharif (2008)

Cost-benefit analysis is another method for comparing project related costs vis-à-vis benefits to form an overall evaluation of an investment project. CBA originally established on concepts of consumer surplus and externality. The theory originates from the work by Jules Dupuit in 1844 and Pigou in 1920s. The consumer surplus concept was pointed out as an example of that when users pay a toll for the usage of a bridge, they gained various benefits. In the scope of this thesis, cost-benefit analysis (CBA) will be discussed in the context of intra-firm strategic investment projects in private sector. Although having a strong background of public sector projects and programs (health care, civil engineering, etc.), the basic principles of CBA apply in private business sector as well.

Theoretical framework for CBA was established in 1958 by three economists Eckstein, Krutilla, and McKean. After this, the use of CBA institutionalized as US, UK, and Canada required to use CBA for certain policies and projects. A vast amount of literature and

papers was published on the subject in the 60s-70s. Alongside governments, also institutions such as OECD and World Bank adopted CBA. Despite the strong background of development in the public sector's health care and environmental projects, CBA is currently used in both international firms and governments. (Mishan & Quah, 2007, p.243)

The cost and benefit analyses in public sector often concentrate on the accumulation of social benefits. *Opportunity cost*, which is the social value foregone when the resources in question are moved away from alternative economic activities into the specific project (Mishan & Quah, p.5), should create sufficient amount of social benefit for a specific project to be worthwhile. Other closely related concepts are Pareto efficiency and Kaldor-Hicks efficiency. An example of utilizing CBA public sector projects: CBA results in that an investment should be made to a fence on a mountainside if the monetary cost of building it should be less than the healthcare costs of people injured in fall accidents. A similar situation occurred with the case of Ford Pinto model, which burst often into flames causing injuries and deaths when colliding with another car. Ford decided not to recall the delivered car base after committing a cost-benefit analysis which estimated recall costs to be 88 million dollars larger than the benefits. Other example is that governments utilize CBA to assess different strategy alignments, e.g. whether they should invest in construction of roads or improving the education system. In private sector the costs are related to tangible and intangible resources that a firm possesses. When a CBA conducted in public sector concentrates on the social welfare and public's willingness to invest, private sector is more interested in benefits for firms and their stakeholders.

According to Mishan and Quah (2007, p.3) CBA is a technique to answer to the question of whether a project or program, or a number of them, should be undertaken, when the investable funds are limited. CBA is also relevant technique when a set of projects or programs in the previous scheme should be chosen. Finally, CBA is relevant for addressing the question of what kind of operational level a factory should have and what kind of outputs should it produce. It is common in CBA that the identified costs and benefits are expressed in financial terms, even the cost-benefit elements under evaluation would be of "less tangible" nature. CBA should not be confused with cost-effectiveness analysis (CEA), which aims for choosing a best alternative to comply a set of requirements.

Another viewpoint is by King and Schrems (1978) who point out three different ways of usage of CBA. First, it can be used as a planning tool for assistance in choosing among alternatives and allocating scarce resources among competing demands. Second use case is usage as auditing tool for performing *post hoc* evaluations or follow-up studies of an existing project. Third, CBA is a way to develop "quantitative" support in order to politically influence a decision.

A common cost-benefit analysis flowchart is presented in Figure 16. This CBA process consists of five principal steps: selecting an analyst, identifying alternatives, identifying and measuring costs and benefits, comparing costs and benefits, and analyzing all the alternatives. (King & Schrems, 1978)

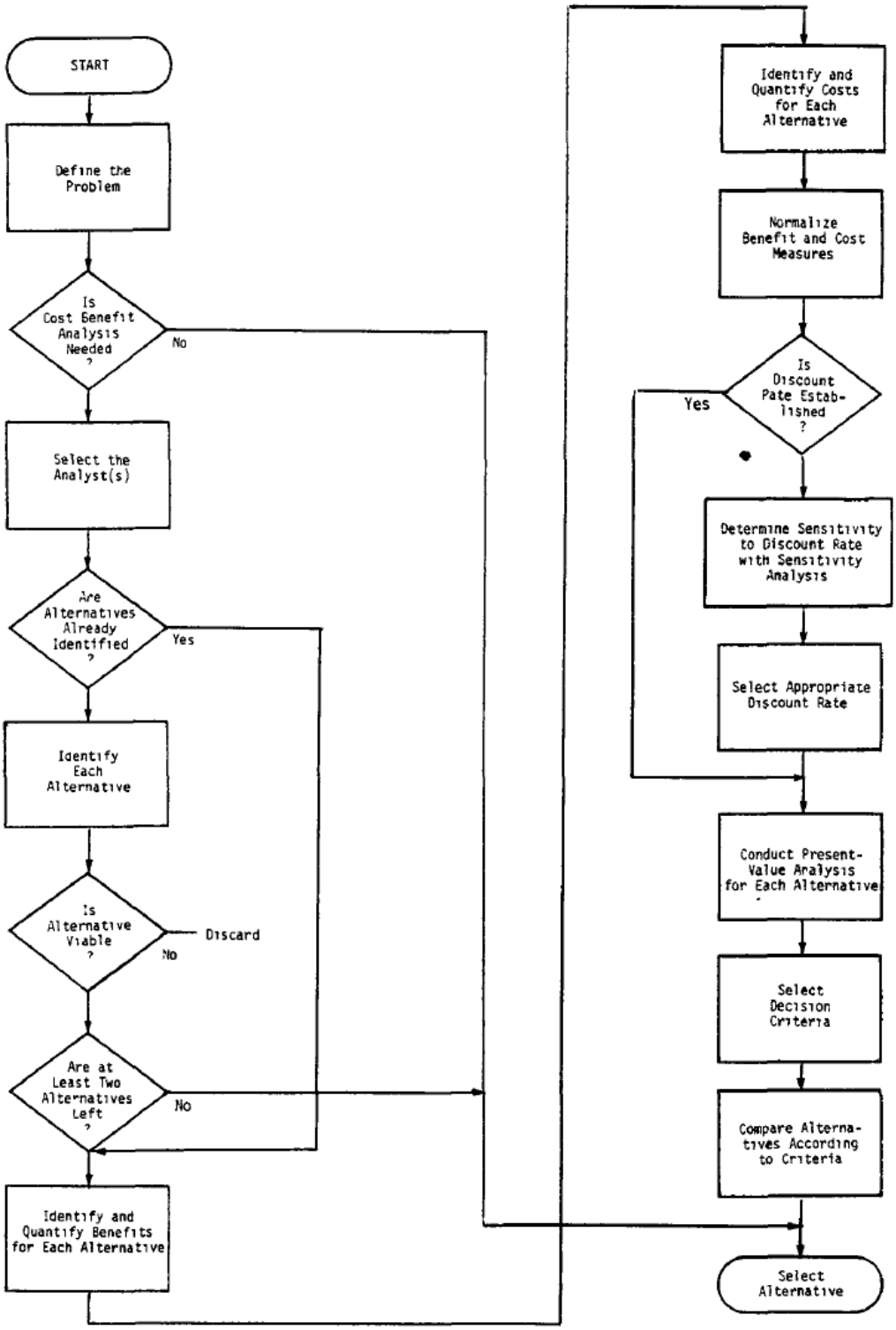

Figure 16. Flow chart of a common cost-benefit analysis procedure
Source: King & Schrems (1978)

Cost and benefit analysis on a project can be conducted at different times. CBA conducted in advance can be used to evaluate different ways of project implementation. During the

project implementation, CBA can be used to measure whether the project goals are being met. After the project has finished, CBA can help evaluate the different outcomes of the project.

Traditionally, net present value (NPV) calculations have been used for assessing cost and benefit analyses. This is because the monetary cost and benefit elements may occur at different times during the investment process. The total financial benefit can be approximated with the following equation, which combines the present value of costs (PVC) and present value of benefits (PVB):

$$NPV = \sum_{t=0}^{n} \frac{B_t - C_t}{(1+d)^t}$$

where d is the discount rate, n is the amount of periods, B_t is the value of benefits in period t, and C_t is the value of costs in period t. The value of d is often determined by the cost of capital for business. The project is worth of undertaking if the net present value is positive. In general, the truthfulness of NPV calculations is dependent on the accurateness of the cost and benefit estimates. The five criteria for NPV calculations are (King & Schrems, 1978)

A) Maximize benefits for given costs;
B) Minimize costs of a given level of benefits;
C) Maximize the ratio of benefits over costs;
D) Maximize the net benefits (present value of benefits minus present value of costs);
E) Maximize the internal rate of return on the investment.

In general, it depends on the business scenario which criterion is the most suitable one.

2.3 Summary of theoretical background

The background and key concepts discussed in Chapter 2.1 and elements for investment project assessment in Chapter 2.2 serve as building blocks for construction part of the thesis. The construction aims to a framework for assessing Nokia Siemens Network's (NSN) strategic investment in technology and architecture asset information management (TAAIM) project. None of the theories of project management, cost-benefit analysis, balanced scorecard, options, or benefit realization management is sufficient alone for investment project evaluation, but they provide knowledge that is essential for evaluation process. It is known prior to the evaluation that many of the benefits that the project is aiming at are of intangible nature – this is why the theory for intangible identification, classification, and measurement is relevant.
Chapter 2.1.2 introduced investment process. 2.2.1This thesis concentrates on project assessment with focus on benefit estimation, so not all of the steps are meaningful. For instance, it is assumed that the investment opportunity is already known (step 1). In addition, it is not relevant to know how the implementation is monitored (step 4). Instead, the framework will support when revising an existing business case (step 2), making a decision regarding the investment project, (step 3), and estimating when the assumed business benefits concretize (steps 5 and 6).

To determine the company specific investment criteria and benefits areas for the framework construction, stakeholder needs and concerns must be determined. Stakeholder analysis methods introduced in Chapter 2.2.1 will be used, with the exception that in the scope of this thesis research, altering the stakeholders' attitudes is not the main priority. It is also assumed that the stakeholders are known already, so identification of stakeholders is not significant. In addition to the stakeholder analysis method, the classification methods will be used to classify stakeholder concerns and benefit expectations. Classification is needed because making sense of a large mass of data would be very difficult without distinct categories with distinct purposes. Classification also helps when further processing the information.

Chapter 2.2.2 provides valuable background information on how to further evaluate the previously identified stakeholder concerns and benefit expectations. Benefit dependency network that was introduced in this chapter will be used for assessing relationships between the benefits in a complex project environment and it is an essential part of intangible benefit evaluation. This is due to the fact that intangible benefits are often a result of a complex series of other benefits and benefit dependency network shows what is needed to produce specific benefits. By evaluating the different benefits on the route, estimation can be given to the intangible benefit. When assessing an investment project, the distinction between ex ante and ex post evaluations is important as many intangibles are not possible to credibly estimate before the project. Chapter 2.2.2 discusses also differences between them. The MERITUM framework for assessing intangibles and real options were also discussed in this chapter. MERITUM uses quantitative indicators related to intangible issues and similar approach is applicable also in the scope of a single investment project.

Real options approach could be used for evaluation of future strategic options of a business but it appears too complex because of required quantitative analysis.

It is important to know that all relevant aspects are taken into account when assessing an investment project. Chapter 2.2.3 is valuable here as the investment project needs to be assessed as a whole entity after stakeholder concerns and benefit expectations are identified and evaluated. Key concept here is decision criterion as the governing stakeholders choose what they are. As a single project including intangibles is in the scope of this thesis, it is relevant to mention traditional decision metrics are not enough for assessing such project. Different decision criteria are used when assessing a project, or a set of them. These decision criteria can vary case-by-case, but sometimes when different projects must be compared, the criterion must be the same in order to achieve consistent results. Putting emphasis on e.g. financial efficiency, customer impact, organizational impact, or strategic fit depends on the case under evaluation.

As a conclusion on chapter 2.2.3 it can be said that as many decision criteria and supportive frameworks exist (e.g. cost-benefit analysis and balanced scorecard), no suggestion can be made which should be used generally. For instance, it was noted by Kaplan and Norton (1992) and Cooper et al (2001) that financial methods are not enough for assessing complex business situations and they might even give misleading signals. The framework to be developed in this thesis should rather guide the evaluator to use the decision criteria and tools that suit best for that specific business situation than provide a fixed evaluation practice. The evaluators should use multiple tools as projects including intangible components cannot be assessed in a generic way. Similarly, NPV cannot be calculated for intangible parts, whereas it can be applied to tangible parts of the investment project.

The context of previously discussed literature to be used in the framework construction process is illustrated in Figure 17. Although the figure does not exactly depict the problem area, such as ontology does, it gathers the relevant concepts together and builds relations between them. In general, the benefits that the project is aiming at constitute on what is required by the project stakeholders, what company strategy drives, and what can be identified relevant from academic literature. The company strategy influences the stakeholder needs and concerns and is thus taken into account. Stakeholder concerns on risks and project expenses can be related to the project itself or the project environment. Benefit expectations are always related to project environment, not to project itself. The investor evaluates the strategic investment project in terms of previously mentioned concepts and uses his/her decision criteria to decide how to proceed.

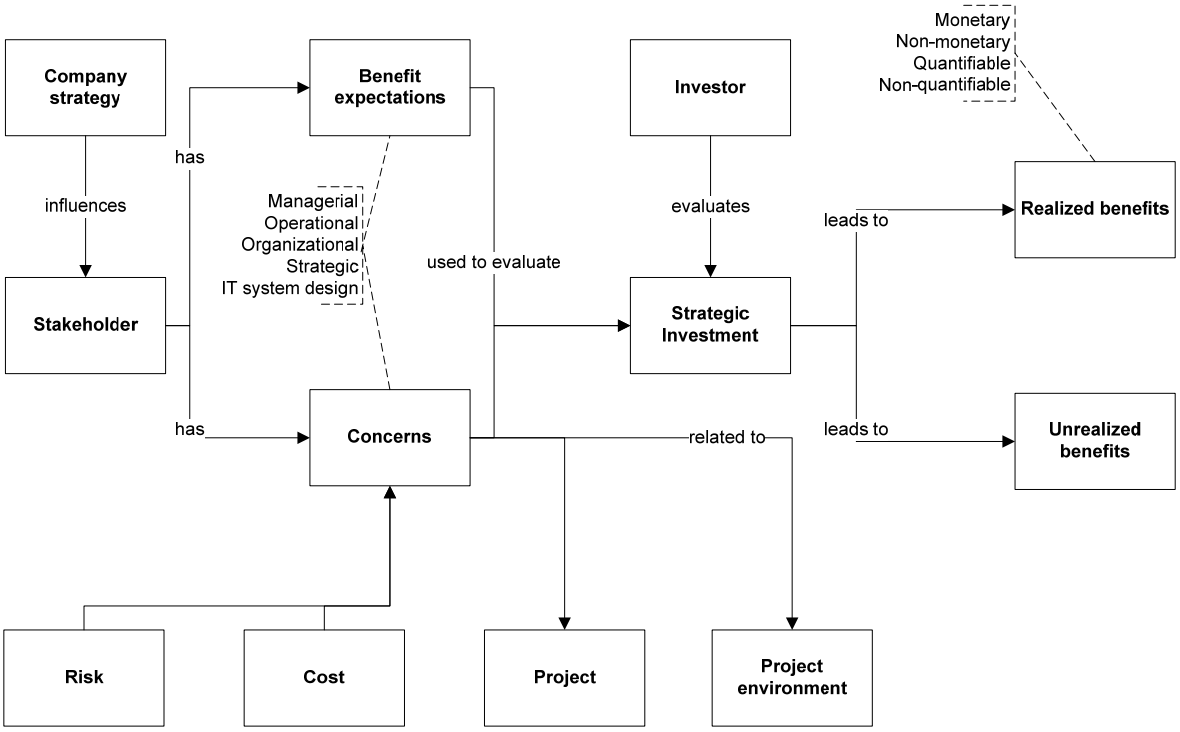

Figure 17. Context of investment project assessment framework construction

This chapter explored literature review to find answers to the research question "How to assess the investment in technology and architecture asset information management at Nokia Siemens Networks?" The following chapter 3 constructs the framework based on the findings of this literature review and empirical research. In chapter 4, the usability of the framework is tested by following the framework process.

3 Construction of strategic investment evaluation framework

3.1 Strategic investment evaluation framework

The purpose the construction process is to offer a framework to help project managers, decision makers such as portfolio managers, and analysts to evaluate and/or improve a single project's business case which captures the reasoning for the initiating project. When evaluating the investment project, framework provides help to understand the project context; relations between expected benefits, key selling points that align with decision criteria, and stakeholder concerns. The framework process starts from stakeholder concern and benefits expectation elicitation, continues with analysis, and ends up with summarizing presentation of key selling points for decision review. The framework can be considered as a funnel: Initially we have much of data on concerns and benefits which are processed and a summary for decision making will emerge. Relations to other projects are essential for decision makers but the focus is here on a single investment project.

During the framework construction process, several employees involved in technology, project, portfolio, and program management were interviewed. The goal of the preliminary interviews was to find assurance that the early drafts of framework were suitable for investment project evaluation and that the concern and benefit categorization was well defined. The interviewees were asked to list their concerns and benefit expectations on areas of human-, structural-, and relational capital, which were discussed in detail in Chapter 2.2. In addition, distinction between short- and long-term was required. These categories were used because they reflect the intangible side of concerns and benefits providing a holistic view of the project itself, the company where it is executed, and external relationships that have implications on the project. Table 8 presents the areas and concepts used in preliminary interviews.

Table 8. Table for stakeholder concerns and expected benefits during preliminary interviews

Category	**Human capital area**	**Structural capital area**	**Relational capital area**
Concerns	Concerns regarding innovation, know-how, teamwork, learning, education	Concerns regarding organization's processes, systems, culture, IPR etc	Concerns regarding customers, competitors, and suppliers
Short-term intangible business benefits			
Long-term intangible business benefits			

The stakeholders chosen for the preliminary interviews were chosen on the basis of their role. The goal was to have as diverse set of interviewees as possible to gain differing opinions about the framework suitability and also differing concerns and expectations. The seven interviewees included portfolio manager, project manager, R&D unit director, corporate development manager, R&D team leader, head of technology and architecture, head of IT team, and head of product and solution management.

As expected, it was noted during the interviews that the concerns and benefit expectations were constantly of intangible nature. Most of the identified concerns and benefits fell under structural capital area whereas human- and relational capital areas included significantly less entries. Additionally, some of the identified concerns and benefit expectations had tangible elements reducing the reasonability of using categorization focusing strictly on intangible areas. This is why it is reasonable to further enhance the categorization with the methods discussed above. Further processing of the results was concluded with that the dimensions of *organizational*, *managerial*, *operational*, *strategic*, and *IT Infrastructure* were most suitable for categorizing concerns and benefit expectations. This categorization framework, originally proposed by Shanks et al (2003), was discussed in Chapter 2.2.1. Further, it was noted that there was a clear distinction of concerns related to the project itself and the outside environment which affects the project.

3.2 Framework elements

Figure 18 shows the elements of the investment project evaluation framework.

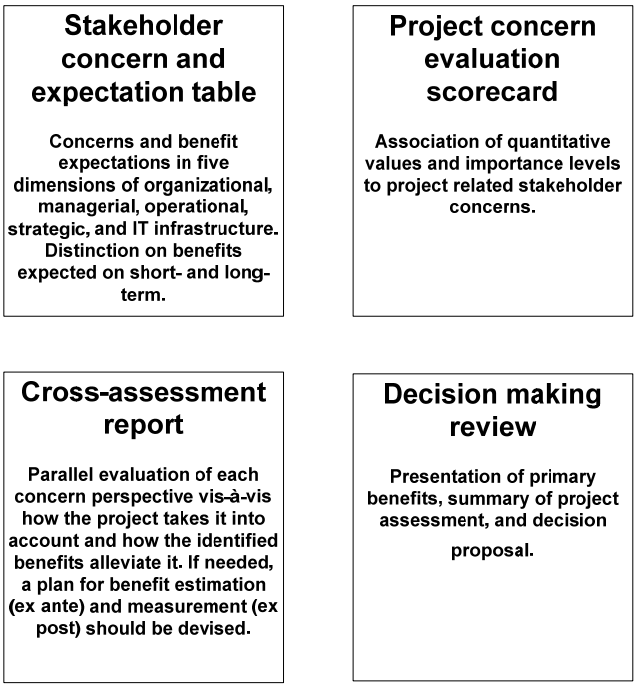

Figure 18. Elements of investment project evaluation

In the following subchapters, the elements and actions needed to produce them are described in detail. The first element of the framework is a table, which is used to map stakeholder concerns and expected short- and long-term benefits. The table is produced by interviewing the relevant stakeholders. Project concern evaluation scorecard is utilized when analyzing the stakeholder interview results. Cross-assessment report is a product of assessing concerns parallel to the expected benefits. Finally, decision making review summarizes the findings of utilizing the framework.

3.2.1 Stakeholder concerns and benefit expectations

First, the person conducting the assessment should identify the relevant stakeholders. No specific guidelines are needed here as it is assumed that the evaluator is aware of the relevant stakeholders prior to evaluation process. Usually the stakeholders include the project planning team members, project champions, management, decision makers, and the people who implement the project.

Second, stakeholder concern and expectation table is constructed by interviewing stakeholders. The target is to identify their concerns and benefit expectations in dimensions

of organizational, managerial, operational, strategic, and IT infrastructure. Additionally, distinction on benefits expected on short and long-term should be required. The dimensions are presented in Table 9.

Table 9. Stakeholder concern and expectation table

Category	Concerns	Expected short-term benefits	Expected long-term benefits
Organizational	Concerns regarding the project environment, company culture, company structure, employees, and information sharing	Short-term organizational benefits related to e.g. employee learning and information sharing	Organizational benefits that are expected in long-term
Managerial	Concerns regarding decision making, planning and other managerial practices inside organization	Short term managerial benefits related e.g. decision making and resource management	Managerial benefits that are expected in long-term
Operational	Concerns regarding the current operational practices in organization, e.g. "too much R&D effort"	Short term improvements regarding processes, productivity, quality, and costs on operational area	Operational benefits that are expected in long-term
Strategic	Concerns regarding current strategic state and the project outcomes on company's strategic position	Short-term strategic benefit expectations e.g. competitive advantage based on easier product customization	Strategic benefits that are expected in long-term
IT infrastructure	Concerns regarding current IT systems inside organization	Short-term benefits on IT infrastructure, e.g. synergies on reusable IT assets, harmonization, and foundation for future business applications	IT infrastructure benefits that are expected in long-term

The amount of interviewees can be decided by the person conducting the investment project assessment. Nonetheless, it is recommended that the amount is not over ten. Otherwise the amount of interview data to be processed increases unnecessarily and makes the overall evaluation too complex. The semi-structured stakeholder interviews should be constructed upon the topics listed in Table 9. One can use the following questions during the interviews:

What concerns can you find in relation to the investment project on organizational/managerial/operational/strategic/IT Infrastructure area? [Give brief description of the area, e.g. organizational: project environment, company culture, company structure, employees, teamwork, innovation, and information sharing]

What kind of short-term benefits do you expect on this area?

What kind of long-term benefits do you expect on this area?

The interviewer should place the identified benefits and concerns to the categories that she sees most suitable. It should be noted, however, that the categorization cannot strictly form bounds on the interview results and thus some concerns and benefits may be placed in multiple categories.

3.2.2 Analysis of the interview results

Analysis of the interview results aims to produce investment project concern evaluation scorecard and a table consisting of primary benefits. Before these can be achieved one needs to process the original interview data. This processing includes removal of duplicates, removal of irrelevancies, merging similarities, replacing concerns or benefits placed in wrong categories during interviews, and finally transforming the project related concerns into scorecard criteria. For benefits, Table 10 should be used. Irrelevant concerns and benefits that do not relate to the project context at all and should they appear in the interview results should they be removed also. As a result of processing, the data set should be significantly reduced simplifying the analysis.

Table 10. Investment project benefits after analysis

Area	Organizational	Managerial	Operational	Strategic	IT infrastructure
Short-term					
Long-term					
Business changes	Optional for benefit dependency network				
Enablers	Optional for benefit dependency network				

Optionally, one can construct a benefit dependency network, or benefit map, which increases the understanding of relationships between investment's enablers, business changes, benefits and primary objectives. An example of a benefit map and different utilization scenarios were discussed above, in Chapter 2.2.2. Benefit map should be used if the evaluator feels that he or she needs to understand better the project context. Benefit map might reveal critical benefit dependencies that otherwise would not have been noticed. This is vital as the critical benefits must be concretized in order to reach the primary objectives of the project. The previous distinction between short- and long-term helps the formulation of benefit dependency network as now it is easier to position the benefits – long-term benefits tend to be farther away from the starting point of a benefit dependency network.

The benefit map is constructed by placing the initial investment as the starting point. The process continues with connecting the benefits that can concretize in a short time-frame and that are not dependent on any other identified benefit to the initial investment. After this, the next phase benefits, business changes, and enablers are filled in sequentially. It is assumed that the expected long-term benefits are farther away from the starting point than the short-term benefits, which often are on the paths towards the primary long-term benefits. The benefit map symbols used for map creation are presented in Figure 19. Additionally, it is suggested that different fill patterns should be used for different categories.

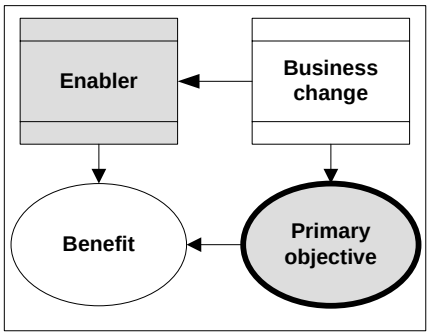

Figure 19. Benefit map symbols

Determining solely the benefits that the project would deliver is not enough. Even the outcomes would seem to be very lucrative, the case might be that the project cannot be executed due to internal or external factors, such as lack of resources; insufficiency of skills needed to implement; or mismatch of project alignment with corporate strategy. These factors appear also as stakeholder concerns and this is why the previously identified concerns should be used as a basis for evaluation scorecard. As every project is different, the author suggests that the contents of the concern evaluation scorecard are not fixed, which was the case e.g. with Bitman's and Sharif's (2008) R&D project ranking framework discussed in Chapter 2.2.3. Instead, the scorecard table should be filled case-by-case matching better a specific business situation.

The investment project concern evaluation scorecard is presented in Table 11 and its construction requires three actions. The process of translating project related concerns into neutral criteria is visualized in Figure 20. First, then original concerns are appended into the scorecard. Irrelevant and duplicate concerns should be filtered out based on evaluator's judgment. Second, the concerns are translated into neutral criteria and evaluation boundaries are chosen. The distinction between *project related concerns* and *other concerns* is done because the scorecard is used to evaluate the investment project itself, not the level of other related concerns e.g. whether the company strategy is good, how severe communication related problems the company has, or what is the current operational cost level at the organization. Evaluation boundaries reflect what the numerical score values given mean and help in interpretation of the evaluation results. Boundary-pair examples include low-high, difficult-easy, wrong-right etc and they should be set in a way that small number reflects a negative issue. Finally, at third step, the neutral criteria are evaluated by utilizing one of the following three options:

- Project team alone evaluates each criterion
- Stakeholders external to project are involved by asking them to fill in the scorecard
- Both project team and external stakeholders participate in evaluation

Table 11. Project concern evaluation scorecard

Area	Original concerns	Neutral criteria	Evaluation boundaries	Score (1-5)	Impor-tance (1-5)
Organizational	Concern 1	Criteria 1	Boundaries 1	Score 1	Importance 1
	…	…	…	…	…
	…	…	…	…	…
Managerial	…	…	…	…	…
	…	…	…	…	…
	…	…	…	…	…
Operational	…	…	…	…	…
	…	…	…	…	…
	…	…	…	…	…
Strategic	…	…	…	…	…
	…	…	…	…	…
	…	…	…	…	…
IT Infrastructure	…	…	…	…	…
	…	…	…	…	…
	Concern n	Criteria n	Boundaries n	Score n	Importance n

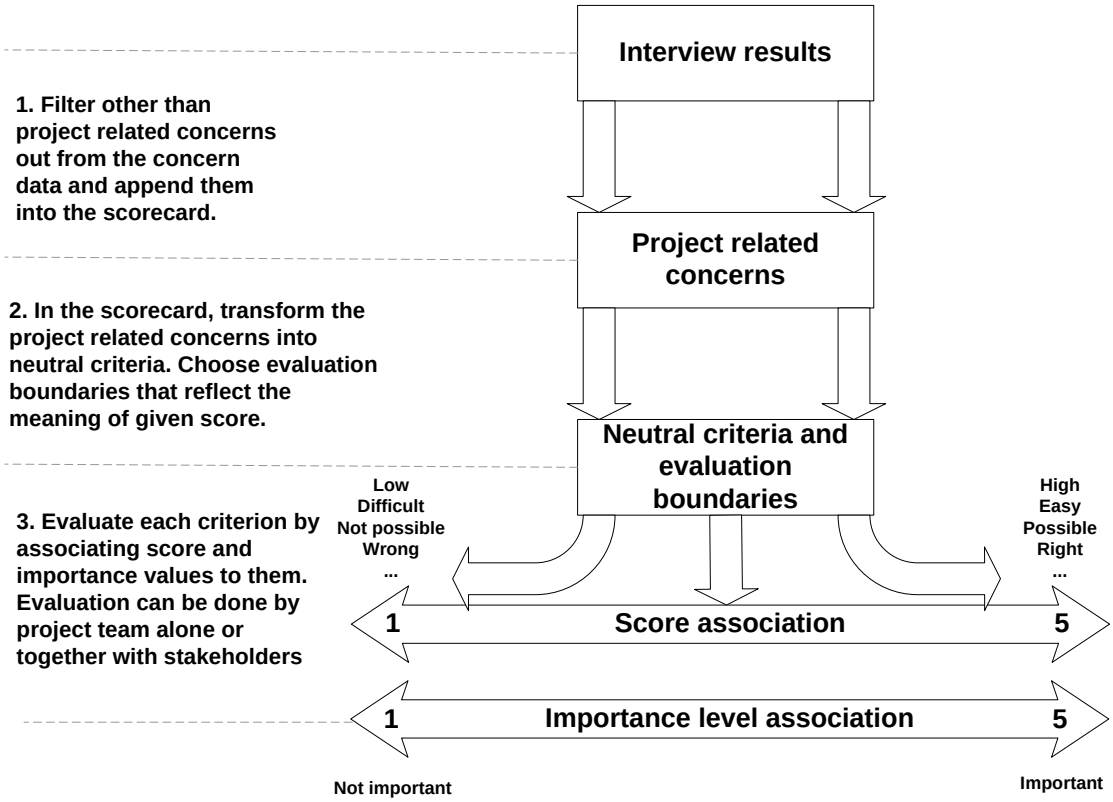

Figure 20. Scorecard evaluation process

As a result of utilizing the scorecard, the previously determined concerns will be associated with score and importance levels which can be used for further evaluation.

Further clarification on the use of neutral criteria is needed. During preliminary framework development it was noticed that assigning a numerical score level to a concern is not reasonable. For example, what does it mean when a score 3 is assigned to concern “Project should not introduce extra work for BU's”? To be able to assign a numerical score value the concern must be further processed to fit better for scoring purposes. In the previous example the concern could be translated to neutral criteria “Possibility to minimize work required from organization”, which is significantly easier to assign value to.

An example of using the scorecard: Concern “risk of budget overrun” is associated with “high” score and “low” importance level can be interpreted as that the project is assumed to overrun its budget while this not being important at all. The interpretation of the scorecard results is done at the next step of the framework.

There are many benefits of using the scorecard. If the scorecard assessment is done by external stakeholders to the project, the concerns identified by specific stakeholders during interviews are evaluated by also others resulting in general opinion. The evaluation scorecard further clarifies the stakeholders’ concerns towards the project and forces the project planning team to look for further improvement. The evaluation might reveal improvement areas that might not have been noted if the evaluation was not conducted. This is the case e.g. when stakeholders differ in their orientation towards the project. Sometimes a specific stakeholder group is considered vital for the project’s success and their concerns are more important than of the other groups. In this case, the scorecard can be used on stakeholder group basis. This usage scenario reflects the opinion differences among stakeholder groups, e.g. management vs. operational workforce, and helps the project staff to clarify the stakeholder situation.

3.2.3 Cross-assessment

At this part, the identified stakeholder concern perspectives are described with respect to the received score and importance levels and evaluated parallel to the expected benefits. The intention is not to revise each and every concern identified but rather the concern perspectives (managerial, operational, organizational, strategic, and IT infrastructure) as whole entities.

Some of the concerns relates to the project itself whereas some concerns do not relate to the project directly, but rather to the domains that the project can have beneficial effects on. At the first case, it will be elaborated how well the project takes the project related concerns into account. At the latter case, it will be elaborated how the identified benefits alleviate the concerns e.g. by providing monetary savings.

The result should be a written report containing two parts. The first part summarizes the scorecard evaluation on project related concerns per perspective. The following elements should be included here:

- Conclusions on the scorecard results for the perspective
- Suggestions on how the project could be improved to match the concerns and reasoning why some concerns will remain unchanged also in the future

Second part is parallel evaluation of benefits and concerns. The evaluation should be done for each benefit that was selected from the initial interview results to Table 10. Because distinction with project related and other concerns was made, also the following guiding questions should be addressed, preferably in a table to maintain clarity:

- How could the specific benefit be characterized? Is it a "key selling point" or "primary benefit" that will be used for project justification?
- Can the benefits be estimated beforehand, can they be measured afterwards, and how the measurement should be done?
- Which non-project related concerns does the specific benefit alleviate?

The intention here is not to actually try to measure the benefits but rather distinguish between dimensions of tangibility and quantifiability. At the second part of cross-assessment, the previously formed benefit map is useful as it illustrates the dependencies between enablers, business changes, benefits, and primary benefits. It helps in evaluation of what is needed to attain the primary benefit objectives and when are they expected to concretize. Some of the benefits are expected to be justified in financial terms. This is where the benefit estimation and measurement methods discussed in chapter 2.2.2 can be utilized.

3.2.4 Review and decision making

The fourth step completes the project assessment and presents a decision proposal regarding the project. The review is based on previous parts of the framework process. The goal here is to provide an easy-to-read report that does not leave room for multiple interpretations regarding the assessment results.

The review contains three parts:

- The primary benefits ("key selling points") of the project divided into the five perspectives (organizational, managerial, operational, strategic, and IT infrastructure), a metric indicating the estimated value of benefit (low-high, monetary or non-monetary), and conclusion on whether the expected value is sufficient vis-à-vis costs and expectations

- Short two-part summary of the project assessment including description on how the project related concerns were taken into account and how the benefits alleviate the non-project related concerns
- Decision proposal based on the framework analysis process (“go”, ”no go”, defer etc) and a set of recommendations. The recommendations should go beyond the decision proposal by describing in a more detailed manner how to proceed with e.g. future decisions regarding the project.

It must be assumed that the evaluator or evaluating team has an objective approach to the framework evaluation process. Otherwise the decision proposal is biased towards subjective agendas; for instance project champion as evaluator would tend to not present negative issues in the decision review whereas negatively biased stakeholder would neglect some of the primary benefits.

Whether the benefits presented in the decision review are sufficient depends on the decision criteria. As is known from practical business, these criteria vary between companies and they can also vary between projects that are under decision review. As discussed in chapter 2.2.3, some examples of decision criteria include:

- Project plan comprehensiveness (objectives, scope, technical implementation, budget etc)
- Strategic fit
- Financial measures (NPV, ROI etc)
- Non-financial measures

Often financial measures such as NPV are required in the business case. The review in this thesis highlights that the “benefits come in many flavors” - monetary, non-monetary, quantifiable, and non-quantifiable. For instance, if financial measures are considered as the only decision making criterion of importance, it should be suggested to not invest if the NPV is negative even though non-monetary benefits would be lucrative. Non-monetary benefits can be used to justify the project to stakeholders that prioritize them over monetary benefits. To summarize, several examples of conditions on which the project under evaluation should be given a “no go” decision can be formulated:

- Primary benefits on the five perspectives (organizational, managerial, operational, strategic, IT infrastructure) are not considered large enough. Sufficiency of the benefits depends on the decision criteria in use.
- The project involves considerable risks that cannot be managed and they are considered too high when compared to the benefits. In other words, there exist major stakeholder concerns that the project cannot or are not reasonable to take into account.

Based on the review, the decisions concerning the investment project can be made e.g. by a project governance board which approves and denies project budgets. Here it must be noted that the relation to other projects is not considered in contradiction to the case of portfolio

management, where always a set of projects is under evaluation. If evaluating two or more competing projects, they all should be evaluated with the framework using same decision criteria.

3.3 Process

The process showing the utilization steps of the investment project assessment elements is presented in Figure 21.

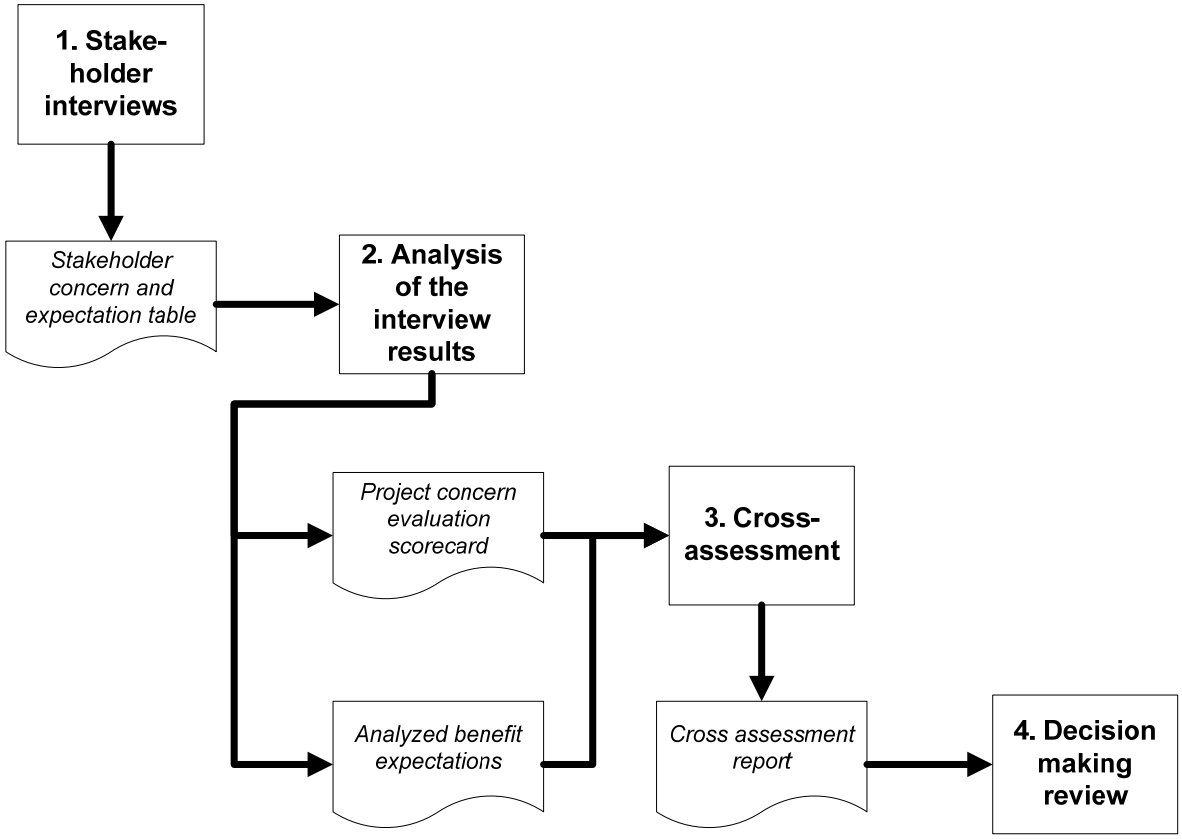

Figure 21. Strategic investment assessment framework process

4 Case Nokia Siemens Networks

4.1 Company context

Nokia Siemens Networks is a joint venture company formed of Siemens COM and Nokia Networks. NSN is a communications service provider operating in telecommunications industry. NSN provides solutions for 1400 public and corporate customers located in some 150 countries. In 2009, over one billion people connect through NSN's networks and the company has 60000 employees. The vision of NSN is to provide *individual communications experience*. The mission of the company states that "*we help communications service providers build more valuable customer relationships*". On strategy level NSN concentrates on flexible service creation and management; customer and service specific experience; efficient and low-cost connectivity; and customer and content aware delivery. The foundation of the strategy includes solution capabilities, one NSN with passionate and empowered people, and competitive operations. NSN divides the competitive assets that its business depends on in the following way:

Installed base: NSN has a large installed base of network infrastructure in place that enables NSN to compete on global basis. This works as a significant competitive advantage against smaller competitors who do not have such installed base.

Software and hardware products which can be further divided into software and hardware components.

Global reach and service capability: NSN solutions consist of software and hardware products and services. NSN's capability to reach its customers globally and timely is required to ensure customer satisfaction.

Scale of different products, solutions and capabilities work as an asset for NSN when large variability of choices is required by customers.

People possessing insight and innovation and respecting customer intimacy working in corporate functions (finance, strategic management, marketing etc) and business units (R&D, services etc). The human capital works as an asset for NSN as customers worldwide demand innovative solutions and ethical business partners respecting "green" environmental values.

Different trends in NSN's business area induce need for strategic change. Before the merger of Nokia Networks and Siemens COM, it was clear that the competition was intensifying in the telecom market. Competitors such as Huawei, Ericsson, and Alcatel-Lucent had been gaining market share and winning important contracts in the near past.

The global economic crisis has affected NSN's financial operations and required NSN to take actions regarding its operational efficiency and expenses. As little growth opportunities were seen in the maturing telecommunications industry, there was need for changes in both strategic and operational levels. Some of these changes required to sustain competitiveness in the market include enhancing deep and continuous information sharing, shortening of time-to-market, and reducing costs. Investment projects and programs concentrating on areas of quality, cost consciousness, knowledge management, IT consolidation, and employee training were launched to drive the organizational change. As technological and economical changes are currently accelerating and diversity and complexity of systems is increasing, NSN is facing challenges from both business and technological areas. This highlights a need to connect business and technology strategies.

To improve NSN's competitiveness on the previously discussed problem areas and induce strategic change, technology and architecture management (TAM) function was established. TAM aims to have beneficial effects on productivity, cost, quality, and time-to-market. This is achieved by providing governance over technologies over product life-cycles and consolidating activities across businesses. After establishing TAM, it was soon clear that an IT system for identifying and managing technology and architecture asset information was needed. This led to the creation of business case for the project. Business case includes assessment of different costs and benefits that would be involved within the investment in TAAIM function.

4.2 Project description

Managing knowledge efficiently in product-creation processes has become necessary for companies to be able to compete in constantly changing environment. The lack of standardized formats and processes related to TAAIM lead to high level of knowledge diversity. The product knowledge appears in multitude of formats and is heavily networked. Due to absence of a system for managing such knowledge different benefits are not concretized. The goal of TAAIM is to enhance NSN's product management practices by providing an IT system for collecting, formalizing, and leveraging information related to technological assets. In addition, a new process involving employees to work within the IT system was seen necessary to ensure that the TAAIM related practices across the company were common.

To further clarify the TAAIM project, it is essential to define the relevant concepts. Hunt et al (2001) define re-usable assets to include technology of all forms: equipment, capabilities, modules, designs, processes, suppliers and teams. Other examples of assets include architecture assets, design assets, innovation assets, and technology assets. TAAIM focuses on technology and architecture assets, which have also implications on other asset classes as well. Technology and architecture asset is formulated in NSN context as a *technology component or architecture description that adds Nokia Siemens Networks business value*. It can be e.g. a software or hardware component originating from internal development or

external vendor. Another example of TA asset is a document describing product architecture.

To establish the TAAIM IT system, an IT project was launched. The IT project started with creation of a business case. In NSN context, *business case is management tool to prioritize change initiative by evaluating proposed net benefits and how they will be achieved and followed and profitability assessment of major change, involving process and IT elements*. To get a positive investment decision from relevant decision body inside NSN, it was required to identify the stakeholders, define requirements, devise a project schedule, and measure the relevant benefits, risks, and costs.

Additionally, a project steering group was formed to plan, design, build, and verify the TAAIM IT system. In NSN context, the role of the steering group is to ensure the success of the program or project, i.e. to ensure that the project outcome will fulfill the business case, benefits and requirements of the stakeholders. The steering group does this by approving and controlling:

- Operational framework of the project, i.e. scope, schedule and cost.
- Project progress via milestones, using and reviewing information provided by project stakeholders
- Project's risk management

Furthermore, the responsibility of the TAAIM steering group was to ensure that the project:

- Has a mission, scope, schedule, budget
- Has a qualified project manager
- Has sufficient and qualified resources
- Has timely, purposeful and clear decision-making, regardless of the situation
- Has adequate support and business commitment

TAAIM project faced many challenges during the business case creation. Meritum project's final report (2002) "Guidelines for managing and reporting on intangibles" states: "*In recent years, the idea that information systems do not allow for an efficient management has become widespread, since they do not capture a wide range of intangibles that, within the economic context previously described, are among the fundamental determinants of firms' success*". Another relevant quote is by Karel (2008):

"Information and knowledge management pros often hear senior executives state that corporate data is their most valuable asset. Unfortunately, these same executives will refuse to finance and prioritize efforts to cleanse, standardize, and govern this data when they learn just how expensive and time-consuming it will be to accomplish."

Further, Hawking et al (2004) found that *ERP implementations are people focused projects which rely heavily on change management for success.*

The quotes above sum up the major challenges of TAAIM investment. It was seen by both the stakeholders and the steering group that the changes induced by the TAAIM investment and the expected benefits were largely of intangible nature. This highlighted the importance of identifying and measuring such benefits in order to justify the investment. During times of fierce economic pressure it is essential to justify investment projects by both concrete financial means in addition to non-financial benefits. The resource gatekeepers able to approve, defer, or kill investment projects demand detailed business case including plans, both business and technical, financial projections, risk and stakeholder analyses in order to favor the investment decisions. Although TAAIM was often seen as essential part of NSN's technology management practices, the investment delayed. In addition to the challenges discussed above, many other reasons for the delay of TAAIM investment exist, and they are visualized in Figure 22.

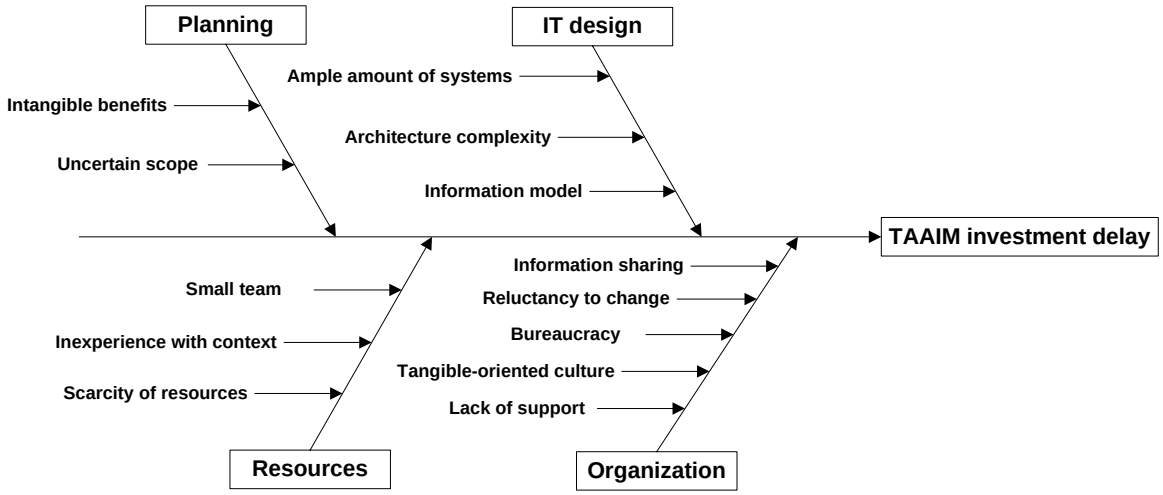

Figure 22. Challenges in the project environment

During the business case creation phase it was noted that many of the stakeholders were very busy with their current tasks, involved in many other change programs, and thus they were very hard to convince about the benefits of TAAIM. Information was not shared between key stakeholders on regular basis so building a real-time picture of the project environment was difficult. Many of the decisions required to advance in project implementation were seen bureaucratic.

The environment of TAAIM project is complex, it keeps changing, and many uncertainties exist so the project plans cannot be rigid at early project phase. The scope and deliverables of TAAIM project are difficult to estimate. The stakeholder interviews revealed that TAAIM is expected to deliver business results meeting multiple criteria. This is why traditional project management practices are not sufficient; the project planning and execution requires adaptive project management practices ("one size does not fit all") introduced by Shenhar and Dvir (2007), which were discussed in chapter 2.2.3.

The IT system design itself turned out to be problematic itself. The landscape of IT systems inside NSN is ample and this increased the design architecture complexity. TAAIM information model design had to take requirements of existing IT systems and stakeholders transforming it into a complex process.

4.3 Utilizing the framework

4.3.1 Stakeholder interview results

Stakeholder concerns and benefit expectations were identified by interviewing a portfolio manager, project manager, R&D manager, head of R&D development, head of technology and architecture, head of R&D unit, head of IT team, and head of product and solution management. The following tables show the original interview results.

Organizational perspective	
Stakeholder concerns	
Concerns related to project itself	***Concerns related to company***
- Organization's willingness to change as required by the project might lack - Achieving buy-in among stakeholders is difficult; employee reluctance to use - Importance related to similar projects and processes (TAAIM might not be needed) - Parties involved in TAAIM system implementation might avoid taking responsibility - TAAIM is trying to control via process and this might raise resistance - Project environment keeps changing - The project might increase "inertia" in organization stamping out innovation - At first, the project is seen only as extra work - Risk that commitment of management not sufficient - R&D organization should not implement	- No common and formal practices - Employees working in silos and not aware of what others are working on - Re-use culture has always been hard to establish - Units are working separately and not sharing information although sharing a common goal - BU willingness to cooperate and share information - Knowledge is largely in tacit form and disappears as employees leave the firm - Too many development projects at the moment

this alone as they don't have business pressure - Processes are not always followed. TAAIM process does not guarantee system usage - TAAIM must be marketed on large area in order to succeed	

Short-term benefit expectations

- Knowledge integration between different organizational domains
- Tacit and explicit know-how sharing across BU's
- Improved information quality
- Innovative ideas regarding product creation as the asset pool becomes visible

Long-term benefit expectations

- New innovative ideas due to cross-BU information sharing and technology screening
- Know-how quality improvement
- Enhanced learning curve for employees working on same technology areas due to common information sharing and problem solving
- Innovation capabilities increase as same assets are not created over and over again
- TAAIM system could enable job rotation as experts in different BU's working on similar topics could be spotted; this would help the cross-BU cooperation and flow of tacit knowledge
- Networking in company increases, and this supports the "one company" concept.

Managerial perspective

Stakeholder concerns

Concerns related to project itself

- Project related costs and benefits very hard to estimate
- Project outcomes not conforming stakeholder requirements; the benefits presented are not concrete enough
- Risk of project budget overrun
- The project context has a lot of question marks; it is not top priority
- Scoping of the project is difficult
- TAAIM might not understand the users as well as needed
- Project environment keeps changing
- Monetary cost and time spent using the system; it should cost nothing to users
- TAAIM is trying to control via process; this might raise resistance
- Project should not introduce extra work for BU's
- Centralized team cannot implement the system as relevant stakeholders need to be involved

- Risk of the project is implemented too late to answer the immediate need
- No reference point for TAAIM - don't know whether others have succeeded
- Project financing might be hard to get although good projects never lack funding
- Changes to common architectures are made because of demands of one business unit

Concerns related to company's managerial practices

- Project success is not monitored and verified after ramp-down at NSN
- Product architects and managers are lacking a common tool for TA asset management purposes

Short-term benefit expectations

- Improved visibility to product technology implementation
- Product management more efficient due to increased visibility; technology decisions and planning will become easier
- Technology screening
- Planning is done in uniform format enabling cross-BU compliancy
- TAAIM could help in technology screening
- Expert knowledge easily obtainable
- Useful planning tool for architects; drives re-use
- Possibility to use already existing assets instead of creating new

Long-term benefit expectations

- Improved implementation monitoring capabilities
- More efficient strategic planning and decision-making because implementation could be monitored and future goals could be set into the system
- Product decision making more efficient due to technology feasibility studies
- Supplier decision making more efficient
- "Randomness" in decision making decreases
- Benchmarking with competitors becomes easier

Operational perspective

Stakeholder concerns

Concerns related to project itself	***Concerns related to how company operates***
- TAAIM's contribution to re-usability culture - Project should not introduce extra work for BU's - Increased commonality might be hard to achieve on SW components due to customers' demand for customization	- Overlapping work is done in BU's - Development of technology assets is increasingly intangible - Re-usable technology assets are much more expensive to develop than 'regular ones' - Currently very limited visibility to technology implementation

- Impact on time-to-market - Impact on cost-effectiveness - Impact on quality	- Company not always delivering what is promised

Short-term benefit expectations

- Expert knowledge easily obtainable
- Same assets are not created over and over again; reduction in overlapping work
- Useful tool for architects to support product creation
- Increased re-use
- Possibility to use already existing assets instead of creating new
- Huge potential for savings in time and monetary cost

Long-term benefit expectations

- Increased working effectiveness due to company-wide visibility
- Increased re-use of technologies; less overlapping work
- Shortened development time due to improved re-usability
- Increased quality of products
- Easier installation at customer premises
- Improved co-working
- TAAIM system could enable job rotation as experts in different BU's working on similar topics could be spotted
- Reduced costs and R&D effort

Strategic perspective

Stakeholder concerns

Concerns related to project itself

- No direct effect on firm's customer relationships
- No direct effect on firm's supplier relationships
- No direct on firm's competitiveness
- Risk of the project is implemented too late to answer the immediate need
- TAAIM is 'nice to have' project as it boosts efficiency; there are more urgent investments.

Concerns related to company's strategic issues

- Company not always delivering what is promised
- Estimating switching costs between suppliers are hard to estimate
- Risk of that changes to common architectures will be made because of demands of one business unit
- Fierce competition at telecom market

Short-term benefit expectations

- Decision making regarding suppliers and technologies more efficient
- Increased awareness of procurement on "what we have"
- Improved negotiation position with customers and suppliers due to increased visibility
- TAAIM is part of a larger program and this brings synergy benefits
- Consolidating the amount of suppliers is beneficial

Long-term benefit expectations

- Product development focus improvement; company chooses to develop products that sell better ("hit-rate")
- Consolidated amount of suppliers
- Increased customer happiness due to increased quality
- Increased product technology compliancy leads to easier installation at customer premises
- Improved customer happiness due to shortened delivery times and when not delivering case-by-case anymore
- Increased customer happiness
- Benchmarking with competitors becomes easier
- Time-to-market improvement leads to increased market share
- Enhanced visibility enables better negotiating position with suppliers; supplier evaluation practices improve
- Consolidated way of communicating with suppliers leads to better contracts
- Interfaces to different IPR assets such as open source technologies has beneficial effects on customers and suppliers
- Harmonization of technology strategies

IT infrastructure perspective

Stakeholder concerns

Concerns related to project itself

- Software is difficult to manage with PLM systems; SW and HW are very different and cannot be managed currently within one PLM IT system
- System usability and complexity; no training should be required
- The system should operate at top of existing systems so it is easy to use
- The sensitive R&D information must have strict access rights
- The R&D information should not be shown to customers
- Information granularity hard to determine, should not go to too detailed level
- The time spent using IT system should be minimized as it is reduced from R&D work
- A challenge of whether the system is as useful planned
- The information leaks to competitors, access control needs to be well defined

- Access control: The sensitive information must not leak out - Stakeholder needs properly taken into account in system design - Centralized team cannot implement the system as relevant stakeholders need to be involved - The whole IT landscape should be taken into account - Component descriptions must be accurate enough to be useful ***Concerns related to company's IT infrastructure*** - Far too many IT systems at the moment at NSN - IT landscape is complex
Short-term benefit expectations
- TAAIM is part of a larger program and this brings synergy benefits - Reduced amount of IT systems - Less IT systems leads to less time spent using and leads to cost savings - IT implementation savings - Increase usage of current PDM systems
Long-term benefit expectations
-

Additionally, the stakeholders considered the following factors important when assessing TAAIM investment project success during the implementation and after it is completed:

- Re-usability increase and cost-reductions
- The usage level of the system after implementation
- The portion of technology and architecture asset base in the system
- How many re-usable assets are found
- Costs, profit, break-even, IRR
- How business benefits were concretized
- Project should be assessed at each milestone, especially when it is completed
- Change in decision making practices
- Change in amount of suppliers
- Time and resource budged
- Planned functionalities that were delivered according to schedule
- Investment profit target must be reached

The amount of reduced development costs due to discovery of overlapping implementations was seen as the most important factor for evaluating the project's success. On the financial side, it was noted that the profit target must be reached and the project must be completed within schedule and budget. In addition, it was mentioned that the financials are not relevant in the beginning, but as the project advances, financial benefits should be assessed at each milestone.

4.3.2 Analysis of the interview results

The second step of the framework involves processing of the interview results to be utilized on project benefits table and investment project evaluation scorecard. The analysis was done by the project team that is also responsible for planning the TAAIM business case. In other words, from the three evaluation options, "project team alone evaluates each criterion", was chosen. This time it was not possible to include the stakeholders into the process due to lack of resources.

Table 12 shows the benefits that were processed from the original interview results. These benefit elements were also used for benefit dependency network formulation, which is shown in Appendix A. The benefit dependency network illustrates the cross-dependencies of the expected benefits, primary objectives, enablers, business changes listed in Table 12. Duplicates and irrelevancies that have little to do with project context were removed. The selection was based on evaluators' judgment.

Table 12. Benefits processed from the interview results

	Organizational	**Managerial**	**Operational**	**Strategic**	**IT infrastructure**
Short-term	- Improved information quality - Distribution of tacit expert knowledge - Cross silo communication	- Technology implementation visibility - More efficient planning - Better view to actual usage of suppliers - Decision making support	- Discovery of overlaps	-	- IT synergies - Increase usage of current PDM systems - Less time spent using IT - Less IT systems and IT cost savings
Long-term	- Improvement in innovation	-	- Reduced overlaps, increased asset re-use - Decreased amount of maintained components and reduced procurement costs - Increased commonality of technologies, technology compliancy and easier installation at customer premises - Decreased R&D costs and time efforts - Improved product quality - Time-to-market improvement	- Better supplier negotiating position - Increased customer happiness, customers contract again, and new customers - Company competitiveness increase - Harmonization of technology strategies	-

Business changes - Use common IT system instead of varying methods - TAAIM process - Use already existing assets
Enablers - Technology screening - Information formalization

Table 13 is a result of processing the identified stakeholder concerns according to the three phases illustrated in Figure 20. The purpose of the scorecard is to include scores and importance levels to project related concerns. This is why the first processing step was to pick only project related concerns from the interview results. Second, the concerns were translated into neutral criteria. Third, each criterion was associated with a score and importance value.

Table 13. TAAIM concern evaluation scorecard

	Concern	Concern criteria	Evaluation boundaries	Score	Importance
Organizational	Organization's willingness to change as required by the project might lack	Organization's willingness to change as required by the project	Low – High	**3**	**5**
	Achieving buy-in among stakeholders is difficult; employee reluctance to use	Buy-in among stakeholders	Low – High	**3**	**5**
	Parties involved in TAAIM system implementation might avoid taking responsibility	Responsibility taking for TAAIM system planning among IT before budgeting decision	Avoidance – Responsi-bility taking	**1**	**4**
	The project might increase "inertia" in organization stamping out innovation	Projects implications on organizational innovation capabilities	No effect – Significant effect	**3**	**2**
	Importance related to similar projects and processes (TAAIM might not be needed)	Importance related to similar projects and processes	Not important – Important	**2**	**5**
	Risk that commitment of management not sufficient	Commitment of management to the project	Not committed – Committed	**3**	**5**
	Processes are not always followed. TAAIM process does not guarantee system usage	Effect of TAAIM process on organization	Negative – Positive	**2**	**4**
	TAAIM must be marketed on large area in order to succeed	TAAIM “marketing” needed in order to succeed	Significant need – No need	**1**	**4**
Managerial	Project related costs and benefits very hard to estimate	Difficulty of project related cost and benefit estimation	Difficult – Easy	**2**	**5**
	Project outcomes not conforming stakeholder requirements	Ability of the project to deliver outcomes conforming stakeholder requirements	Low – High	**3**	**4**
	The benefits presented are not concrete enough	Concreteness of benefits presented in the business case	Not concrete – Concrete	**4**	**4**
	Risk of project budget overrun	Ability to keep project budget within limits	Low – High	**2**	**2**
	The project context has a lot of question marks	Clarity of project context presented in business case	Unclear – Clear	**3**	**4**

	Scoping of the project is difficult	Project scope definition	Fuzzy – Well defined	**4**	**2**
	TAAIM might not understand the users as well as needed	Project teams ability to take stakeholder's needs and business requirements into account	Low – High	**4**	**4**
	Project environment keeps changing	Project teams ability to cope with changing environment	Low – High	**5**	**5**
	TAAIM is trying to control via process; this might raise resistance	Difficulty of designing TAAIM attractive rather than forcing to use by process	Difficult – Easy	**3**	**4**
	Project should not introduce extra work for BU's	Difficulty of designing TAAIM concept as a whole to be light-weight	Difficult – Easy	**2**	**5**
	Centralized team cannot implement the system as relevant stakeholders need to be involved	Ability of the team to involve stakeholders in the planning and implementation	Low – High	**3**	**5**
	No reference point for TAAIM - don't know whether others have succeeded	Risk of investment due to lack of comparison points	High – Low	**2**	**2**
	Project financing might be hard to get although good projects never lack funding	Difficulty of getting positive investment decision from the company	Difficult – Easy	**1**	**5**
Operational	TAAIM's contribution to re-usability culture	TAAIM's contribution to re-usability culture	Low – High	**5**	**5**
	Impact on time-to-market	Impact on time-to-market	Low – High	**3**	**2**
	Impact on cost-effectiveness	Impact on cost-effectiveness	Low – High	**5**	**5**
	Impact on quality	Impact on quality	Low – High	**3**	**2**
	Reduced R&D effort might not be significant	Reduced R&D effort	Low – High	**4**	**5**
	A challenge of whether the system is as useful planned	Risk that the IT system will not be useful for stakeholders and it will not be used	High – Low	**3**	**5**
Strategic	No direct effect on firm's customer relationships	Effect on firm's customer relationships	Low – High	**3**	**2**
	No direct effect on firm's supplier relationships	Effect on firm's supplier relationships	Low – High	**5**	**5**
	No direct effect on firm's competitiveness	Effect on firm's competitiveness	Low – High	**3**	**2**
	Risk of the project is implemented too late to answer the immediate need	Timing of the project from the aspect of company strategy	Bad timing – Good timing	**2**	**4**
	TAAIM is 'nice to have' project as it boosts efficiency; there are more urgent investments.	Strategic priority of the project	Low – High	**3**	**4**
	Impact on NSN's pursuit for "one-company"; technology strategies, IT systems, processes, and practices	Impact on NSN's pursuit for "one-company"; technology strategies, IT systems, processes, and practices	Low – High	**3**	**3**
Infrastructu	SW and HW are very different and cannot be managed currently within one PLM IT system	Difficulty of designing information model and governance on both SW and HW domains	Difficult – Easy	**4**	**2**
	IT landscape is complex; the whole IT landscape should be taken into account	Difficulty to take the whole complex IT landscape into account	Difficult – Easy	**4**	**2**
	System usability and complexity; no training should be required	Difficulty of attaining high TAAIM IT system usability level	Difficult – Easy	**4**	**4**
	The system should operate at top of existing systems so it is easy to use	Difficulty of building on top of existing systems	Difficult – Easy	**4**	**2**

	The sensitive information must not leak out and it should have strict access control	Difficulty of building secure IT environment and defining access control	Difficult – Easy	**5**	**4**
	Information granularity hard to determine, should not go to too detailed level	Difficulty of defining required information and modeling it	Difficult – Easy	**3**	**2**
	Stakeholder needs properly taken into account in system design	Difficulty of translating stakeholder needs to usable IT system features	Difficult – Easy	**4**	**4**

4.3.3 Cross-assessment

This part of the framework discusses scorecard evaluation results and characterizes the expected benefits. First, conclusions on the scorecard evaluation results are made. These results including mean values for importance and score levels are presented in Figure 23. Second, project benefits are characterized listing the non-project related concerns that they alleviate and elaborating how the benefit values could be estimated.

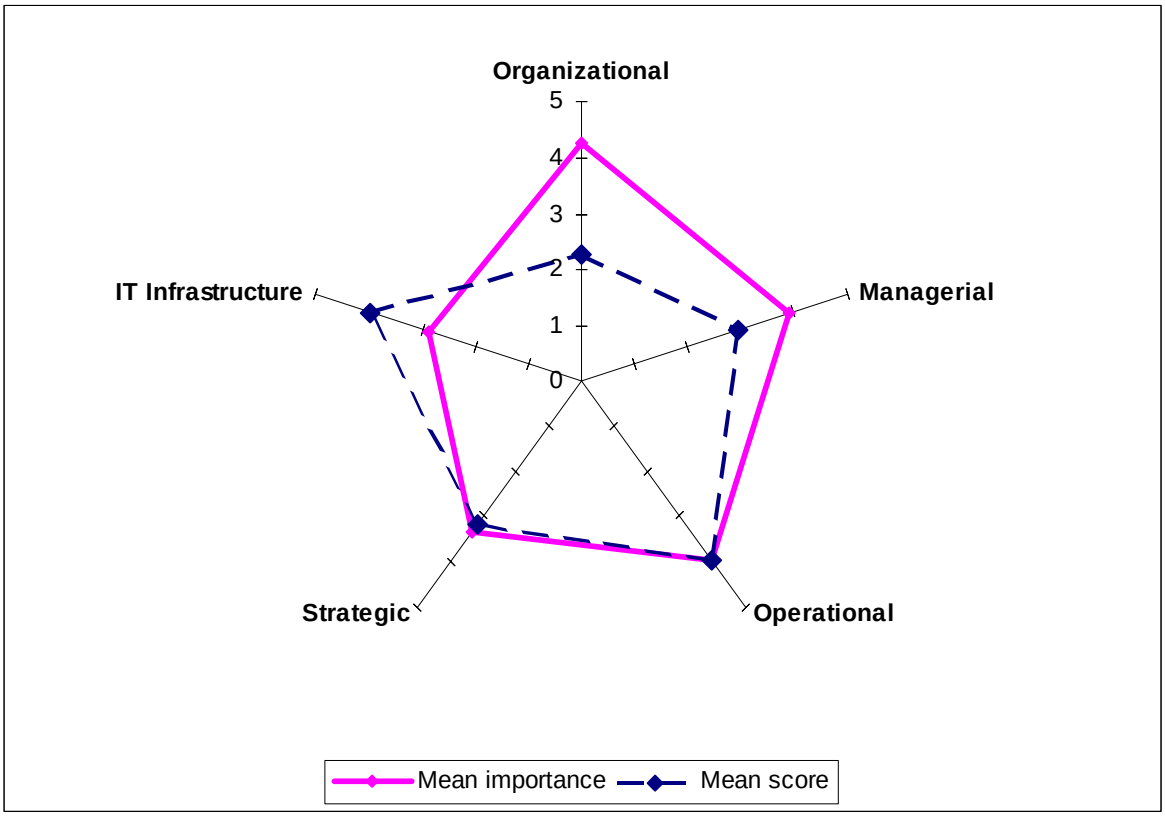

Figure 23. Mean scores and importance levels of TAAIM project scorecard evaluation

It must be noted that although claiming benefits to be tangible and quantifiable, the measurements might be difficult since there are multiple activities (e.g. procurement and quality programs) impacting the same areas with TAAIM and it might be too complex to figure out exactly which portion of changes is caused by which activity. In this case, it must

be contented with that estimation with lower and upper bounds or using a survey is best that one can do.

Organizational perspective

Summary of scorecard evaluation on project related concerns

Number of short-term benefits: 4
Number of long-term benefits: 6
Number of benefits in dependency network: 4
Number of concerns: 19
Number of concerns in scorecard: 8
Mean score: 2,25
Mean importance: 4,3

The organizational issues raised most of the concerns among stakeholders and this perspective was considered as the *most important* and *least well performin*g by the evaluators. The respective scores were 2,25 and 4,3. This means that TAAIM project has the biggest challenges on organizational perspective and it is the most critical area in order to succeed. Several highlights from the scorecard evaluation can be made. Related to project implementation, organization's willingness to change and project buy-in were considered very important. In order to succeed with the project, achieving stakeholder commitment is critical. Organization's responsibility taking regarding IT system implementation was seen as a major problem with high importance. This has been a problem since the beginning of the project because IT resources cannot be used without an approved budget. Thus, a positive investment decision is needed in order to receive design, managerial, and development support from IT organization.

To improve it's scoring on organizational perspective, more efforts on marketing the concept and achieving buy-in are needed. Communicating the benefits should be continued to ensure that relevant parties (management, systems users, and implementers) understand what the project aims at and how they could benefit from it. The communications should also address the project's relation to other projects; how they are taken into account and e.g. why TAAIM should be invested in instead of some other initiative. TAAIM process is needed because it is understood that this kind of initiative cannot be "sold" to the IT system users just based on benefits. It is also understood that it is not possible to substantially increase the acceptance of TAAIM process as such processes are almost always seen in negative light. The process issue will most likely remain as a concern in the future also.

Parallel evaluation of benefits and concerns

Organizational benefits	Concerns that the benefit alleviates	Benefit characterization, estimation, and measurement
Improved information quality	**Managerial: Currently very limited visibility to technology**	**Short-term, tangible, quantifiable** Much of the information regarding technological

	implementation **Operational: Development of technology assets is increasingly intangible**	and architectural assets is managed currently with varying methods and it is difficult to determine how up-to-date the information is. By collecting TA information under common format, the information accurateness and likeliness to be up-to-date increases helping the product development. TAAIM supports product creation processes by connecting the information domains in multiple existing IT systems in the company and providing practices for handling "intangibles". The benefit effect is clearly identified yet difficult to measure. The measurement of information quality could be bound to metrics such as level of information up-to-date and number of duplicate data elements.
Cross silo communication	**Organizational: Units are working in silos, sharing no information although sharing a common goal, and not fully aware of what others are working on** **Organizational: Re-use culture has always been hard to establish**	**Short-term, intangible, non-quantifiable** Information supplied by multiple functional units leads to wide view to TA asset base and enables BU's to see across BU boundaries. Increased communication across BU boundaries, decision support and better planning practices support technology re-usability culture. As the project advances, BU's should be more willing to cooperate and share information as they gain benefits from it. The intangible benefit cannot be accurately identified or estimated due to complex organizational environment.
Distribution of tacit knowledge	**Organizational: Knowledge is largely in tacit form and disappears as employees leave the firm** **Organizational: Units are working in silos, sharing no information although sharing a common goal, and not fully aware of what others are working on**	**Short-term, intangible, non-quantifiable** TA asset knowledge is codified as employees enter it in the IT system. TA assets are elements where employee expertise and knowledge is embodied. This knowledge is kept up to date, it remains at the company even the person would depart, and is accessible to all relevant stakeholders. The benefit effect is intangible and not valid for measurement.
Improvement in innovation		**Long-term, intangible, quantifiable** Due to possibility of choosing from existing TA asset base during product development instead of creating from scratch, the saved resources can be used for more innovative work. Although the benefit effect is intangible, one can monitor the number of innovations inside the organization to quantify the beneficial effect.

Managerial perspective

Summary of scorecard evaluation on project related concerns

Number of short-term benefits: 8
Number of long-term benefits: 6
Number of benefits in dependency network: 4
Number of concerns: 17
Number of concerns in scorecard: 13
Mean score: 2,9
Mean importance: 3,9

Managerial perspective was evaluated to possess amount of concerns second only to the organizational area. The most significant concern related to overall justification of the project and the difficulty of achieving positive investment decision. Estimating the benefits in the business case turned out to be problematic yet very important to succeed in as project stakeholders demanded certain level of concreteness and high values for them. The framework analysis helps in these issues and improvement should be expected. A concern emerged that TAAIM might not be able to take all stakeholder requirements into account. It is clear that not each and every requirement can be fulfilled; this is why this will remain a concern in the future also, albeit not very significant. It was noted that the project environment is complex, but the project team felt that they are dealing with this issue very well. Another concern related to the TAAIM concept heaviness and the necessity of binding employees to a new process, underlining the effort required by the organization to get TAAIM practices ongoing. It might not be possible to significantly improve TAAIM's scoring on this issue and this will remain as a concern in the future also.

To improve managerial scoring, the business case should present more concrete benefits to help the project justification and show that the project conforms what is required by stakeholders. Also, the project scoping should be enhanced to more accurately define the areas that TAAIM affects. Finally, the project team should try even more to involve the stakeholders in planning.

Parallel evaluation of benefits and concerns

Managerial benefits	Concerns that the benefit alleviates	Benefit characterization, estimation, and measurement
Technology implementation visibility	***Numerous concerns***	**Short-term, intangible, quantifiable** TAAIM collects TA asset information, which is scattered around organization and recorded in numerous formats (MS Office files and databases only accessible for small groups) under a common format (IT system). This leads to better visibility regarding technology implementation (R&D, software and hardware development etc) and actual usage of supplier products. The effect is largely intangible and not valid for measurement although visibility works as the most significant

		enabler to other benefits. A survey can be used for estimation to determine whether IT system users think that a change has occurred in visibility.
More efficient planning	**Organizational: No common and formal practices**	**Short-term, intangible, quantifiable** Common practices for functional units to manage TA asset information, and generate reports including relevant information previously not available. As a result of establishing the IT system, the relevant stakeholders have the capabilities to access TA asset information and execute product planning in an easier way. Estimation can be based on survey directed on IT system users after the system is in use.
Better view to actual usage of suppliers	**Organizational: Units are working in silos, sharing no information although sharing a common goal, and not fully aware of what others are working on**	**Short-term, intangible, quantifiable** The cross-BU information collected by TAAIM leads to a wider view to technology implementation, including the usage of different suppliers' products and licenses. Survey can be used here to determine whether IT system users think that a change has occurred in visibility.
Decision making support	**Organizational: Units are working in silos, sharing no information although sharing a common goal, and not fully aware of what others are working on**	**Short-term, intangible, quantifiable** Cross-function visibility and information linkages previously not available provide support for technology management. Estimation can be based on survey directed on IT system users after the system is in use.

Operational perspective

Summary of scorecard evaluation on project related concerns

Number of short-term benefits: 6
Number of long-term benefits: 8
Number of benefits in dependency network: 7
Number of concerns: 11
Number of concerns in scorecard: 6
Mean score: 4
Mean importance: 4

Operational perspective contained the least amount of concerns and the project was seen to match them very well. TAAIM's contribution to re-usability culture, cost reductions, and R&D effectiveness is very high, whereas this requires a successful planning and implementation of the project. A risk that the IT system will not be seen as beneficial by the stakeholders was noted and this might lead to serious problems.

To ensure the operational usage of the IT system the improvements above should be taken into account, specially noting the communication of concrete benefits. Additionally, the IT

system should be designed in a way that it requires minimal effort from the end users and is capable for the use cases that support stakeholders' everyday work. Not much of room for further improvement can be seen on operational perspective, especially when noting that the sources of concern ("impact on time-to-market" and "impact on quality") are seen as relatively unimportant.

Parallel evaluation of benefits and concerns

Operational benefits	Concerns that the benefit alleviates	Benefit characterization, estimation, and measurement
Discovery of overlaps	**Operational: Overlapping work is done in BU's, same assets are created over and over again**	**Short-term, tangible, quantifiable** NSN is doing parallel technology implementations. Many technology components have multiple designs and each accrues million-grade development costs. By providing NSN-wide visibility to technology implementation, TAAIM enables relevant stakeholders to spot overlaps concerning technology components and supplier products. To estimate the monetary benefits of reducing overlapping work and increasing re-use rate, one should first form a baseline of current technology implementation costs on the areas that TAAIM will affect. The costs should be mapped under specific categories, e.g. "power supplies", which includes all the licensed technology and development costs. Next, a target state should be set indicating the savings that are generated by the project.
Reduced overlaps and increased TA asset re-use	**Operational: Overlapping work is done in BU's and same TA assets are created over and over again**	**Long-term, tangible, quantifiable** In current state, no common practices for managing technology reuse across NSN exist. Due to increased communication, discovery of overlapping technology implementations, driving the usage of existing TA assets in product design, and other enabling benefits, the re-use rate should increase across the company. The simplest case is to set a baseline, observe the reduced amount of suppliers or overlapping technology implementations and measure directly the savings in time and/or monetary cost.
Increased commonality of technologies, technology compliancy, and easier installation at customer premises		**Long-term, intangible, quantifiable** Increased usage of common assets means that those common technologies are better tested and should operate better in customers' network. However, commonality is an ambiguous concept and can be measured in many ways. One way to estimate this benefit could be observing the amount of received fault reports from customers.
Reduced R&D costs and time efforts		**Long-term, tangible, quantifiable**

		TAAIM improves company's cost-effectiveness by providing support for technology reuse and harmonization. The cost-effectiveness emerges from the reduced amount of development work needed for multiple implementations. Other benefits, such as better product planning capabilities, decision making support, discovery of overlaps, distribution of knowledge, and less time spent using IT lead to reduced R&D time and money expenditures. Reduced costs and time efforts can be measured directly; this however might require use of multiple KPI's.
Decreased amount of maintained components and reduced procurement costs		**Long-term, tangible, quantifiable** Cost reductions on logistics and warehousing can concretize as less hardware components are needed due to the usage of common components. This can be directly measured, however it might be difficult to show which part of the change was caused by TAAIM.
Improved product quality		**Long-term, intangible, quantifiable** The usage of common components that have been designed as high quality leads to increase in overall quality level. Quality as a concept is ambiguous leading to multiple interpretations of effects that TAAIM might have on quality.
Time-to-market improvement		**Long-term, tangible, quantifiable** Reduced research and development efforts in product lifecycle affect directly to the time that is required to introduce new products and releases to the market. This time-to-market improvement can be observed, but it might be difficult to show which part of the change was caused by TAAIM.

Strategic perspective

Summary of scorecard evaluation on project related concerns

Number of short-term benefits: 5
Number of long-term benefits: 12
Number of benefits in dependency network: 4
Number of concerns: 8
Number of concerns in scorecard: 6
Mean score: 3,2
Mean importance: 3,3

The strategic perspective was considered less important than organizational, operational, and managerial perspectives and it scored better than managerial and organizational perspectives. Furthermore, the effect on NSN's customers and competitiveness was

considered to be adequate and not very important whereas the effect on supplier relationships was very high and important. Further, the problem with project being delayed was considered to be significant, since the immediate need for project benefits cannot be fulfilled. As some stakeholders considered TAAIM as not business critical but rather a "nice-to-have project" with less significance, the project team admitted that not all stakeholders can be pleased. Finally, the project was considered to have some effects on the NSN's pursuit to further enhance its integrity after the merger.

To improve its scoring on the strategic area, not much can be done. Most of the strategic concerns were considered not very important and can be omitted as they are not critical from the aspect of project success. As the strategic priority was scored '3', the project team can still continue improving the business case and communicating the benefits to the management, if they wish to improve their strategic priority. From the strategic aspect, the timing of the project is not "on-the-spot", so the project could possibly be revised to address the current needs.

Parallel evaluation of benefits and concerns

A long-term goal in use of TAAIM practices is to enhance NSN's competitiveness. By observing the TAAIM benefit dependency network in Appendix A we see that managerial, organizational, and operational benefits are needed to concretize strategic benefits. Attaining operational benefits of time-to-market improvement, easier installation at customer premises, and quality improvement lead to the strategic benefits related to customers.

Strategic benefits	Concerns that the benefit alleviates	Benefit characterization, estimation, and measurement
Better supplier negotiating position	**Strategic: The usage of strategic suppliers is not consistently leveraged**	**Long-term, tangible, quantifiable** As the visibility to supplier utilization improves, the company can improve the gained awareness when making decisions regarding the usage of suppliers. The result is that the supplier amount changes and can be measured directly.
Increased customer happiness, customers contract again, and new customers	**Strategic: Fierce competition at telecom market**	**Long-term, intangible, quantifiable** Improved product quality and delivery times (due to more efficient customization) have beneficial effects on customer interface. However, the measurement is difficult as it is almost impossible to show that which the effect of TAAIM was.
Company competitiveness increase	**Strategic: Fierce competition at telecom market**	**Long-term, intangible, non-quantifiable** Being able to customize and develop new products faster leads to customer benefits discussed above and this increases company competitiveness. Same reasoning of measurement difficulties apply here

		as above.above
Harmonization of technology strategies	**Organizational: Units are working in silos, sharing no information although sharing a common goal, and not fully aware of what others are working on**	**Long-term, intangible, non-quantifiable** Since the merger of two companies the technology portfolio has included overlapping work. By increasing commonality and re-usability technology strategies align to same direction. Same reasoning of measurement difficulties apply here as above.

IT infrastructure perspective

Summary of scorecard evaluation on project related concerns

Number of short-term benefits: 5
Number of long-term benefits: -
Number of benefits in dependency network: 4
Number of concerns: 16
Number of concerns in scorecard: 7
Mean score: 4
Mean importance: 2,9

The mean score of four reflects that the TAAIM concept takes the IT infrastructure related concerns well into account. The importance score of 2,9 is the lowest of all perspectives meaning that organizational, managerial, operational, and strategic issues are more important for the project. The concerns on this perspective related to the usage of the system, technical implementation, and information modeling. Also information updatability was mentioned as an important factor as up-to-date information is needed for effective technology management. These issues are relatively well addressed by the project. Only the information granularity was seen as issue that scored '3'.

To improve its scoring on the IT infrastructure perspective, the project team should even further improve their plans on technical implementation of the system.

Parallel evaluation of benefits and concerns

IT infrastructure benefits	Concerns that the benefit alleviates	Benefit characterization, estimation, and measurement
IT synergies, less IT systems and IT cost savings	**IT infrastructure: Far too many IT systems at the moment and IT landscape is complex**	**Short-term, intangible, quantifiable** The project is part of a larger program and the IT system itself is planned to utilize existing IT assets. This brings monetary synergy savings to project governance structure and also the technical implementation including development and software license acquisition costs. TAAIM supports IT system consolidation. The savings

		generated is equal to the reduced amount of IT system costs. This can be measured by first setting up a baseline and observing the costs as IT systems are integrated or removed from use.
Increase usage of current IT systems	**IT infrastructure: Far too many IT systems at the moment and IT landscape is complex**	**Short-term, intangible, quantifiable** In addition to the possibility of reducing IT systems from a complex IT landscape, TAAIM aims to utilize the existing systems by accessing their information. This usage can be measured directly.
Less time spent using IT	**IT infrastructure: Far too many IT systems at the moment and IT landscape is complex**	**Short-term, tangible, quantifiable** The transition from working methodology based on diverse manual methods to a more automated IT system, time is saved. This could be measured by forming a baseline of current time spent on IT and measuring time used after IT implementation.

Project related costs

To achieve the organizational benefits, culture changes, process changes, and coordination will accrue costs. These costs accrue due to wages paid to employees coordinating the project, and time spent by employees participating in training. Internal marketing performed by the project team prior to the TAAIM investment can be seen as a sunk cost, albeit not very significant.

Managerial resources spent on IT piloting, drafting initial business case, and drafting technology solution description can be categorized under sunk managerial costs. During the early phase of studying the feasibility of establishing TAAIM a pilot IT project was executed. After this, the project team members concentrated on studying the technological, business, and usability requirements. Project team's effort was spent on interviewing the relevant stakeholders gathering their needs and concerns and marketing the project concept. Also, the time spent by the contributing employees (IT consultation) not directly working in the project team accrued expenses for NSN and thus can be enlisted in sunk costs.

The costs in IT infrastructure category accrue from establishment of TAAIM IT system, which includes work cost of program developers, IT system architects, process developers, and functional experts. Time expenses are the dominating cost element here – no investments in software licenses or hardware will be required as these resources are found in-house and are maintained by other projects. Recurrent (operational) costs are the second cost category. After the system is established, the maintenance of IT software technology and administration work of information elements and models will accrue costs to this category. This administration is done by both contracted services and in-house resources.

As a result of project cost estimations it can be noted that project costs play a minor role when compared to the possible benefits.

4.3.4 Decision making review

Conclusion on primary benefits

In the decision review emphasis is on monetary benefits as they are considered as the most important criteria by the decision maker stakeholders at NSN. The decision makers are part of a governance board which approves R&D project and program investments. Operational area is the main source of monetary benefits and NPV or ROI estimation can be calculated on this area. The calculations performed show that the monetary benefits of the operational area itself are significantly larger than the needed investment costs. In addition to monetary benefits, other areas provide mainly non-monetary benefits which can be used to further justify the project to other stakeholders than the decision makers. Other stakeholders of TAAIM, such as architects, engineers, and developers, require mainly non-monetary benefits on short-term. This claim is supported by the stakeholder the interview results.

The summary on the primary benefits that the project delivers is presented in Table 14.

Table 14. The primary benefits of TAAIM

Primary benefits	Benefit value for NSN	Sufficiency
Managerial efficiency on short-term Common TA management practices by providing technology implementation visibility through an IT system supporting technology decisions	**High non-monetary benefit**	**Sufficient**
Operational efficiency on long-term Reduced R&D costs and time efforts due to discovery of overlaps and increased TA asset re-use, reduced procurement costs	**High monetary benefit**	**Sufficient**
Strategic competitiveness increase on long-term Resource allocation on most profitable operations instead of maintaining overlapping technologies increases NSN's competitiveness, leveraged usage of strategic suppliers, and increased customer happiness due to product quality improvement and technology compliancy	**High non-monetary benefit**	**Sufficient**
Organizational efficiency on short-term Cross-BU information flow and cooperation increase, leveraging of employee expertise and knowledge, increased innovation capabilities	**Low-medium non-monetary benefit**	**Sufficient**
IT synergies Increased usage of existing IT systems by leveraging their information content, synergy benefits due to building on already existing IT systems instead of creating new	**Medium monetary and non-monetary benefit**	**Sufficient**

Conclusion on project related and other concerns

Stakeholder "buy-in" is critical and not achieving it jeopardizes the project success. Internal marketing of benefits and TAAIM process are means to achieve stakeholder involvement and work on these is ongoing. However, there is a risk that these measures are not enough to ensure acceptance among organization. The project benefits are considered to be hard to estimate, but the project team can provide financial projections on operational area and other benefit areas are simply considered non-monetary. Stakeholders are concerned that their requirements are taken into account. This is why the project's goal is to design TAAIM concept as "light-weight" as possible accruing minimum organizational cost. As a "single-point-solution" is not wanted, the IT solution is designed to utilize existing IT systems leveraging their information content.

The variance of working practices across BU's is a stakeholder concern. TAAIM provides common practices for architects, managers, and engineers. Many technology components have multiple designs, each accrues million-grade development costs, and the usage of strategic suppliers is not consistently leveraged. Visibility to technology implementation information across business units is currently not available. With up-to-date information, TAAIM brings visibility to reuse possibilities providing potential in million-grade financial savings in procurement and R&D costs. As the IT system landscape complexity is a source of concerns at the moment, TAAIM helps to consolidate the situation.

Decision proposal and recommendations

The analysis above shows that an investment should be made in technology and architecture asset information management because the benefits conform to the decision criteria outweighing the costs and risks. In addition, major stakeholder concerns were taken sufficiently into account by the project with the notion that pro-active change management is needed to ensure organizational "buy-in" of the concept. The realization of the benefits and project budget should be monitored by following a standard project governance process.

5 Discussion

5.1 Evaluation of the framework

This chapter discusses the validity of the results and whether they could be generalized to other domains than Nokia Siemens Networks, a telecommunications solution provider. Here it is relevant to ask:

- Where the framework was successful and did it fail in some areas? What are the limitations of applicability?
- Are there considerations that were left out of framework assessment but would have been needed in a thorough evaluation?
- Which types of projects can be evaluated with the framework?
- Does the framework tested at Nokia Siemens Networks apply to other companies in the same industry or other industries?

The investment project assessment framework is a tool that requires a lot of effort from the evaluators but results in thorough analysis of stakeholder concerns and benefit expectations converging on a simple decision proposal. By observing this we can imply that the framework is not usable for situations where light-weight or “agile” tool is needed to assist project justification and/or decision making. This can be considered as the greatest limitation of applying the framework. Greatest value of utilizing the framework can be achieved in situations where the project environment is complex, there are multiple benefits, benefit relationships are complex, stakeholders vary in their orientation towards the project, and the original business case must be enhanced. An accurate solution cannot be formulated on project assessment by using the framework but rather a solution which has practical relevance.

As the goal of utilizing the framework in the NSN case was to understand the stakeholders better and use their concerns and benefit expectations as a basis for investment project evaluation, it can be argued that the framework was successful. As a result, the stakeholder viewpoints were codified as they earlier were in tacit format. The project team’s understanding of the project context improved due to stakeholder concern elicitation and the decision making review helped in investment justification.

The intention of this thesis was to emphasize intangible benefit estimation and measurement. The literature review chapter has emphasis on this. In practice, it turned out that the findings were not very usable. Due to lack of resources, it was not possible to conduct extensive empirical research at Nokia Siemens Networks. It turned out that each of the intangible benefits would require considerable amount of effort to estimate ex ante. Ex post measurement would require years of monitoring of different metrics and effort by

multiple researchers. This is one of the most significant limitations of the framework. It does not help much when estimating the intangible benefits.

An issue relates to the fact that the existence of other projects is not explicitly taken into account in the solution framework. As an example, there might be a situation where two similar projects compete for the same resources. This is not a problem since a stakeholder can highlight the relation to other projects as a concern, after which this issue appears in evaluation scorecard and cross-assessment. Evaluators can also use the framework similarly for both of the projects and compare the review parts to converge on a decision.

Validity of the results of testing the framework can be questioned. In the case of Nokia Siemens Networks, project team alone evaluated the stakeholder concerns. This raises a number of issues. First, the stakeholder interview results might be biased towards favoring the project rather than reflecting the reality. Second, the scoring and importance levels might diverge from what is the common opinion in the organization. This is why it is suggested that the scorecard evaluation should always be done by a larger group of stakeholders. Both of the above critique holds true also if the framework is used for the purpose of enhancing the business case and increasing understanding of the project context. This is because the business case owner should know the organization's non-biased opinion.

Another validity issue relates to the placement of stakeholder concerns and benefit expectations to the five perspective categories. Bitman & Sharif (2008) discuss that "*When a set of perspectives is orthogonal --- the criteria selected for each perspective are more likely to avoid duplication and overlapping. This reduces the likelihood of the problems of collinearity in which apparently different factors are, in fact, measuring the same variable"*. Bitman's & Sharif's goal was to converge on a generic R&D scorecard framework for evaluating multiple projects on same criteria whereas the scorecard on the framework presented in thesis is based on few interviews and identified concerns. This is why the classification is not accurate, different amount of concerns per perspective exists, and the concern perspectives may be biased. Nevertheless, the goal was not to develop a generic scorecard but rather a tool for taking the specific business cases concerns into account. In this case the orthogonality is of second importance.

The problem related to incomplete identification of concerns benefits can also be speculated. When there are many people identifying the alternatives, problems may rise from the variance of individual opinions. Some personal opinions may get support on the cost of ignoring relevant alternatives. The evaluators' perceptions during stakeholder concern and benefit expectation analysis might have changed them from the original meaning. Large projects have numerous different benefit and cost elements with different granularities. There is a risk that even the most influential costs and benefits are not identified. It is also common that project owners and sponsors overestimate the benefits and underestimate the related costs. Risks that are not taken into account may concretize and lead to project failure. These are often referred as "unknown unknowns", the risks that we "don't know that we don't know". The problem described above can be solved only by

carefully conducting the interviews and not biasing the project assessment towards personal opinions.

One can bring into question that whether the framework results in a decision proposal that is enough for the decision makers. Answer to this critique is that the framework analysis is enough, because it tells how well the project takes the decision makers' concerns into account. The stakeholder concerns cover all the issues (e.g. financial benefit, project plans, and stakeholder requirements) that are required to know when making an investment decision. The framework process tells whether the project conforms to the decision criteria used by the investment decision makers. Here it is assumed that the analysis is done in objective manner without any biases, especially the decision makers' concerns are known, and no significant sources of concern are left out of analysis. Otherwise the decision proposal is questionable.

As the theoretical newness value should be assessed, one can mention that the framework is unique and originally designed to solve a specific business problem (TAAIM project assessment). It consists of artifacts from numerous managerial practices, such as portfolio and project management, intangible valuation, scorecard evaluation, and stakeholder analysis. To the authors best knowledge, no attempts to formulate an investment project evaluation framework on these artifacts has been made before. These artifacts are combined to a framework process providing a novel way to assess investment projects.

The framework was tested by assessing a project focused on designing and implementing an IT system. The author claims that the assessment tools and identified concerns and benefits discussed in this thesis are applicable in projects on different areas as well. Justification to this claim is that the framework does not assume anything specific about the nature of the project under evaluation. It is common for projects to have stakeholders who have concerns and varying benefit expectations. This is why the framework can be applied in other industries than telecommunications sector as well.

6 Conclusions

6.1 Concluding remarks

The intention of this thesis was to construct a framework for assessing a strategic investment project in terms of stakeholder concerns and benefit expectations. This would be achieved by reviewing literature on strategic investment assessment and interviewing experts at a company to find practical evidence to support framework creation. The literature review consisted of discussion on intangible benefits, their classification and measurement, stakeholder analysis, and project feasibility evaluation. The expert interviews supported the framework construction by providing practical evidence that the draft version of the framework was suitable. As a result, a strategic investment evaluation framework emerged consisting of four consecutive parts of stakeholder interviews, interview results analysis, cross-assessment, and investment decision review.

The applicability of this framework was tested by applying it to a project business case at Nokia Siemens Networks. Interviews with technology and architecture asset information management (TAAIM) project stakeholders were conducted to find out their concerns and benefit expectations. The stakeholder concerns were evaluated with a scorecard. The benefit expectations were placed in a benefit dependency network which turned out to be useful at NSN as it portrayed complex relationships between the project benefits. In cross-assessment part, the analyzed stakeholder concerns were evaluated in terms of how they were taken into account by the project. The benefit expectations were characterized and measurement. Finally, the framework evaluation resulted in a decision proposal of that investment should be made. TAAIM investment was approved at a decision board at NSN as the investment met the decision criteria in use. This is why the author claims that the framework has practical relevance – it helped the project team to enhance the project business case to align with the investment decision criteria and receive a “go” decision by R&D project governance board having power to approve or disapprove the project.

6.2 Future research

As only one project could be evaluated in the scope of this thesis, the framework should be applied in different contexts as well. This would include evaluating a similar IT project with Nokia Siemens Networks case at a different company at different industry, e.g. manufacturing, banking, or governmental sector. Another possibility is to evaluate completely different investment project related to areas such as branding, knowledge management, or design project. The limits of current or improved framework’s applicability could be tested by e.g. utilizing it on a complex design project which requires

a great deal of knowledge on stakeholders, such as nuclear plant or space ship design investment.

As the project evaluation scorecard was used only by the project team during the framework testing part, its usefulness cannot be verified in the case of involving a larger group to evaluation. This is why the scorecard should be utilized with a larger group of diverse stakeholders. Then the evaluation results could be separated into stakeholder categories reflecting what the orientation of different groups towards the project is. Furthermore, mathematical analysis of the scorecard results could be beneficial. For instance, geometric mean and normalized relative weights could be used extend the current analysis.

As benefits that can be expressed in monetary terms are always easier to use when justifying investments, more research is needed on how intangible benefits can be valuated. The framework could be extended to further emphasize on how to quantify the intangibles. An interesting and challenging research area would be to try to fully monitor the realized benefits of an investment project. Monitoring different metrics at an organization or multiple organizations would be required to produce credible results. This research would be a long one since many of the benefits of strategic investment projects take years to realize. The downside of including a thorough evaluation of intangibles is that the framework would become even more “heavy-weight” in terms of how much effort is needed by the evaluators. Nevertheless, as money drives business and project benefits become increasingly intangible in future, project managers are required to put more effort to estimate and measure their intangible assets.

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Appendix A

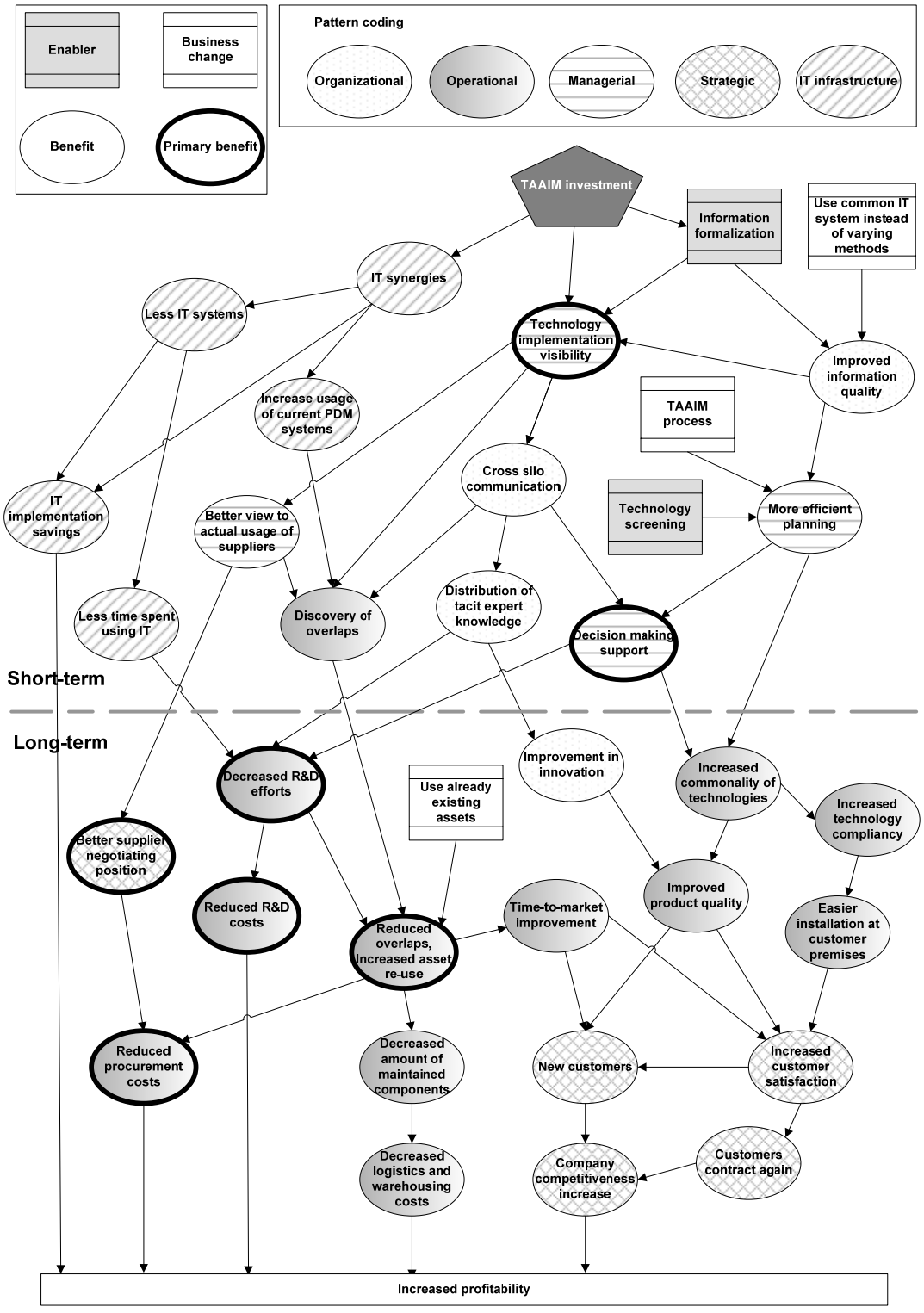

Figure 24. TAAIM benefit dependency network model