Master Thesis in Informatics

What aspects are important in an ex-post investment evaluation?

Dzenana Begovac
Sandra Fagerström
Maria Nobel

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IT University of Göteborg
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Department of Informatics
IT UNIVERSITY OF GÖTEBORG
GÖTEBORG UNIVERSITY AND CHALMERS UNIVERSITY OF TECHNOLOGY
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SUMMARY
In academic research there seems to be great support for ex-post investment evaluations. The importance for organizations to learn from mistakes connected to IT/IS (Information Technology/Information Systems) investment projects and the opportunity to change the investment management process is stressed. Also it is suggested that in order to bring the investment to its best it is necessary to identify shortcomings and correct them. The fact that there is a huge variety of IT/IS investments further complicate the evaluation process. In this paper we have focused on enhancing our knowledge of ex-post investment evaluations. For that reason we have conducted in-depth interviews with mainly IT managers at middle-sized to large companies. By doing these interviews we have gained knowledge in, to which extent ex-post evaluations are done and what difficulties there are that might prevent companies from performing them. An understanding of which variables, intangible and tangible, that where perceived as important where achieved. The interviews showed that it is not common for IT managers to perform ex-post evaluations; this was thought by the respondents to take place at other levels in the company. A framework for ex-post evaluation should deal with aspects as: “Identification of investment gaps”, “impact on organization” and “organizational learning”. Difficulties experienced by respondents where e.g. “poorly performed investments proposals make it difficult or even impossible to know what to evaluate” and “lack of time and personnel”. It was also clear that mostly tangible variables where addressed, concerning time and money. The evaluation methods used by these companies where mainly financial connected to cost and income.

Keywords: ex-post investment evaluation, values, IT/IS investment, evaluation models, evaluation methods, cost, benefit, tangible measures, intangible measures.

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Dzenana Begovac Sandra Fagerström Maria Nobel

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1 Introduction

Competition in today's corporate environment has forced companies to cut their costs significantly. To reduce costs and to improve productivity, profitability, and quality companies are forced to take a deep look at their investments and what make them profitable. This is one of the highly interesting topics in today's IT/IS research. There is no doubt that computerization lead to higher quality in shorter time and with less effort. Many studies show that there is a large difference between the assets that has been invested and the assets that has been earned from these investments. It is also found, however, that large amounts have been invested in IT without any evidence of an increased productivity (Brynjolfsson, E. & Hitt, L.M. 1998). This is just one of the problems that have forced companies to establish management control mechanisms. Among these mechanisms the evaluation of an IT/IS investment are considered as very important (Smithson, S. & Hirschheim, R. 1988).

Despite the fact that evaluation is important, the literature also reflects low uptake of ex-post evaluation in organizations. One of the problems seen is that many of today's projects, i.e. IT/IS investments are evaluated throughout the implementation process, but then they stop. The real benefits arise when people begin to use the new product or system in a proper way, though (Smithson, S & Hirschheim, R 1998; Piric, A. & Reeve, N. 1997). Another reason IT/IS evaluation literature identifies is that many companies have difficulties in identifying and measuring potential benefits and costs. It can be complicated to do cost-benefit analysis because costs and particularly benefits are intangible and hard to define. Intangible variables can be difficult to measure because organizations want to se benefits in form of time and money. Measurement problems, the perception that evaluation is unimportant or not necessary, cost concerns and political or cultural constraints are other problems that are discussed. A variety of methods and techniques for deciding the importance and priority of different IT/IS investments have been proposed in literature. These models provide a classification of IT investments and also suggest sets of methods with different attributes that should better suit different types of investments.

In order to understand what aspects are important in ex-post investment evaluation in the IT/IS area, this study has been performed through literature studies and qualitative interviews. The interviews where conducted at six occasions at different companies with IT executives. A case organization, that provides companies with a tool for distribution and administration of PC environments, has helped with important input and suggestions of IT managers to interview. Their concept is implementing, administering and developing large and geographically distributed PC environments. The challenge for them is to make sure that each and every one of the employees through out the customer companies always has access to necessary operating systems and applications. The idea is to maximize the value of already made investments by utilizing existing components in Microsoft's operating systems and programs to the brim, an area in which they are market leaders. The case organization where interested in finding ways of communicating and measuring the gained benefits of their enhanced PC environment.

1.1 Problem domain

Companies have begun to realize the importance of being able to evaluate the outcome of an IT/IS investment. It is now necessary to show that the investment actually brings benefits to the organization and that the benefits exceed the costs. However, this can be very difficult depending on the type of IT/IS investment. Organizations often focus on a purely financial assessment when evaluating investment requests and outcomes. If the same procedures are applied to IT/IS investments, the true value of the investment is often underestimated. There seems to be a consensus in literature concerning the problems in IT/IS investments. IT/IS investments differ from other investments in that the benefits from IT/IS investments are very difficult to measure. This is suggested to be because the benefits often are intangible and realized during a long period of time; companies' environment is also constantly changing. Even the costs of IT/IS investments are difficult to measure since the duration of IT/IS development often is long (Hallikainen, P. et al. 2003).

There are typically throughout literature different ways to describe the area of IT/IS investment evaluation. Frisk and Plantén (2004) has put different evaluation strategies, approaches and perspectives into a framework (Figure 1). We will use this framework to help us navigate through the problem domain. This framework will also help us to delimitate what to explore. We have highlighted the areas in the figure that is closest to our study.

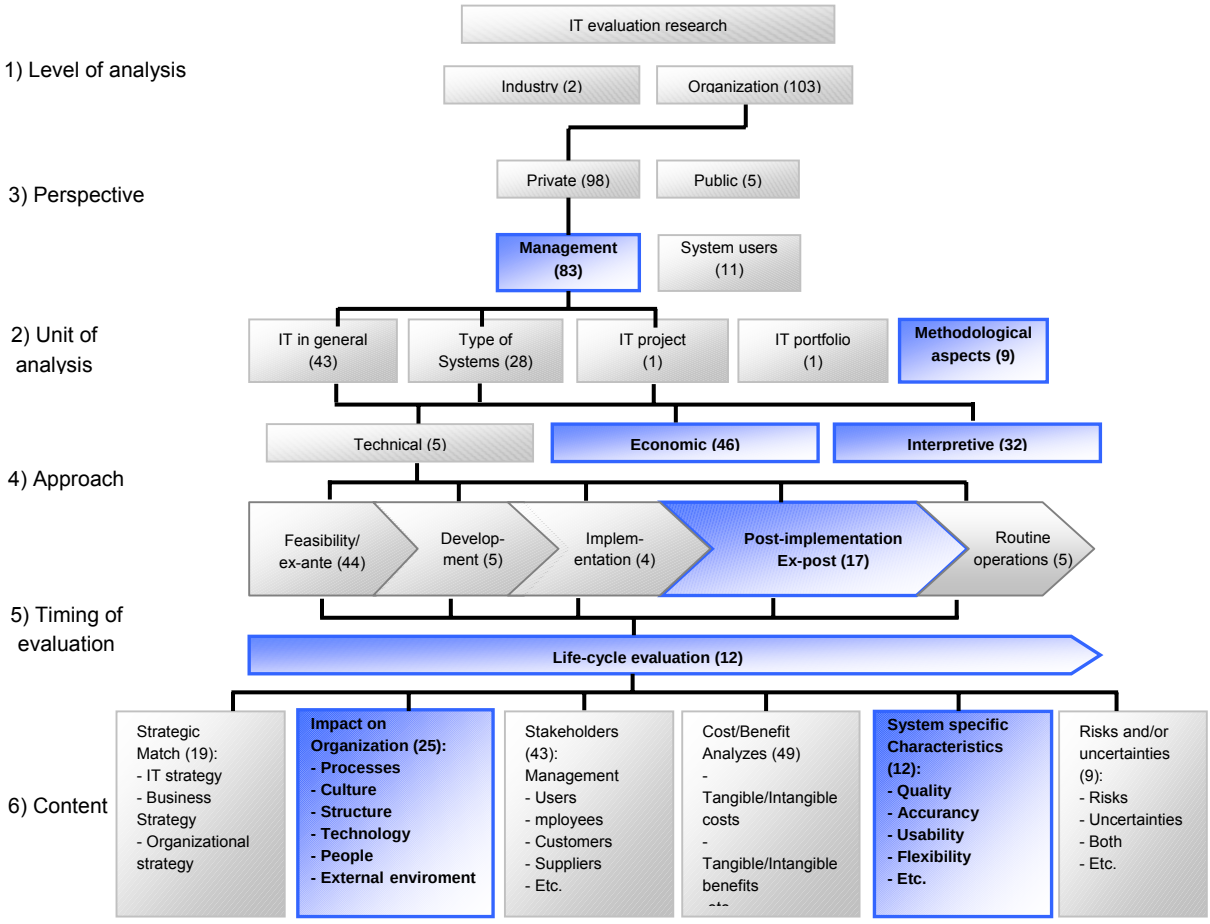

Figure 1: Framework and overview of IT/IS evaluation research (Frisk, E. & Plantén, A. 2004)

As previously mentioned companies usually make *financial* evaluations of investments. There are however, other aspects to consider. Frisk and Plantén (2004) found three approaches - technical, economic and interpretive in their work-through of 105 articles about IT/IS investments evaluation. We have explored different approaches and looked into what different variables are found more important, concentrating on which methodologies are the most common or are considered valuable. There are also different stages along the IT/IS investment lifecycle where an evaluation can take place. Companies commonly put their focus in the beginning of an implementation. It is quite common to analyze what solution would best benefit the company. However, a lot of the organizations see the work as done when the system is implemented. A very small percent make evaluations after the implementation has taken affect. Also, it is not until some time after the implementation has beard upon the organization as it is possible to evaluate if it has been successful or not. According to Davies and Powell (without year), evaluation during development is almost non-existent. Post-implementation/ex-post evaluation is not often done because it is either experienced as too difficult, not necessary, too costly or against the organization's culture. In this study we have concentrated on ex-post evaluation mainly because we have found that there is a huge lack in organizations' performance in this area. Also, the emphasis is on cost/benefit and tangible/intangible measures although we have considered the impact on the organization as an important issue.

The issue of measuring IT/IS investments has for several years been one of the main topics within IS management research (Anandarajan, A. & Wen, H. J. 1999). In response many researchers has tried to develop methods for evaluation. Despite this, there still is not a complete method widely accepted. The methods are often difficult to understand and not validated. We therefore went through several of the most used models and methods to find out what advantages and disadvantages they had, to better understand what an ex-post evaluation could look like. However, there is a vast amount of different methods in different categories and we have only looked into the more common ones. There are different categories of methods; quantitative (traditionally financial), qualitative, and probabilistic, there are also different models that use a mixture of two or three of these categories, further referred to as mixed methods. In this paper we do not explore the probabilistic methods deeper as they preferably are used in ex-ante evaluations and are not applicable for ex-post investments evaluations

There are of course also external factors that may affect the positive outcome of an investment in IT/IS. Devaraj and Kohli (2002) for instance give some examples - a strong/weak economy, insufficient accomplishment of the competitors or that the product manufactured is just a better/worse one. We will however not explore these factors in this paper. Different stakeholders may provide different aspects on what measures/benefits are more important and can also contribute in a positive way to identify different benefits. In this paper we do not intentionally seek different stakeholders' views because of the limited timeframe.

To examine these issues we worked together with an organization that provides companies with a tool for distributing and administer PC environments called FastTrack. The case organization where interested in finding ways of communicating and measuring the gained benefits of their enhanced PC environment. We thought it was interesting to find out what methods there are and what important issues to

consider when evaluating an IT/IS investment. We will not present a complete model for ex-post investment evaluation in this paper.

1.2 Purpose and focal questions

We find it to be an interesting problem; the issue that IT/IS investment evaluations often do not show the real outcome of the investment. For many executives it is difficult to see the real cost and benefits of the investment. It also seems difficult to find and use a proper model for the evaluation of the outcome of the investment. The purpose with this paper was to learn more of *what aspects that are important in an ex-post investment evaluation of an IT/IS investment.*

In order to understand this, the following questions where formed:

- What gains and difficulties do companies perceive with an ex-post investment evaluation?
- What tangible and intangible variables do companies find important?
- Which are the most common methods used in IT/IS investment evaluation?

1.3 Disposition

Chapter 1 contains the introduction, the problem domain and the purpose of the paper with focal questions.

Chapter 2 displays previous research that we have looked into in order to gain a firm foundation to our focal questions and research.

Chapter 3 explains our way of work, the theoretical background and methods used.

In chapter 4 we explain and discuss the results and what they may lead to in terms of a framework for ex-post evaluation of IT/IS investments.

The conclusion is formed in chapter 5.

There are also three enclosures – “Methods”, “Definitions” and “Interview template”. The methods enclosure may be referred to when the reader does not know the methods mentioned in the work. Some methods are more thoroughly explained and some are very brief depending on how easy/difficult it has been to find the information and not on there importance. The definitions enclosure contains some of the terms in the paper, as we perceive them and the interview template were used in the semi-structured interviews.

2 Related research

In the literature review section current theories and thoughts on IT/IS investment evaluation are presented. Especially ex-post investment evaluation concerning difficulties in how to evaluate investments in IT/IS has been looked into. Different evaluation methods; financial as well as more complex methods have been examined in order to understand what makes the evaluation process so difficult and how the process can be performed so that IT/IS investments can be properly evaluated.

It is essential that organizations have information and processes in place so that investment projects are implemented at acceptable costs, in calculated and sensible timeframes. Moreover, these processes shall contribute to recognizable improvements in mission performance (GAO 1997). Often organizations do not perform a proper evaluation though, usually, according to Davies and Powell (without year), because it is so difficult to identify the intangible benefits besides the difficulty of placing value on information itself. The big issue is *how* to measure the impact on the organization, but not only that, Devaraj and Kohli (2002) points out that often companies transfer the benefits of an IT/IS investment to their customers and so make it difficult to measure the true value of the investment. Hinton and Kay (1996) declare that the evaluation of an IT/IS project cannot be successfully treated as separate from the context in which it is used since an IT/IS investment is affected by the heritage and legacy of previous investments; it so forms part of a continuous series of investments.

"Without appraising an application from within its organisational framework it is difficult to determine what its implications may be for the users or how this will influence organisational performance."

(Hinton, C. M. & Kaye, G. R. 1996)

There are some specific difficulties concerning IT/IS investments, for instance; the difficulty of allocating costs to a specific project when the result will be used throughout the organization. Also, it is difficult to estimate ongoing costs since the lifespan of a system rarely is known. Some IT/IS professionals suggests that software should be capitalized since the return generally occurs over time, also it has maintenance associated with it and therefore should be handled as any other capital investment (Violino, B. 1998). Moreover, IT/IS projects of today often change the structure and behavior of the organization it is implemented in, thus making it more difficult to understand what and how to evaluate (Saarinen, T. 1996). The implementation of IT/IS should be viewed as a part of the organizations ongoing development. It is not uncommon for investment-oriented managers to fail to recognize that IT/IS investments are incremental, continuous, long-term and a source for organizational learning (Davies, D. & Powell, P. without year; Irani, Z. 2002). Also Saarinen (1996) points out that the difficulty with an IT/IS investments is that they are often corporate-wide, having long-lasting effects and are intangible. Anandarajan and Wen (1999) claim that although managers may include a checklist with intangible benefits, these values are usually ignored since it is so difficult to quantify them. Hinton and Kaye (1996) found that managers usually focus on justifying IT/IS investments in the same way as they do operational investments and not by intangible measures as in marketing investments.

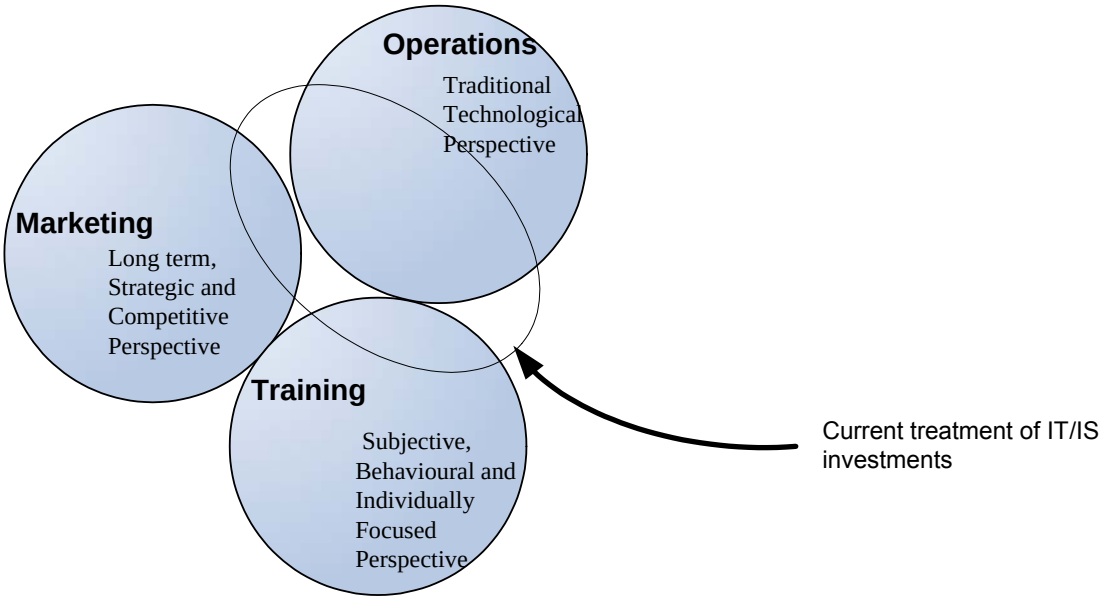

Figure 2: The different investment perspectives by Hinton and Kaye (1996).

The current management of IT/IS investments is mostly in the operations domain, being short-term and technical (see figure 2) according to Hinton and Kay (1996); whereas it may be more beneficial to treat IT/IS investments in the same way as in the marketing domain and place more importance to the training domain. The marketing domain is treated as long-term and is more strategically justified. Also, the training domain takes into account the more intangible issues like; organizational culture and politics as well as the individual (Hinton, C. M. & Kaye, G. R. 1996). Generally though, profitability benefits are measured with financial methods. Profitability still is mostly linked to the impact on the work process and the resulting cost savings and is used to evaluate the "bottom-line" impact of the IT/IS investment (Devaraj, S. & Kohli, R. 2002; Saarinen, P. 1996). However, as Devaraj and Kohli (2002) explain; benefits can also be found in the productivity and consumer value dimensions. Here though, the benefits are more of an intangible nature.

Irani (2002) states that; one of the difficulties in using appraisal techniques for evaluating intangibles is to get all stakeholders to agree on what meaningful measures and important values there are. Devaraj and Kohli (2002) claims that explicitly outlined objectives is essential; they help to ascertain realistic costs and benefits as well as helping in finding contingencies and also getting groups to invest (time and interest) in the project.

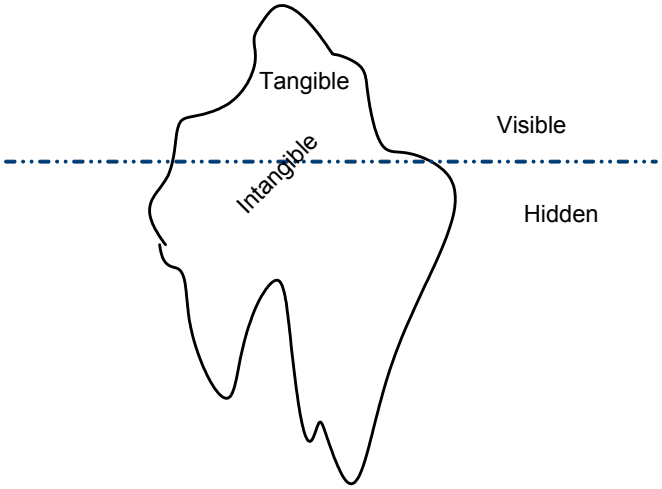

Figure 3: Visible and hidden aspects of an IT/IS investment

Hinton and Kaye (1996) explain the trouble with visible aspects of cost and benefit often concealing a hidden dimension (Figure 3). According to Milis and Mercken (2004) and Hinton and Kaye (1996) these are benefits which management overlooks or choose to ignore. Costs are usually easier to measure than benefits. However, a large part of the costs of an IT/IS investment is intangible or hidden (Milis, K. & Mercken, R. 2004). Examples are; training costs or a temporary decline in efficiency due to the switch from a well-known system to a new one. Money et al. (1988) suggests that when evaluating an IT/IS investment the emphasis should be on value rather than cost and that the focus should be on intangible benefits as traditional Cost/Benefit analyses are most often inadequate for IT/IS investment appraisal.

2.1 IT/IS investment evaluation

An evaluation can be performed at different stages of an investment cycle; ex-ante, during or ex-post evaluation (Davies, D. & Powell, P. without year). The ex-post investment evaluation is important in order for the organization to learn and to, if necessary, address issues with the investment in order for it to perform as good as possible. It can however be a sensitive matter if people (e.g. the manager who made the decision) experience the evaluation as personal or suspect it to be unfavorable. This in turn can lead managers only to make “safe” investments. It is also crucial that the ex-post evaluation takes place after a sufficient period of time depending on the complexity of the implementation (Devaraj, S. & Kohli, R. 2002).

Today, companies have been forced to cut their IT/IS cost significantly because of increased competition and global economic aspects. Because of the uncertainty involved, management control mechanisms like evaluation has become more important. Evaluating an IT/IS investment should be a cycle of different procedures (see picture 4) rather than something that is conducted once. Also GAO (1997) points out different phases in IT-investment; Selection phase that corresponds to “ex-ante evaluation”, Control phase which corresponds to “During evaluation” and the evaluation phase, here called “ex-post evaluation”. In this paper we concentrate on ex-post investment evaluation.

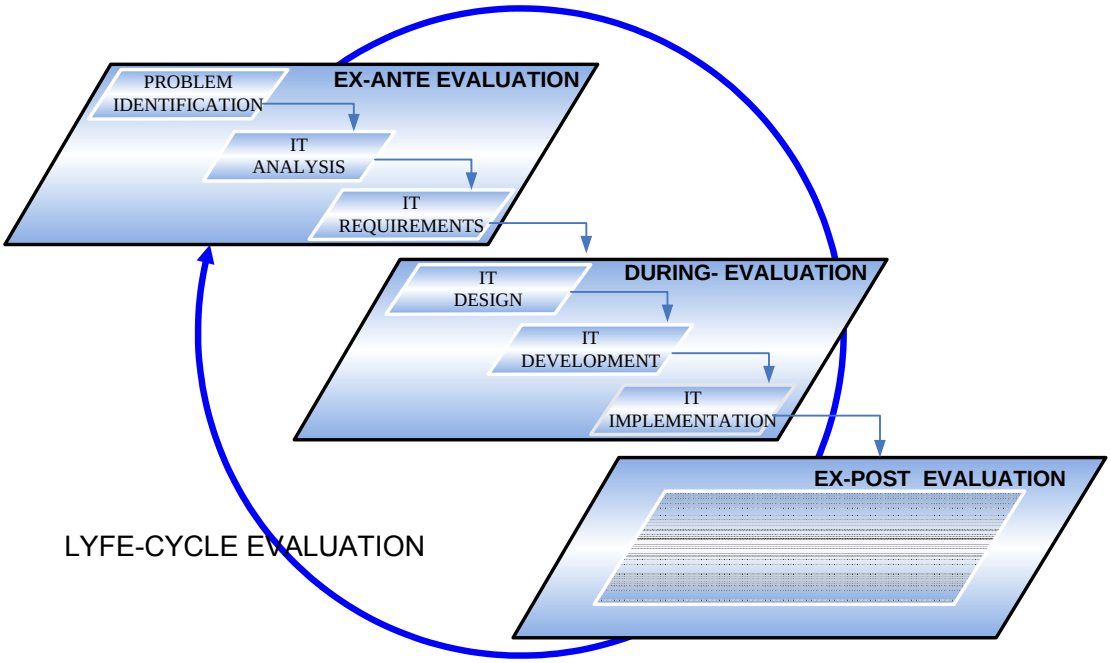

Figure 4: The IT/IS evaluation cycle.

According to Symons (1991) a "successful" evaluation requires a wider examination of the organizational situation than has traditionally been made. He argues that a complete evaluation process includes *the subject of evaluation, the criteria* that is used and *their measures*. GAO (1997) explains the importance of including the organization's operating environment as well as its goals and missions when performing an IT/IS investment evaluation. An evaluation can be used for different purposes (André, H. 2003):

- As a control tool
- To encourage learning
- Symbolic (e.g. to show that current standards are followed)
- Fundamental effects (when evaluation affect and create new practices)

Anandarajan and Wen (1999) suggest that evaluations of IT/IS investments are significantly different from other investments in two aspects:

- It is difficult to quantify the wide range of intangibles that most often are involved in these kind of investments
- There is a rapid change in everything associated with the criteria of IT/IS investments

2.2 Ex-post evaluation

In this section we examine the measurement problem in the context of ex-post investment evaluation, i.e. the evaluation of an existing system performance. Ex-post evaluation refers to the consequences of the investment after the system has been implemented (Smithson & Hirschheim 1998). Here we illuminate the ex-post evaluation where the purpose is to verify the contribution the investment has made to

the organization, organizational learning and the enhancement that can be performed when a gap between anticipated and produced benefits are identified.

An ex-post evaluation takes place after a project has been completed and closed (Piric & Reeve 1997). It is common that ex-post evaluations are performed two, three or even five years after a project has been completed. Ex-post evaluations are designed to measure the result of project success. In an ex-post investment evaluation, actual results are compared and evaluated versus expected results (GAO 1997). GAO explains that in this phase an assessment shall be made on the investment's *impact on mission performance*. Secondly, the evaluation shall *identify possible changes or modifications that are needed* and third, a *revision of the investment management process* can be made based on lessons learned. Also, if necessary an attempt should be made to find out why major differences have occurred between the expected and factual result (if they have occurred) (GAO 1997). Ex-post evaluations are used to establish lessons learned from investments already implemented, and to apply those lessons to future decisions.

The value of performing ex-post evaluations is found across literature. Norris (1996) stress four reasons for ex-post evaluations where several are similar to what GAO suggest. Firstly, they help organizations to make more realistic estimates in the future. Secondly, they give the organization the opportunity to take corrective action, i.e. to improve their actions in future. These benefits include improvements that come from organizational learning (Kumar, K. 1990). Thirdly, it helps build organizational confidence in the business focus and professionalism of the department. If the organization is able to see achieved purposes, confidence will rise and they will be able to look towards new possibilities. There will be an improved confidence in the IT/IS department (Hillam et al. 2000). The fourth reason is that they give feedback if the actual value has been achieved from the IT/IS investment or not.

There are at least three important reasons for undertaking an ex-post evaluation according to Farrell et al. (1998):

1. **Re-evaluation of the economic appraisal approach**
   It is very common for economical appraisals to be based on a series of assumptions about costs and benefits that may or may not be fully achieved in reality. By undertaking en ex-post evaluation the organization will be able to re-evaluate the ex-ante evaluation that has been done.

2. **Control of Ex-ante evaluation thoroughness**
   How through was the ex-ante evaluation? Was it thorough enough for a proper ex-post evaluation to take place?

3. **On-going asset management**
   It is not enough to review projects after implementation to determine if the ex-ante assumptions were realistic or not. It is important for the organization under the evaluation of the project consider the matters of exploitation of assets and reorganization to ensure that resources are allocated in the most effective way.

According to Farrell et al. (1998) an ex-post evaluation quantifies the actual effectiveness of a project, comparing conditions before and after implementation. According to Wescoat (without year) an ex-post evaluation should be:

- ***Comprehensive***

  A comprehensive ex-post evaluation includes the full collection of environmental, social, economic, and institutional impact and also related projects.
- ***Integrated***

  An integrated ex-post evaluation observes the relations between different types of impacts.
- ***Long-term***

  Long-term evaluations examine impacts that occur over several decades or more.
- ***Cumulative***

  Cumulative ex-post evaluations consider how the impacts of one investment are related to the impacts of other investments and other structural and non-structural measures.
- ***Adaptive***

  Adaptive ex-post evaluation is used to constantly evaluate and adjust decisions.

It is important to point out that an evaluation is necessary in order to make sure that the IT system still is proper for the business needs in the organization (Sohal & Ng 1998). Hillam et al. (2000) noticed that that ex-post evaluation can create positive insights in the organization and so avoid sabotage of otherwise competent implementations. The positive effects of IT/IS investment evaluations increases for every evaluation the corporation performs. These positive effects stem from previously successfully evaluated projects. The more and better an organization perform the ex-post investment evaluation the more they learn and can evolve their investment management process. Seddon et al. (2002) concludes that while successful IT/IS evaluation practices did not “cause” good IT/IS performance they were closely related.

Literature shows the need for ex-post evaluation and Willcocks (1996) argues that ex-post investment evaluations should be an integral part in the overall appraisal process. It is also shown that ex-post evaluation should be undertaken because in most cases it is important to go back across the process to make sure that the benefits specified are actually achieved. Specifically, it is important to define benefits both quantitatively and qualitatively to measure the outcome (GAO 1997). According to Piric & Reeve (1997) methods that are used in Ex-post evaluation are based on hard data and have been seen as more reliable. It is however important to mention that these methods are less useful when making evaluation to learn for future projects. One of the reasons to conduct an ex-post evaluation can be to identify arguments or incomes suggested in the ex-ante evaluation. Studies have identified significant benefits for organizations undertaking ex-post evaluation of IT/IS projects. However, literature also indicates a low uptake of ex-post evaluation in organizations. Studies show that it is common for organizations to perform ex-ante evaluations but not many carry out ex-post evaluations. Even in organizations where there is a formal ex-post evaluation procedure or policy the occurrence of an ex-post evaluation is not guaranteed (Ballantine, Galliers & Stray 1999; Norris 1996). Lin & Pervan (2001) found that organizations are focused on justifying the investment rather than ensuring a planned benefits management approach. In 2002 Seddon, Graeser & Willcocks concluded that

not much has changed over the past decade *"IT projects continue to fail, yet only 50% of organizations conduct post implementations evaluations"*.

Theoretically ex-post evaluation can produce benefits for subsequent IT/IS investments. These benefits however, usually are either not being recognized or achieved or else significant inhibitors are present. Norris (1996) found four grounds for evaluation problems.

1. Difficultly evaluating, including measurement problems
2. Perception that evaluation is unimportant or not necessary
3. Cost concerns
4. Political or cultural issues

1. Evaluation is too difficult

As (Norris 1996) points out, costs are easy to discover but ex-post benefits are more difficult to identify because of the use of several business or functional areas. Norris indicates that these benefits are often entangled in the general business results of those areas and are not generally identifiable or are intangible. One of the reasons that evaluations are viewed as difficult is because of problems measuring the actual benefits (Remenyi 2000).

2. Evaluation is not necessary

The most common reason for not to undertaking an ex-post evaluation is for organizations that have a reduced cost view of IT/IS. This reason makes evaluation irrelevant and becomes the motive for the organization not to undertake an ex-post evaluation (Seddon et al.2002). Another motive not to undertake ex-post evaluation is a general lack of interest.

3. Cost Considerations

According to Norris (1996) evaluations are forced to compete with all other organizational activities for inadequate capital and because of that the benefits must also be more important than the cost of conducting the evaluation, otherwise managers may feel that the capital could make more value if it is placed elsewhere. According to Seddon et al. (2002) one of the most common reasons for the low undertaking of ex-post evaluations may be the lack of clear benefits against the obvious cost. The costs of evaluation include:

- The time and cost to perform the evaluation.
- The political cost of offending interested parties if the assessment is unfavorable.
- The costs required implementing effective changes in organizational evaluation practices, if that is being attempted.

4. Political Dimensions

Hillam et al. (2000) claims that one of the political reasons for not undertaking an ex-post evaluation is that the evaluation can be used to protect or challenge political positions and/or power positions in the organization. It has been noticed by Seddon et al. (2002) that there is a huge probability that the ex-post evaluation may not be executed if the ex-post evaluation might have negative consequence for the managers. It can also be difficult to evaluate if the result shows that the project was successful, the manager may then loose resources and staff. Another consequence with an ex-post

evaluation is that it will bring to light errors with the system (Norris 1996). Managers can have a low confidence in ex-post evaluations if they think that an ex-post evaluation may perhaps provoke negative consequences to arise in the organization. Seddon et al. (2002) indicates that managers carry out ex-post evaluation only if they have been forced to do so and Norris (1996) claims that the managers will undertake evaluation only when:

- They recognize a personal advantage that outweighs the supposed costs.
- They are required to do so by another (more senior) manager who perceives a value in performing an evaluation.

Another reason that ex-post evaluation is not conducted more often can be that the investment is justified in abstract financial terms. Terms that developers and users may find too abstract (Remenyi & Sherwood-Smith, 1999).

2.3 Measurements, models and methods

A number of management tools to guide decisions related to proposed changes can be found in literature. In this section important measurements and what different models and methods have to offer and how they can be used are explored. Information about specific methods has been placed in Enclosure I and in this section emphasis has been put on their implications. The word framework and model has been used interchangeable in the text below to make the text more flowing.

GAO (1997) points out that the IT/IS performance measures used shall be closely tied to the investment's expected benefits and focused on the alignment with business results. Saarinen (1996) claims that often there is a reliance on subjective assessment and surrogate measures. There is a question of what should go in to the evaluation, the product itself or the benefit of using it or maybe both.

2.3.1 Tangible and intangible measures

We use the term intangible to denote soft assets or variables difficult to define such as: brands, software, customer satisfaction, logos, company culture, employee satisfaction and so on. Intangible benefits and costs are often known to management but are difficult to measure or quantify (Milis, K. & Mercken, R. 2004) and are often overlooked as they are difficult to define and monitor (Davies, D. & Powell, P. without year). Intangible values are, according to Hinton and Kaye (1996), the costs of an investment that generally does not have a physical form and are justified in terms of future value, rather than past cost. IT/IS can produce many benefits that may improve performance and might speed up business processes, provide more accurate information for decision making and management control, improve communications and make it easier for employees to work together. These kinds of benefits are often hard to measure and their impact on the organization even more so (Turban, et al. 1999). Tangible values however can easily be identified by management and can be quantified (Milis, K. & Mercken, R. 2004).

According to Read, et al. (2001), it is important to start measuring, monitoring and managing intangibles for compelling reasons:

- Identifying and communicating the value of intangibles can have a profound effect on the markets view of company performance and potential. Even so, intangible assets are often systematically underreported and therefore undervalued.

- To make sensible decisions about the balance between physical and intangible investments, companies must be able to value their customer relationships, brands, human capital and intellectual property.

- Because intangible assets are generally unreported, they are invisible and there for not exploited enough.

According to Read et al. (2001) some skeptics however, believe that intellectual assets never will be meaningfully measured. Intangibles can vanish overnight; e.g. a technology can be replaced.

According to Brown (1994) tangible benefits are a direct result of the introduction of the IT/IS and are easily measured. He also points out that soft benefits include at least intangible, indirect and strategic benefits. Figure 5 describes to which extent benefits are directly traceable to the introduction of the information system and also if they easily can be quantified. The horizontal axis distinguishes between quantifiable and non-quantifiable benefits. The vertical axis distinguishes between those benefits strongly connected to the introduction of the information system and those that depend to a greater extent to other organizational factors (Brown, A. 1994).

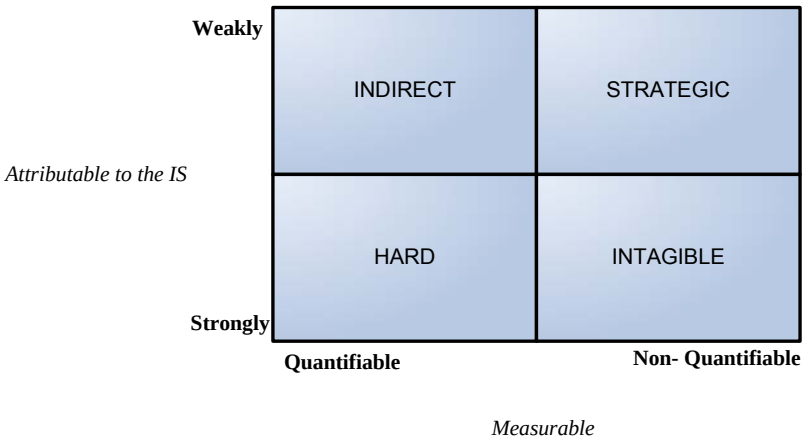

Figure 5: Different types of IT/IS Benefits (Brown, A. 1994)

Hard benefits are often related to cost reduction, such as the reduction in personnel/staff, time savings and so on. Such measurable benefits are relatively easy to incorporate in traditional investment appraisal techniques.

Problems in measuring benefits are mainly related to the remaining three categories of so-called “soft” IS benefits. *Intangible* benefits can be assigned to particular applications but they cannot easily be expressed in quantitative terms. Benefits of this type arise, e.g. with the introduction of a Decision Support System (DSS). Such systems are generally expected to improve the quality of decision-making as well as the job structure of the DSS users. “Quality of decision making” and “job structure” is per se difficult to define. Also, even if this is accomplished, it may still be difficult to assign a quantitative, i.e. monetary, measure of the improvement (Brown, A. 1994).

According to Brown (1994) *indirect* benefits are potentially easy to measure but can not be wholly attributable to the proposed investment and can only be realized as a result of further investments, enabled by the new system. The implementation of a Local Area Network (LAN) across an organization provides for instance an infrastructure onto which valuable shared applications can later be implemented. Although this is a potential benefit made possible by the LAN, it cannot be realized unless these shared applications are also successfully introduced. Such complementary investments may be in IT or in any other organizational resource, such as a change in business processes enabled by the introduction of IT/IS. *Strategic* benefits relate to positive impacts realized in the long run and usually come as a result of the synergistic effects among contributing factors. Strategic benefits are the outcome of, for example, a new business strategy or a better market positioning of the organization, which can only be partially attributed to a given IT/IS investment. Such benefits are undisputedly difficult to quantify due to their very nature and to the risk associated with their realization. Infrastructure technologies include mainframe computers, operating systems, networks, database management systems, utility programs, development tools and more. Since many of their benefits are intangible and are spread over many different present and future applications, it is hard to estimate their value or evaluate the importance of enhancements or upgrades. In other words, it is much more difficult to evaluate infrastructure investment decisions than investments in specific IT application projects. (Turban, E. et al. 1997). An IS seldom provide one type of benefit alone. Any information system can be expected to deliver a range of different types of benefits (Brown, A. 1994). Table 1 illustrates this concept. While any type of benefit can generally be sought and realized by an information system, Table 1 emphasizes those types of benefits that are typically associated with each investment type (Farbey, B. et al. 1993). The table provides a classification of the different types of benefits directly applicable to different types of IT/IS investments.

Project Types	**Typical Benefits Types**			
	Hard	***Intangible***	***Indirect***	***Strategic***
Business Transformation				x
Strategic Systems			x	x
Inter-Organizational Systems		x	x	x
Infrastructure		x	x	
MIS and DSS		x		
Direct Value Added	x	x		
Automation	x			
Mandatory changes	x			

Table 1: Typical Benefits of Different IS Projects (Farbey, B. et al. 1993)

In accordance with Irani (2002), Piric & Reeve (1997) claims that different investments demand different methods. He also describes the importance of using an application specific model to integrate key business drivers. According to Hallikainen

et al. (2003) it is important to consider in which context the evaluation takes place when determining what evaluation criteria and methods are useful for an IT/IS investment. An incorrect method can lead to poor decisions and counterproductive investments.

There are different types of methods; quantitative (traditionally financial), qualitative, and models that use a mixture of methods from different categories, further referred to as mixed methods. Methods found have been put into these different categories. Tables of these methods can be found at the beginning of each category (i.e. quantitative, qualitative and mixed) to make it easier to handle the large amount existing. These are only the most common ones and no effort has been placed on listing all existing methods and models.

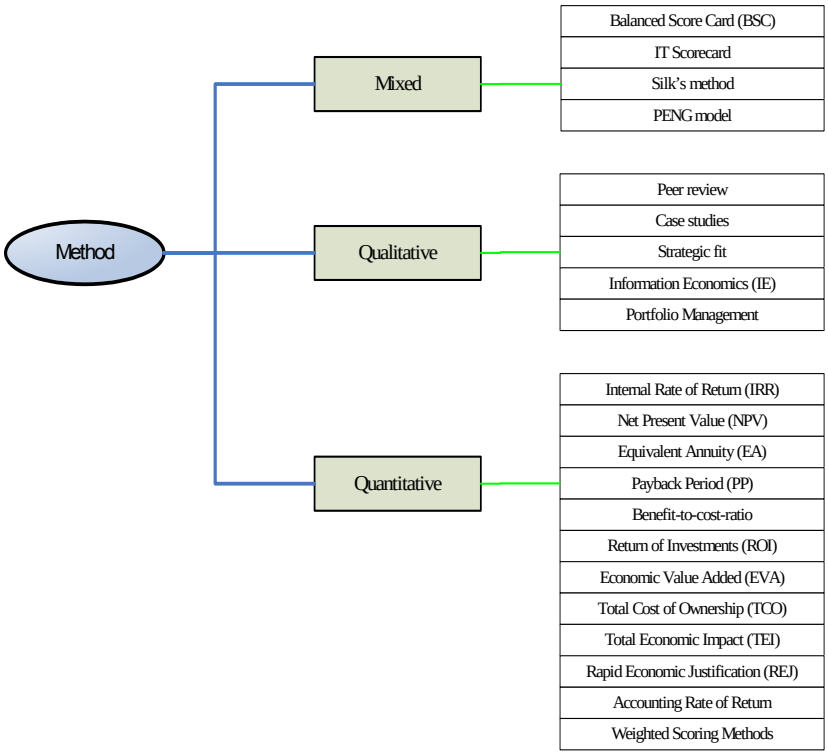

Figure 6: Schematic figure over the categorization of different methods

As investments in IT/IS has moved from manufacturing towards service and more strategic investments the benefits has become more intangible and more difficult to define. The traditional cost/benefit analyses are therefore not as favorable for today's IT/IS investments (Davies, D. & Powell, P. without year). Since different stakeholders have different perspectives they will choose different tools and techniques, therefore a wider organizational framework should be used according to Hinton and Kaye (1996). They suggest that such a model should acknowledge the interaction between the technology and other organizational variables. Milis and Mercken (2004) state that there is a consensus in literature; traditional methods are not appropriate for the evaluation of IT/IS investments. They describe two approaches to achieve more adequate results; adjusted traditional methods and new methods. The use of adjusted traditional methods, to meet the difficulties of IT/IS investment evaluation, can make the evaluation process easier to understand and use. With adjusted traditional methods the evaluation criteria is similar as those used for other investments and can then more

easily be compared. Milis & Mercken (2004) suggest two ways to adjust traditional evaluation methods.

1. Managers can enter *estimates* of intangible benefits into, for instance the NPV model.
2. Managers can enter *expected* values (multiplying the probability of realization of an expected benefit by its estimated value) into, for instance the NPV technique.

Milis and Mercken (2004) claims that neither adjusted nor new techniques are frequently used and that this may be explained by the fact that the outcome of the techniques are difficult to interpret and use. Similar to Davies and Powell (without year), they suggest that it make sense to use a mixture of techniques to eliminate or diminish the weakness of a single technique. GAO (1997) has a similar view and suggests that a method should provide an assessment of the investment and the development process. Further GAO explains that the evaluation should indicate whether or not the organization's investment decision process are supporting or improving the success ratio of IT/IS investments. Davies and Powell (without year) claim that, reliance on a single technique may lead to sub-optimization or even failure.

Devaraj and Kohli (2002) suggest a framework where four phases are involved:

- ***Exploration,*** the intention is to find out what should be measured and how to analyze. Also, it is important to find out what expectations there are from future users.
- ***Involvement,*** this phase involve stakeholders and considers political issues that can sink the project. By involving stakeholders it is easier to understand how to measure the outcome and how the company shall make use of it. It is essential to reach more or less a consensus of what constituent value and how to measure it.
- ***Analysis,*** the effort in the previous phases will show here. The match between the "what and how" to measure and the organizational objectives is what constituent the real challenge, and if gained, the success.
- ***Communication,*** the bedrock in getting people involved and ultimately the success of the project.

This framework is similar to PENG. The PENG model also considers:

- **Preparations;** where the purpose is to identify what to measure and analyze and also to create an understanding and consensus for the investment
- **Analysis;** to identify and value benefits.
- **Guarantee of quality;** risk is assessed and persons responsible for the realization are decided.

Irani, Z. (2002) claims that when the purpose of an IT/IS investment is operational (or operational efficiency), financial methods might be appropriate. However, if the purpose is strategic (as more and more of the investments today is) a different approach must be taken in order to cover the more intangible areas of that investment.

There is a positive relation between IT/IS evaluation and alignment of IT/IS with the business strategy (Hallikainen, P. et al. 2003). Selecting appropriate performance measures is therefore important since they will determine the amount of value that can be uncovered. The measures selected will also influence how the organization behaves and where it places its emphasis. However, the literature provides conflicting advice. Some authors suggest that managers should measure the effect of IT/IS on profit in existing financial measures. Others propose looking beyond the traditional financial indicators and measure what management think is important (Simmons, D. 1996).

Milis and Mercken (2004) stress the importance to acknowledge and understand the different parties involved in IT/IS investments. These are, according to Milis & Mercken;

- ***The organization***, represented by the management, the main benefactor of the organization
- ***The users***, who will operate and achieve the benefits of the investment
- ***The implementers*** of the new technology, the project team
- ***The supporters***, a heterogeneous group who supply resources or services when the new technology is implemented
- ***The stakeholders***, all those who will be effected by the new technology

Milis and Mercken (2004) suggests that when the appraisal of IT/IS investments are solely based on traditional investment appraisal techniques, only the objectives of the management is taken into account. They claim; that focusing too much on the financial gains can abate the benefits of the IT/IS investment.

Several methods can be used to assess the value of an IT/IS investment. These methods provide a clearer view and a vision of what the realization of the investment will mean to the organization. Davies and Powell (without year), claims that most firms use a combination of methods because no single evaluation method is simple enough for managers to understand as well as complex enough to include the issues involved. However, Hinton and Kaye (1996) found that the most used techniques where; Payback, Discounted Cash Flow and Cost/Benefit analyses, this indicating that the most popular reason for justification of IT/IS investments are cost reduction. However, they found that the second most popular reason where to establish whether or not the investment where in line with the overall strategy. Davis and Powell (without year) claims that about two thirds of the organizations use cost-benefit as their first priority even though literature shows that it is outdated and does not show the true worth of IT/IS.

In many investments quantitative methods are preferred. Other types of investments may be more dependable on qualitative methods. Quantitative methods are more appropriate in areas where outcomes are tangible, while qualitative methods are more appropriate in areas where the ultimate outcome is intangible (Piric & Reeve 1997). In most cases it is possible to use both qualitative and quantitative approaches and at least some of their elements in the same evaluation situation. How to combine qualitative and quantitative methods depend on a number of different issues; e.g. in which circumstances they are used, what available data sources there are, what the characteristics of the examined sector are, etc.

Irani (2002) suggests a model that integrates the characteristics, benefits and costs associated with the specific application being considered. This would, according to Irani, make the evaluation process more manageable. He distinguishes between concept based and financially based assessment processes. The concept-based approach is more interpretative and may be used to communicate the issues and ramifications involved in the project. He also suggests that concept justification can be regarded as fundamental to robust IT/IS evaluation. Financial justification includes traditional appraisal techniques and there are limitations regarding their use with IT/IS investments according to Irani (2002), e.g. difficulty quantifying the intangible benefits, no common consent in what constituent purposeful evaluation or the discouragement of long-term strategically significant investments that offers intangible or non-financial benefits. Saarinen (1996) suggests that by including the development process and the impact on the organization alongside the user information satisfaction (UIS) instrument a more comprehensive and direct evaluation can be made that more conforms to the traditional cost/benefit analyses. Saarinen so suggests a four-dimensional analysis model containing; the development process, the use process, the IS product quality and the impact on the organization.

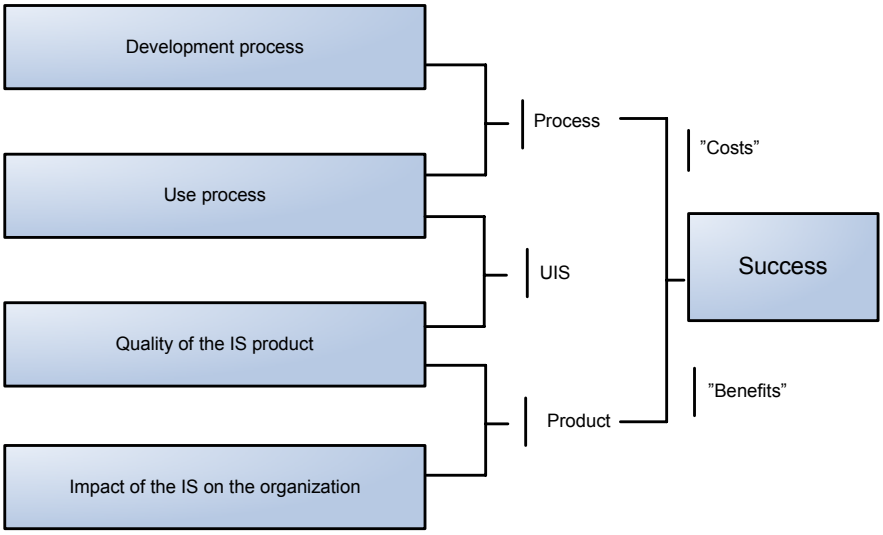

Figure 7: Saarinen's Main dimensions of IS success

Saarinen's (1996) four-dimensional model to evaluate investment success includes:

- Success within the *development process* can be measured externally (within budget and time frame) or internally (right level of expertise).
- Success within the *use process*; communication and service should be at the right level.
- Success with the *quality of the IS product* is characterized by system quality and information quality.
- Success measured by the *impact the IS has on the organization* can be seen in how the new system effects the organization.

With this approach different people/managers need to evaluate different aspects/dimensions. Saarinen's model is closely related to GAO's recommendation to include; *Customers/Users* since several of the intangible benefits can be related to how users feel about the investment, *Mission impact* to determine whether or not the

investment has achieved the intended impact and if it still is aligned to the organizational goals and mission and finally, *Technical ability* where the work force ability to use the new system and the resulting user satisfaction is evaluated (GAO 1997).

2.3.2 Quantitative methods

Quantitative methods are often thought of as objective, however, predicting and assessing costs and benefits often come down to "experts" judgment (Saarinen, T. 1996). Also, Saarinen claims that if estimates are built on subjective predictions and are changed during the project, the objectivity can be questioned. Hinton and Kaye (1996) describe that these methods has an accounting perspective and mainly supports a short-term investment attitude and usually ignores the social dimension of an organization. Quantitative methods are considered well developed by Piric & Reeve (1997) who claims that the application of quantitative methods is significant in different areas. Anandarajan and Wen (1999) explains that traditional financial methods like Net Present Value (NPV) and Internal Rate of Return (IRR)[1]; estimate and evaluate cash flows, identify and consider the time value of money, establish whether incremental benefits exceed incremental costs and determine a number that express the extent of project viability. However, Money et al. (1988) claims that the traditional cost/benefit approach and other approaches not considering intangible benefits are no longer valid.

We have paced more information about methods in enclosure I, "Methods". Here we try to present a more general view. The table below is an attempt to summarize the most common quantitative methods to aid the reader.

[1] See enclosure, Methods

Quantitative methods for evaluating investments		
Method	***Advantages***	***Disadvantages***
Internal rate of return (IRR)	Brings all projects to common footing. Conceptually familiar, takes the time value of money into account	Assumes reinvestment at same rate, not possible to compare projects of different size, does not calculate risk if dealing with mutually exclusive investments
Net present value (NPV)	Very common. Maximizes value for unconstrained project selection, risk can be calculated when comparing investments	Difficult to compare projects of Unequal lives or sizes
Equivalent Annuity (EA)	Brings all project NPVs to common footing. Convenient annual figure.	Assumes project repeat to least common multiple of Lives, or imputes salvage value.
Payback period (PP)	May be discounted or non-discounted. Measure of exposure. Rule-of-thumb	Ignores flows after payback is reached. Short-termed, does not take risk into account, does not calculate the time value of money
Benefit-to-cost-ratio	Conceptually familiar. Brings all projects to common footing.	May be difficult to Classify outlays between expense and investment
Return of Investments (ROI)	Includes the whole lifecycle of the investment, has a limited risk calculation	Does not calculate the time value of money, does not calculate risk if dealing with mutually exclusive investments
Economic Value Added (EVA)	Conflicting and confusing goals are replaced with a single financial measure for all activities	A high-end view that can be difficult to connect to
Total Cost of Ownership (TCO)	Works well for analyzing a narrow function or series of functions	Does not assess risk or provide a way to align technology with strategic goals
Total Economic Impact (TEI)	Best for infrastructure or enterprise wide projects and when analyzing two distinct scenarios	It probable that there are specific disadvantages also with this method but we have not been able to find them in literature
Rapid Economic Justification (REJ)	Best suited for managing single projects, has an business assessment phase and a risk analysis	The analysis is subjective and the method can be slow
Accounting rate of return	Is widely used and easy to understand.. Data is readily available for calculation.	Does not take into account the time value of money. Is based on accounting profits which are subjective.
Weighted Scoring Methods	Address different factors. Different types of scales can be used for various factors. Decision factors are plainly identified and weighted	Basic scoring models do not plainly account for uncertainty. Difficult to address future events or pending decisions. Decision factors may be linked, which may result in double counting.

Table 2: Quantitative methods

Piric & Reeve (1997) identifies different types of quantitative methods:

- **Financial methods**
  These methods are able to present correct calculations of the efficiency and distributional effects of research. The results are usually calculated with help of methods like Internal Rate of Return (IRR) and Net Present Value (NPV). These methods have certain advantages e.g. the possibility to make the evaluation process much faster and easier. The most important or common financial evaluation methods are:
  - *Cost-benefit/cost-effectiveness analysis*
    The most well known method is cost-benefit analysis (CBA). The purpose of the analysis is to justify and explain the social benefits and costs of a particular investment in terms of a common monetary unit. According to Kylefors (2001) CBA is used as a support for decision-making when choosing between two or more projects or recommendations concerning one single project. The most important characteristic of a CBA is to identify all costs and benefits of a project, to quantify all costs and benefits and express them in financial terms and also to reduce the future costs and benefits to the present value using a reduction rate.
  - *Return On Investment (ROI)*
    ROI is one of several approaches when building a financial business case. Decision makers evaluate the investment's potential by comparing the extent and timing of expected gains to the investment costs. ROI-analyses are often used to show what value you can get from a potential IT/IS investment.
  - *Net Present Value (NPV)*
    The Net Present Value of an investment is the difference between the sum of cash flows that are expected from the investment and the sum first invested. NPV is a sum that expresses how much value an investment will result in.
  - *Risk profiles*
    The purpose of a Risk Profile is to provide related and background information to an organization so that risk managers can make decisions and, if necessary, take further action.
- **Econometric methods**
  According to Piric & Reeve (1997) the econometric method is an ex-post evaluation method. The method is based on statistical methods, which include economic theory. Using these methods demands the collection of historical data on production, inputs, prices, past research expenditure, and so on.
- **The scoring methods**
  The scoring method is based on decided criteria. A list of projects is compared against a list of approved criteria that have predetermined weighting. Scoring models work primarily by integrating economic data, qualitative factors and intuitive judgment of managers. However, it involves the assignment of monetary values to intangible benefits and Money et al. (1988) therefore deems them as primarily cost oriented. The method works well for systematizing and simplifying the decision making involved at any level of the organization. Even though these methods are primarily used in ex-ante evaluations they may come in handy if there is an incentive to evaluate further

development of the investment in the ex-post evaluation. The method is often used to integrate multiple goals and objectives. A main characteristic of this method is that it remains subjective, both in terms of the criteria and the weighting attached to criteria. (Piric & Reeve 1997)

2.3.3 Qualitative methods

Qualitative methods are usually used to assess the value of people and processes by measuring subjective and qualitative inputs (CIO, 2004).

More information about methods is placed in enclosure I, "Methods". The table below is an attempt to summarize the most common qualitative methods to aid the reader.

Qualitative methods for evaluating investments

Method	*Advantages*	*Disadvantages*
Peer review	Gives quality assurance and improves scholarship by ensuring relevant literature is cited. Receives added value by the process of revision	Reviewers are human and can make factually incorrect judgments. Reviewers may often disagree Can be time consuming.
Case Study	It is contemporary, applicable to real-life and human situations and is public accessible through written reports.	It can be complex because it generally involve multiple sources of data, may include multiple cases within the same study and produce large amounts of data for analysis
Strategic fit	It fits with strategic direction of the corporation and business is more valuable financially when it is capable of contributing heavily to corporate performance and objectives enhances firm's overall worth	Does not help when choosing between investments that are mutually exclusive
Information Economics (IE)	Takes value and risk into account Assess people issues as well as technical ones Fairly fast way to prioritize spending and align IT/IS projects with business goals	Can be over-mechanistic and time consuming Not designed to manage projects Relies entirely on consensus of subjective opinions
Portfolio Management	Changes the management processes	Changes the management processes Takes time to incorporate the method with the organization

Table 3: Qualitative methods

Money et al. (1988) claim that it is of importance to acknowledge and identify the benefits particular to a specific IS so that what is measured is of relevance for the IS being considered. Piric & Reeve (1997) identifies three types of qualitative methods:

- **Peer review**
  Peer review is a method that is typically for ex-ante evaluations but sometimes can be used in an ex-post evaluation. The method is based on a panel of experts in respective fields, evaluating proposed projects based on their own judgments and expertise. Peer review is vital for enhancing the quality, credibility and acceptability of published research and practice papers.
- **Case studies**
  Case studies are perceived as one of the most important types of qualitative methods in ex-post evaluation. The main advantage of a case study is that it is based on hard data, i.e. based on projects that are already completed. In that

way it is much easier to identify important indicators since the outcome is "visible". The positive aspect using this technique is that it usually has a clearly defined plan and that the results are well based.

- **Strategic fit**
  Strategic fit are built upon Porter's value chain and evaluates the alignment between the IT/IS investment and the company's goals.
- **Information economics (IE)**
  IE is best used to evaluate a portfolio of projects, to decide how and where to allocate resources so they will be of greatest benefit (CIO 2004).
- **Portfolio Management**
  Portfolio Management is to view IT/IS staff and projects as assets managed by the same criteria a manager would apply to any other investment (CIO 2004).

2.3.4 Mixed methods

Since all traditional methods has strengths and even if adjusted, has its drawbacks, it is suggested that it makes sense to mix different methods to even out the weakness of using one single method (Milis, K. & Mercken, R. 2004).

More information about methods is placed in enclosure I, "Methods". Here we try to present a more general view. The table below is an attempt to summarize the most common mixed methods to aid the reader.

Mixed methods for evaluating investments		
Method	***Advantages***	***Disadvantages***
PENG model	Makes the project more clear. Contributes to achieve a larger amount of profit. Can be used as method or a process.	It is very important that the right person perform the judgment.
Balanced Score Card (BSC)	The measures incorporated in the BSC are grounded in the organization's strategic objectives and competitive demands. Helps the organization to focus its efforts on the strategic vision.	Difficulty isolating the impacts of IT/ IS from other factors affecting the business performance.
IT Score Card	As above – BSC. Take specific IT/IS investment issues into account	It probable that there are sprcific disadvantages also with this method but we have not been able to find them in literature
Silk's method	Quantifies intangible benefits	May overlook the subtleties of intangible benefits.

Table 4: Mixed methods

Anandarajan and Wen (1999) suggests a mixed model for financial evaluation where intangible benefits are quantified by using the concepts of opportunity costs and expected value in probability theory. They also incorporate risk by using sensitivity analysis. They suggest three steps:

1. Determination of tangible and intangible benefits
2. Determination of costs
3. Identification of NPV and risk assessment

Two other examples of mixed models are:

- **Balanced Score Card (BSC)**
  The BSC framework is a mixture of methods, financial and new evaluation methods. The model was formed to take into account external, internal, financial and future perspectives (Kaplan, R. S. & Norton, D. P. 1992). BSC is a concept that will help the organization to transform strategy into action. BSC is a system that considers vision and strategy, and reflects the most important aspects of the business. BSC supports strategic planning and implementation by combining the actions of all parts of an organization around a common understanding of its goals.

- **PENG model (Prioritering Efter NyttoGrunder** (Using Benefits for Prioritizing)**)**
  The PENG-model is a tool to identify and evaluate, in money, future or already achieved benefits. The PENG-model, according to the creators, helps communication between the business and IT managers (Dahlgren, L. E. et al. 2003). The model is used as a tool for business development and can be used in conjunction with other models or methods. The authors claim that their model leads to better specification of requirements, a more comprehensive objects layout, an enhanced management commitment, a deeper knowledge for the business processes and an improved overall view. By conducting a benefits analysis with the PENG-model the decision grounds will be sounder and with clear objects for change and intangible benefits made visible and valued (Dahlgren, L. E. et al. 2003).

2.4 Summary

The focus in academic research on the purpose of ex-post evaluation is to assess whether the organization have spent the invested money efficiently and effectively. By conducting an ex-post evaluation the organization is suggested to be able to quantify the actual effectiveness by comparing conditions before and after the implementation. The purpose of the ex-post evaluation has been proposed to be to find out whether the organization has achieved goals that were anticipated for the investment. Another purpose is to learn from the past what can be changed in the next investment cycle and also how the evaluation can be enhanced. For the possibility to attain such results it is important for the organization to clearly identify the goals and objectives. It is also perceived important to keep the flexibility in the evaluation since it is common that things change during the implementation.

Even though it is clear that advantages can be achieved with an ex-post evaluation it is clearly stated in previous research that organizations rarely perform these evaluations. The fact that organizations do not conduct ex-post evaluations is proposed be because:

- They either find evaluation difficult or not necessary.
- The perception that an evaluation costs more than what can be gained.
- They do not have the technical expertise to perform the evaluation.

Tangible variables can easily be identified and quantified by management. There is however a problem regarding the intangible variables. Some of the tangible and intangible variables that have been proposed are presented in the table below.

VARIABLES	
TANGIBLE	- Reduced costs - Improved decision speed - Improved product quality - Less error - Less time needed for support issues - More stable IT-environment - Shorter employee training time - Higher accuracy of data
INTANGIBLE	- Synergy with other projects - Better learning value - Job enrichment - Improved costumer service - Improved decision making - Customer satisfaction - Enhanced employee productivity

Table 5: Most referred to variables (Literature)

Different methods are used for different types of investment. The most common and most used methods are the quantitative methods due to that the organizations are more accustomed to analyze financial improvement and success.

It is suggested that a balance between qualitative and quantitative methods would be beneficial to accomplish, because there is not a single method that is sufficient when evaluating the entire dimension. The suggestion is to integrate different methods to achieve a wider understanding.

3 Method

In this chapter we present methods used in this paper and also explain how we have used them in our way of work. Further we display the methods used for the collection of the empirical material and a motivation to the selection of the respondents that was included in the interviews. Finally we critically discuss different parts of the methods used in our work.

3.1 Science theory

It is of great weight that the work is anchored in a strategy. The theory shall help in showing as a correct picture of the reality as possible. The study may be conducted in a deductive or an inductive way (Patel, R. & Tebelius, U. 1994). Interviews can be either qualitative or quantitative. Below these methods are described:

In positivism the point of view is that the world is extern from the researcher and that the researcher should be independent and free from presumptions. This is so the researcher shall not affect the outcome (Easterby-Smith, M. et al. 2001). In this view science shall focus on pure facts and the researcher shall search for fundamental laws. In a positivist view it is common to use a deductive way of work. In deductive theory existing principles and theories are used to form a hypothesis in order to draw conclusions. Material in a deductive way of work is often collected through the use of quantitative methods. The deductive way usually applies to the nature scientific research area (Patel, R. & Tebelius, U. 1994). It is important that science show a high grade of replication. In other words it shall be possible for an outsider to control the outcome (Backman, J. 1998).

The interpretative outlook has surfaced as a reaction to the positivist view on reality. In the interpretative approach scientists deliberately use their previous comprehensions in the research process. The inductive method is the opposite of the deductive. An inductive approach has its base in empirical data. Data is first collected and are later worked on and formed to a general theory (Backman, J. 1998). This way of work allows the researcher to study the object without first having to anchor the investigation to existing theories in the area. The qualitative approach is mainly inductive and used within the humanistic and social science areas. The use of several methods are common and gives the scientist different perspectives of the investigated phenomenon. The selection should be small and investigated in depth or over a long period of time (Easterby-Smith, M. et al. 2001).

3.2 Procedure

We have chosen to work with a qualitative approach because we were interested in finding out people's perceptions and experiences of ex-post evaluations in order to get a deeper understanding of the research area. A preconception and interest for the problem domain primarily rose from earlier studies. Further insight has been demanded to get a clearer view of the situation and this has been achieved by literature studies as well as qualitative interviews. Formulations of the focal question have been modified iteratively during the work. Our focus has so matured with analyses and renewed studies into literature and discussions with the interviewees, as is the way of qualitative research (Holme, I. M. & Solvang, B. K. 2001; Backman, J. 2002).

The work process is seen in the figure below:

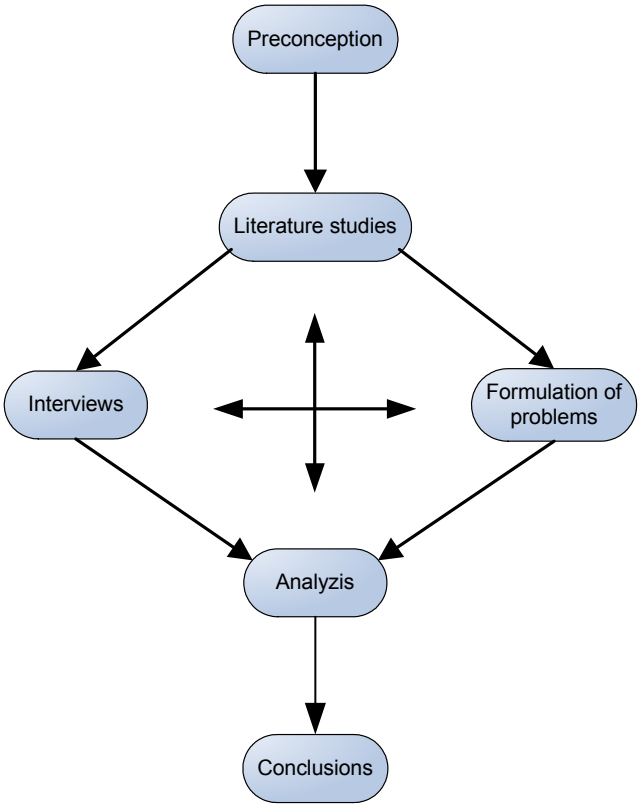

Figure 8: Work structure

We studied research in the area and with the gained knowledge constructed our focal question and an interview template. Previous research together with interview answers where then analyzed and further studies in the area have been performed and so on. The study has therefore evolved in an iterative way. The purpose of the literature studies was to create a fundamental understanding for the problem domain, but also to anchor the focal question of the study to accepted theories in the area.

We have chosen to categorize different evaluation models and methods used in an ex-post evaluation. The work has resulted in constant updates and further exploration to understand the research area. We started out with analyses of models and methods, parallel to extensive literature studies. Eventually through our iterative process the problem area and problem formulation were identified. Eventually the focal question was scrutinized against the information collected.

3.2.1 Collection of data

The material in our study has been collected through different collecting methods and can be divided into two categories, primary and secondary data. We have collected primary data mostly through qualitative semi structured interviews. Secondary data has been collected through academic articles or literature and documentation from the case organization.

The purpose with the empirical investigation was to gain an understanding for and an insight in how ex-post evaluation of IT/IS investments are conducted at an IT department in a middle sized or large company, and also to find out what methods and

values where used. The goal with the interviews and the selection of respondents were to find out to which extent ex-post evaluation where performed and to discuss what benefits may occur with an ex-post evaluation. In previous research it is clear that ex-post evaluations seldom is performed, even so it is claimed to exist very well developed methods for evaluation. We wanted to find out if companies had adjusted to these newer methods. Some of the respondents where addressed with assistance of the case organization, others where found by personal contacts.

Primary data has been collected through qualitative interviews with different respondents. There have been six in-depth interviews with IT managers or comparable decision makers from different companies. The interviews were conducted at the company in question or, if not possible, through an interview by phone. On one occasion there where two persons present so the total amount interviewed can be said to be seven. Two interviews where conducted with people from the same company although on different levels, so there where a total of five companies. Four out of five companies had experience from FastTrack and four out of seven people. The respondents where all asked the same questions except for the FastTrack specific questions; that only where presented to the respondents with FastTrack experience. The interviews where performed in the way of an informal discussion around the questions (Holme, I. M. & Solvang, B. K. 2001). The organizations involved have IT departments with a size variation of between 20 to 400 persons. The organizations have business units in countries all over the world.

To perform interviews when actually meeting the respondent is preferable since it is easier to discuss and ask open questions then. Also, it may be a little more comfortable for the person being interviewed. An interview template was made in advance to try to find new perspectives towards the focal questions. To facilitate the analysis and interpretation of the material, all the interviews where audio taped and transcribed (Backman, J. 2002). The template can be viewed in enclosure III. On several occasions discussions have taken place with representatives from the case organization. Before interviewing the respondents the template has been sent to the respondents so that they could study it. This has made it easier for us to discuss the questions since they have been prepared. However, this can affect the answers so that the answers are the “politically correct” ones. After the interviews where made, the information was transcribed from a tape recorder to get as much information as possible from the respondents and to not miss useful input.

With the interviews we wanted to create a broad range of variation and also, to find respondents with deep insight in the research area (Holme, I. M. & Solvang, B. K. 2001). We experienced some problem with getting interviews with IT managers with knowledge into the type of solution the case organization provides. Mainly, managers are short of time and it can be difficult to find the time to meet. The interviewees roles and organizations where:

IT managers at Kinnarps, SAPA and Teliasonera, Information Manager in the South America/Asia Pacific divisions for EKA Chemicals, IT manager in charge of GSM AS at Teliasonera mobile, Sundsvall, Business coordinator at Teliasonera mobile, Sundsvall and finally Manager of technology and economy of communication and company workplace, Vattenfall Data

Kinnarps AB
Kinnarps is the third largest furniture manufacturer in Europe. Kinnarps AB's major products are table and storage systems, screen and scan systems, work chair, visit and conference chairs, soft seated and coffee tables. Kinnarps is a family owned business and was founded 60 year ago. Kinnarps AB have their own IT division in charge of the IT support for around 750 clients each day. It is common that ca 10 co-operators share one computer that makes up one client.

TeliaSonera
TeliaSonera offers customer services within the mobile communications, Internet, data communications and fixed telephony areas. TeliaSonera is the largest mobile operator in Sweden and Finland, the second largest operator in Norway, and the fourth largest operator in Denmark. TeliaSonera has their own IT division that performs development, maintenance, support and helpdesk tasks throughout the company.

SAPA
SAPA develops and markets high value-added profiles; buildings systems and heat transfer strips in aluminum. The business concept is built on close co-operation with customers in Europe, North America and Asia. SAPA have their own IT division that consists of 22 persons responsible for running the IT development and support.

EKA Chemicals
EKA Chemicals, with 3000 employees, is one of ten business units within the Akzo Nobel Group. Their major products are chemicals for the pulp and paper industry. Other important market areas are chemicals for water treatment, fine and specialty chemicals for laboratories, the pharmaceuticals industry etc. EKA Chemicals have an IT division. The information manager interviewed is responsible for the IT support in the South America, Asia division.

Vattenfall Data
The vision of Vattenfall is to be the leading European energy company. Today Vattenfall produce electricity and supply energy to several millions customers in the Scandinavian countries and north Europe. Vattenfall's main products are electricity and heat. Vattenfall Data has their own IT division that consists of 380 people, but they also have a technical service and all in all they are about 700 people.

Studies of original sources and literature have been conducted to increase knowledge about IT investments evaluations to measure quantitative and qualitative effects. Useful databases of academic articles have been important for the outcome of the report, such as the most used "Business Source Premier" and "Academic Search Elite". Also, material provided in previous academic studies has been scrutinized. Some templates and presentation material from the case organization has also been examined.

3.3 Method discussion

We believe that a qualitative approach would better provide different kind of variables and we would have a better chance to find hidden or unknown variables (Holme, I. M. & Solvang, B. K. 2001). We have therefore prepared the qualitative interviews thoroughly and used standard templates for the interviews so that it would be easier to discuss around the same questions with the respondents.

When analyzing the interviews our preconceptions and focus may have had an affect to what findings where placed in the interview results. We have though, concentrated on bringing issues related to our focal question into the paper and left out information irrelevant to these questions. On several occasions there where questions the respondents found difficult to answer and a discussion on how to interpret them took place. This increased our over-all knowledge and made it easier to understand issues involved in the companies.

We are aware that our interpretation is biased by earlier knowledge; therefore we have tried our thoughts and ideas with the respondents, the case organization and other researchers during the work. By continuously evaluating how applicable and usable our theory building are we hope to have reduced some of the problems with the qualitative way of work.

There are limitations in the selection of respondents. The case organization helped locating respondents they thought might add important information to the research. We asked the organization to also provide us with names that might not be so positive, which they did. Unfortunately, in these organizations, none of the managers where interested in, or had the time to participate. This may have created a bias if the remaining respondents did not have a diverse understanding of the area. It cannot be ruled out that by eliminating themselves from the study the remaining respondents may be too similar and some aspects might therefore have been missed. We tried to, in some way, compensate for this by finding IT managers outside the case organizations contacts.

4 Results and discussion

In this chapter we present and discuss what has been learned from interviews conducted with various IT managers/decision makers. Also on several occasions FastTrack and intangible/tangible variables have been discussed with persons from the case organization. We have in addition received documents from the case organization; showing the work and evaluations done at present. We discuss ex-post investment evaluation, gains and difficulties. Are they carried out, if not, what are the reasons not to perform them. We compare previous research with our investigation to find similarities and discrepancies. We discuss what should go into an ex-post evaluation and why. We also consider what tangible and intangible variables that may be important. We have looked into models and methods available and what important contributions they claim to have in an ex-post investment evaluation.

Investments need to be evaluated continuously and not only in an ex-ante evaluation. Both in previous research and in our empiric study it is found to be of importance to make proper evaluations; ex-ante, during and ex-post investment. Therefore it seems appropriate to claim that investments should be managed with a lifecycle approach to get a correct picture of the outcome of the investment. We have though as previously explained; concentrated on the ex-post investment evaluation part of the lifecycle model.

4.1 IT/IS investment evaluation

In the companies interviewed, investments are generally initiated from business units/segments. The IT department estimates costs for development and maintenance. Investments can be initiated by the IT department but then mostly concerns updates and enhancement in already existing systems. There are also requests concerning more strategic investments or concerning the infrastructure. These kinds of investment decisions take place at a higher organizational level. It is also possible that an investment need to take place because of changes in legislation. At IT department level it is not common to have standardized models or methods for evaluation. Usually the IT department simply calculates the costs and the investment decision is taken elsewhere.

Previous research claims that the current treatment of IT/IS investments is more in the operational area (see Figure 2). This is confirmed in our interviews, where investments are generally measured in financial terms and methods, more suitable for the tangible benefits and costs present in that area. A shifting towards the marketing and training areas is suggested. According to our study this seems to be a possible way to address the wider needs associated with an IT/IS investment evaluation (see Figure 8).

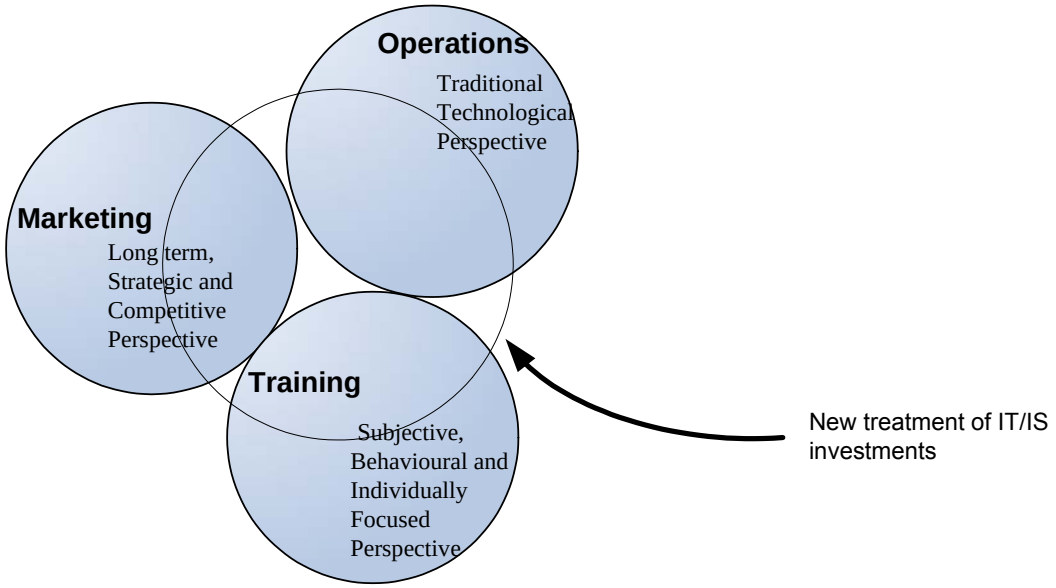

Figure 9: A shift in the treatment of IT/IS investments regarding the different investment perspectives.

We suggest that some of the problems associated with IT/IS investments bad reputation considering being profitable depends on the way they are measured. As Hinton and Kaye (1996) points out there are other considerations to make. I.e. when the investment is long-term, strategic, affect users through out the company or concerns customer interactions. Also one of the IT managers[1] interviewed argues that an IT investment should match the company's general goal and business idea, a more strategic view. This also supports this shift. He also finds it important to have long term investments evaluated a period of time after the deployment (tree to five years).

4.2 Ex-post evaluation

The IT managers where interested in, and somewhat aware of, the usefulness of a proper method to measure the supposed benefits of an investment. However, even with a greater understanding of the problem, most of the companies did not make an ex-post evaluation of IT/IS investments. Several of the respondents felt that all organizations could gain from making ex-post evaluations. However, some of them pointed out that sometimes maybe more money where lost than gained with an ex-post evaluation.

An ex-post evaluation can target the investments impact on the organization if the right methods for measurement are used. There are several suggestions in different articles although the similarities are predominant. There is a strong recommendation in these articles to use a framework in order to have a more formalized way to perform ex-post evaluations. Because benefits can be brought to the organization from different dimensions it is important that all benefits are viewed. Especially non-financial benefits and costs are claimed to be significant because they often dominate IT/IS investments. We suggest that companies should use several methods within a framework and adapt which ones to use depending on the type of investment as also Brown (1994) advocates. We have identified three main dimensions an ex-post

[1] IT manager at SAPA, interview by phone the 24th of November, 2004

evaluation should comprise (see Figure 9) by support of information gained through previous research and our own studies. These are:

- *Identification of investment gaps*. An ex-post evaluation can be used to identify benefits not attained by the investment or costs that where hidden in previous steps. It should also identify what needs to be done in order for the investment to reach benefits proposed and be at its best.
- *Impact on organization.* All investments show effect on the organization and by examining these; management can learn if e.g. further training is necessary or if political issues or the corporate culture needs to be addressed.
- *Organizational learning.* Investments show either good or bad results, or both in different areas. These results can be analyzed to prevent the organization to make the same mistakes in future investments and also to improve the evaluation procedure it self.

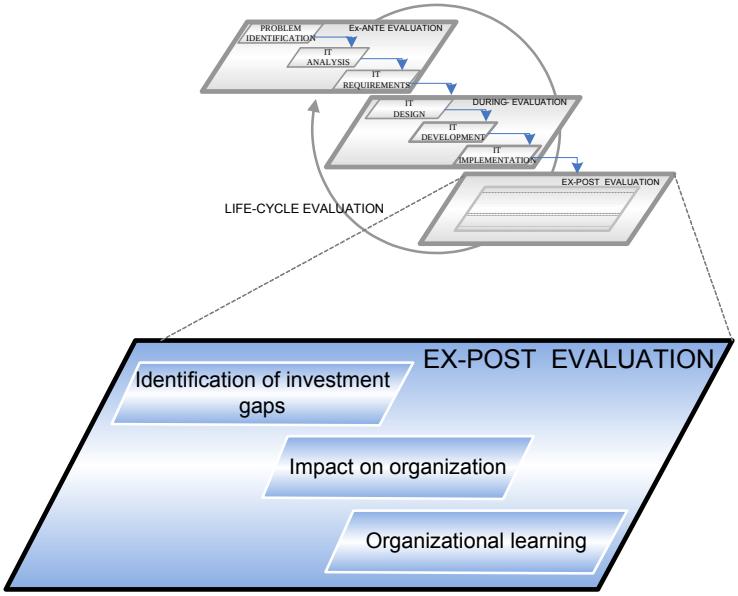

Figure 10: The IT/IS evaluation cycle with the emphasis on the ex-post investment evaluation.

We have noticed some problems for companies who want to make ex-post evaluations. In some, support from top executives may not be so strong or the department might not be capable of taking the initiative to conduct an ex-post evaluation. Other companies might have a form of organization where it is not possible for the IT/IS executives to make that decision. For whatever reason, if a company does not conduct an ex-post evaluation, it may result in an organization incapable of learning from their mistakes, doing the same mistakes over and over again. This is especially so in organizations where the environment changes rapidly causing management change. Problems might then arise when new executives arrive and forget to, or do not find it necessary, to make the evaluation. Also, if personnel are transferred or quit, their acquired knowledge moves with them.

Although most companies find it very interesting to do ex-post evaluations and measure as much as possible ([1];[2];[3],[4]) it is seldom or even rare that they do. Only two respondents claimed that ex-post evaluation is being performed in their departments. These evaluations were financial and variables where measured in terms of costs and time. Cost is one of the most important parameters today (the interviews are here concurrent with previous research); this is probably because costs tend to increase rapidly when IT/IS investments are delayed. Examples of methods used where; ROI calculations or a simple check of the profits and loss account. Several of the respondents pointed out that a continuous check at the running expanses where carried out and so they felt they knew if an investment where viable. These methods or control measures only measures the financial aspect. However, several respondents believed that ex-post investment evaluations where conducted at other departments or levels of the company. We felt that it would be important to approach other levels in the organization in order to find out if more thorough ex-post evaluations are performed there.

If companies do not evaluate their investments as well as they are capable of, they will not get a meaningful calculation of the outcome. Companies consider it hard to find time to evaluate; it is difficult to take time from every day work ([2], [1], [5]) also, they perceive it as unnecessary to evaluate inexpensive investments ([5],[6]); this is also supported in previous research.

Issues or reasons expressed by respondents on why ex-post evaluations not where performed:

- Poorly performed investments proposals makes it difficult to know what to evaluate
- Organizational change – the decision criteria may not exist or has been changed since the decision where made
- Lack of resources – shortage of time or personnel
- Poor knowledge of existing models or methods
- Low priority, new development projects are more important in a competitive environment
- Too costly, the evaluation is perceived to cost more than what can be gained
- No support from management

Some investments are measurable at once, but most IT investments are showing their benefits over a period of time and are not directly profitable and measurable. As explained in previous research different models and methods should be used depending on what type of investment the company has made. Not one method is suitable for all investments and not one method is enough for a specific investment. The model/method need to be chosen when the type of investment is decided so that the evaluator can use the proper variables for an effective ex-post evaluation. We

[1] IT manager at Kinnarps, interviewed on the 9th of November, 2004
[2] IT manager at Teliasonera, interviewed on the 13th of December, 2004
[3] IT manager at SAPA, interviewed by phone on the 24th of November, 2004
[4] Manager of GSM AS at Teliasonera, mobile interviewed by phone the 6th of December, 2004
[5] Business coordinator at Teliasonera mobile, interviewed by phone on the 6th of December, 2004
[6] Information technology and communications manager at Vattenfall Data, interviewed by phone on the 20th of December, 2004

therefore find it important that companies categorize their investments so they can perform an appropriate ex-post evaluation at the right level of abstraction and at the right organizational level (see Table 2 and 6).

	Project Types	Typical Benefits Types			
		Hard	*Intangible*	*Indirect*	*Strategic*
	Business Transformation				x
	Strategic Systems			x	x
	Inter-Organizational Systems		x	x	x
FastTrack	Infrastructure		x	x	
	MIS and DSS		x		
	Direct Value Added	x	x		
FastTrack	Automation	x			
	Mandatory changes	x			

Table 6: The types of investment FastTrack adhere to

To include the organization's operating environment, as well as its goals and missions when performing an IT investment evaluation is of great weight. In general the respondents seemed to perceive the benefits with an ex-post evaluation. On the other hand only one or two of the respondents showed an interest or made an effort to actually move in that direction. This attitude might be ascribed to the fact that we mainly asked IT managers and that these issues where handled at a different level in the company.

We propose that there should be a corporate standard that all divisions and managers should adhere to. This would make it easier to compare different types of investments and also enhance the learning across the company. Organizations may choose to, according to the respondents, not evaluate if the investment is small or low cost. In these cases it is thought not to be necessary to evaluate or that the evaluation itself will cost more than what can be gained. There for it must be decided what type and size of investments that must adhere to corporate policy or what level of evaluation is necessary. Thus, smaller investments within one department can be evaluated in one way and larger investments with impact on a wider area may be evaluated in another way, with different methods and with different people involved.

4.3 Measurements, models and methods

Only three of the companies claimed to have specific methods for evaluating an IT/IS investment. Several of the respondents did not perceive the evaluation to be inside their field. The methods suggested where mainly financial; e.g. ROI, EVA and Payback. There is however at Kinnarps an effort to correct this lack, here they use BSC and have started to use the PENG model for some types of investments. At Kinnarps one person is always assigned the responsibility to make sure the benefits are being realized[1].

[1] IT manager at Kinnarps, interviewed on the 9th of November, 2004

IT/IS investments are often long-term and with gradual updates. This can create problems if the company wants to make evaluations[1]. There are also variables that are difficult to measure and because they are so difficult to measure organizations tend to ignore them or simply do just mention them; no effort is made to measure the intangible benefits such as increased customer or user satisfaction. An evaluation method can facilitate the concretization of benefits and help in:

- Getting a clearer picture of why the investment was made.
- Documenting the evaluation models way of work.
- Follow up on attained effects; a more structured base to evaluate after can be gained.

Variables need to be decided beforehand so that the organization measures the right things. Although there are many existing models and methods that can be used in an ex-post evaluation, poor knowledge of existing models or methods neutralize the benefits that might be achieved. There seems to be a low priority to gain knowledge of how to use these models for measurement. We suggest that companies who are serious about using ex-post evaluations as a tool to enhance their business take time to work through, with key personnel and executives, how and when to perform these evaluations.

At the case organization persons who work with implementing the FastTrack solution has a strong wish to be able to measure more qualitative measures. However, they experience difficulties in how to actually measure this. Discussing this has come up with examples like:

- If employees does not have to put time and effort into being upset because of troubles with the PC and an overloaded support department; they can be expected to be more efficient. How can this increased efficiency be measured? -

Mainly, quantitative measures are used by the case organization to show investment success. Examples are:

- No. of support calls
- Time until problem is solved
- Reduction of licenses
- Reduction of staff

And the benefits FastTrack is supposed to achieve are increased:

- Speed
- Automation
- Delegation
- Cost control
- Flexible access
- Stability

[1] IT manager at SAPA interview by phone on the 24th of November, 2004

The main effect of implementing FastTrack is of course reduction of costs due to these variables. Both the respondents and the case organization experience the more stable environment as one of the main reasons for implementing FastTrack along with cost reduction.

All of the respondents thought it were essential to be able to quantify benefits and costs. For instance, it was perceived as important to respect intangible values, but intangibles where not thought to determine if an investment would be performed or not[1].

"When it is possible to place a monetary value, it is done…when it is not possible… it is usually enough to mention that it will lead to a better service towards the customers, customer service has a very high priority."

(Manager of GSM AS at Teliasonera, Sundsvall)

Several of the respondents where concerned about not having a standardized model for evaluation and felt the company would benefit from having a corporate wide one. However, it was suggested that there is a risk that evaluation models can get to static, not allowing for enough flexibility[2].

IT/IS investments give indirect, intangible, quantifiable and non-quantifiable as well as qualitative effects and may also give vital strategic benefits (Brown, A. 1994). This indicates that there is a need for evaluation methods to measure these effects. As the interviewed persons indicated, it is very important for companies to be able to quantify variables. Intangible variables are very important[3] but since they are hard to quantify they are hard to measure and to use as parameters for an ex-post evaluation. During the interviews, it was clear that companies, at least their IT functions, hardly measure benefits or take them into account. Organizations ought to try and find out what benefits their investments are going to give. However, also previous research shows that intangible variables are hard to quantify.

Variables suggested by the respondents where:

- less incidents
- less errors
- more efficiency at workflow and processes
- increase in efficiency
- less time needed for task
- cost reduction
- increase in income
- more stable work/IT environment
- standardized work/IT environment
- less time spent on being irritated
- short return on investment
- more security
- increased user friendliness

[1] IT manager at Kinnarps, interviewed on the 9th of November, 2004
[2] Manager of GSM AS at Teliasonera, mobile interviewed by phone the 6th of December, 2004
[3] IT manager at SAPA interview by phone on the 24th of November, 2004

- customer satisfaction
- less dependent on key personnel
- quality raise
- goodwill
- faster time-to-market
- coordination
- automation
- more efficient logistics
- transparency
- optimization of product planning
- enhanced communication
- streamlining the order handling

Specific FastTrack benefits suggested by the respondents where:

- standardized environment
- central handling of environment
- shorter lead time
- less number of support incidents
- raised security
- a structured way to delegate
- cost savings
- enhanced quality
- speed in deployment

All respondents claimed that the standardized PC environment of FastTrack where perceived positive by the users although they at first where a little uncertain of how to react. After a while users saw the benefits of a more stable platform and quicker possibilities for support as outweighing the slight limitation in their freedom to personalize “their” PC.

The case organization conducts a qualitative and quantitative follow-up some time after the implementation of FastTrack. They quantitatively measure for instance; number of support calls and time until the problem is solved. Qualitatively, a questionnaire directed to the users is handed out to get feedback on how the roll out and information provided about the change has been perceived. Questions in this questionnaire consider e.g. function of the new computer environment, response time, performance and stability of the environment.

Cost reduction, increased income and efficiency at workflow and processes are variables that always where referred to by the respondents. This might be because they are easier to measure. The respondents also agreed that customer/user satisfaction is important, but as it is an intangible benefit they hardly attempt to measure it. Some of the departments thought it enough to use the ROI method. We argue that it is *not* enough to use ROI as a sole method to measure variables in an ex-post evaluation. This is because all benefits and costs are not measurable in a financial method.

4.4 Summary

It was difficult for the respondents to relate to ex-post investment evaluation and to the issues involved. None of the departments where our respondents work perform an ex-post evaluation where "all" variables are considered. At a couple of the companies simpler evaluations where conducted and at one corporation there where plans to in the future perform these evaluations. Although it was hard for the interviewees to come up with what could be gained from an ex-post evaluation almost all of them thought that organizations could benefit from them if conducted. Concerning the difficulties it was easier to come up with reasons why they where not performed. The users felt that there was not enough time and personnel to spend on these issues. Mostly, it was perceived to be somebody else issue, the business unit, product owner or customer services etc. Therefore it may be important to conduct this kind of research at a higher level in the organization.

It was, however, somewhat easier to suggest important variables, several picked from previous investments. The most referred to variables where; automation, short ROI, more stable and standardized work/IT environment, increased efficiency and less errors.

VARIABLES	
TANGIBLE	- Reduced costs - increased efficiency - Better coordination - Less errors - Less support incidents - More stable IT-environment - Faster time-to-market - More security - Shorter lead time - Enhanced quality
INTANGIBLE	- Less time spent on being irritated - Increased user friendliness - Goodwill - Customer satisfaction - Enhanced employee productivity

Table 7: Most referred to variables (Results)

Although we have only interviewed five companies it is apparent that financial methods are dominating when evaluating an IT/IS investment. The most commonly used methods for evaluation in the departments interviewed where:

- Cost-benefit/cost-effectiveness analysis
- Return On Investment (ROI)

Only at one company where there other methods present, that is, BSC and the PENG model.

According to our study:

- IT managers use primarily methods that measure benefits and costs
- IT managers have trouble with hidden cost and benefits and generally does not measure them

- IT managers feel that it is hard to find time to evaluate, and think it is difficult to take that time from daily work
- IT managers think it is unnecessary to evaluate short lived and not too expensive investments
- IT managers prioritize costs and financial benefits. The benefits identified are generally reduction of time and lowering of costs.

5 Conclusion

We have now gained a better comprehension of what aspects that are important in an ex-post investment evaluation. Both what is considered important in previous research and what IT managers think about ex-post investment evaluations.

What gains and difficulties do companies perceive with an ex-post investment evaluation?

The gains from an ex-post investment evaluation will be in the financial, human recourse and organizational domains. If done properly the organization will learn to make more and more correct assessments and so gain a better control of the costs and effects of investments. We found that difficulties in ex-post investment evaluations where:

- Poorly performed investments proposals make it difficult or even impossible to know what to evaluate.
- The changing organizational environment also changes the decision criteria so that the grounds for the investment decision do not exist when it is time to do the ex-post evaluation.
- Lack of time and personnel.
- Inadequate knowledge of existing models and methods.
- New projects are more important to prioritize in a competitive environment.

Difficulties also lie in the balance between doing an adequate evaluation and at the same time know what evaluation types that should be performed on a full scale, a slimmed version or just satisfy with having a person responsible for bringing the investment to closure. It is important to categorize investments so that methods can be used at a correct level of abstraction.

What tangible and intangible variables do companies find important?

All respondents thought it very important to be able to quantify variables. This is also seen in Table 7 (p. 45) where tangible variables are more common and where more easily expressed by the respondents. The most common variables measured where cost and time. Variables can be found on different organizational layers see Figure 11 below (p. 49).

Which are the most common methods used in IT/IS investment evaluation?

Methods used are still mainly financial and used in ex-ante evaluations. None of the departments where our respondents work perform a proper ex-post evaluation. This shows that there has not been any change in this area, at least not in the organizations interviewed.

The purpose of this paper was to find out *what aspects that are important in an ex-post investment evaluation of an IT/IS investment.* With support in literature and of the discussions with respondents and the case organization, we suggest that companies should use several methods within a framework and adapt which ones to use depending on the type of investment. The framework should deal with aspects as (see Figure 10, p. 39):

- *Identification of investment gaps.*
- *Impact on organization.*
- *Organizational learning.*

We propose that further research perform investigations in higher organizational levels to find out if these problems with, or lack of ex-post evaluations are organizational wide. Another interesting diversion is to see if it is more common in government administrations to perform ex-post investment evaluations or not.

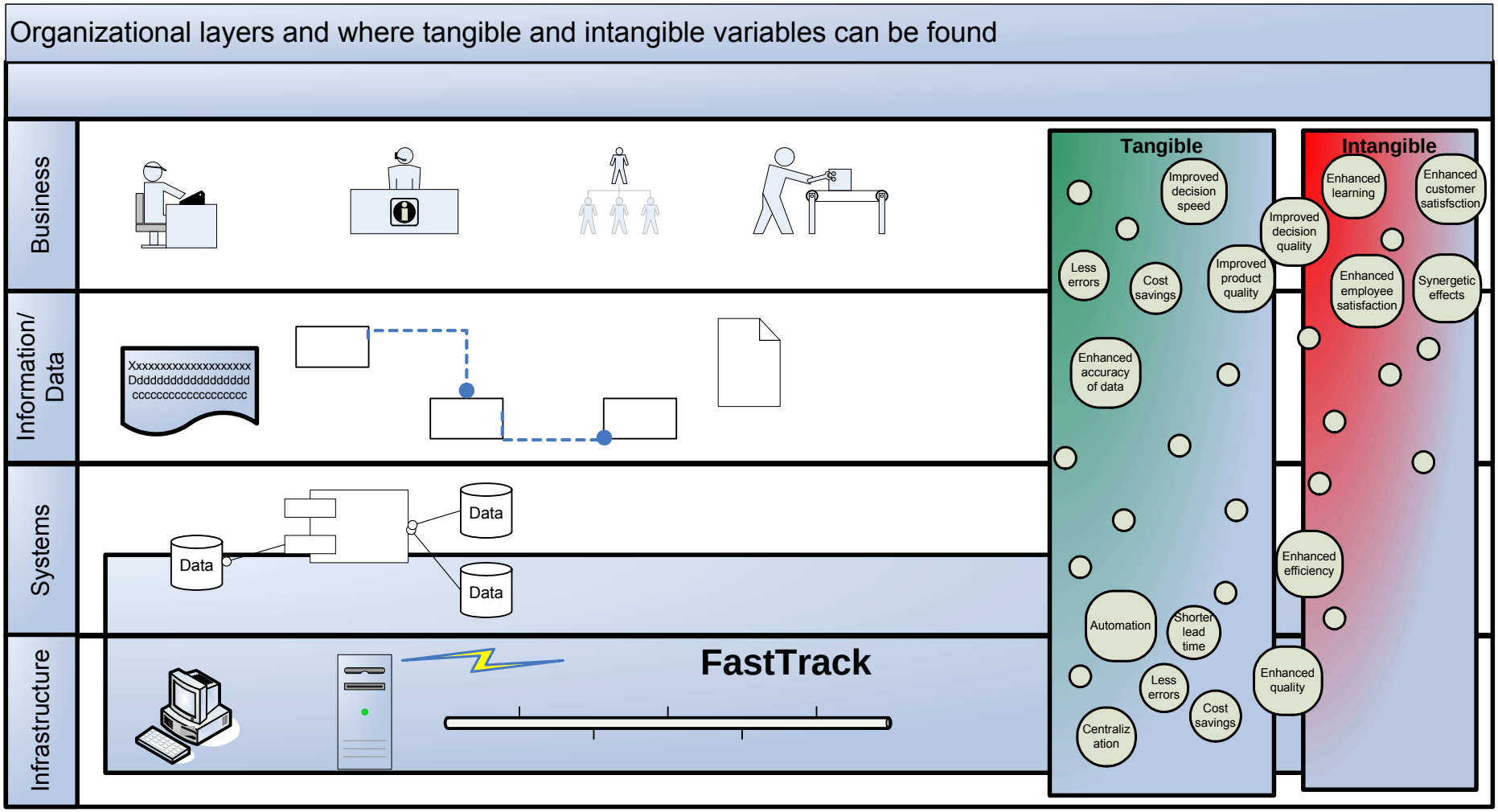

Figure 11: Variables found at different organizational levels

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Enclosure I, Methods

In this enclosure the methods we have looked into are placed. There might be a matter of opinion if some of them should be classified as methods or models. We have not in this enclosure put an emphasis on whether they are the one or the other; therefore they will all be referred to as methods.

Quantitative methods

Cost-benefit analysis

Cost-Benefit Analysis (CBA) estimates the corresponding money value of the benefits and costs to establish whether the implementation of e.g. a new IT/IS solution is meaningful. King and Schrems (1978) explained that CBA seeks to estimate and compare the costs and benefits of an undertaking and is an information support tool for decision making on rival priorities. It provides input for decisions on how much capital investment is justified relative to the expected benefits. The first step in the development of a CBA is to define the evaluation methods and the indicators guiding the quantitative and/or qualitative estimation of the impacts resulting from the changes.

A CBA must include complete aspects of the projected benefits and costs for all alternatives. Intangible benefits should be included along with tangible benefits and costs. Intangible benefits should be evaluated and assigned relative numeric values for evaluation purposes. For example; maximum benefit could be assigned a value of 5, average benefits a value of 3, and minimum benefits a value of 1.

According to King and Schrems (1978) a cost-benefit analysis should be the first choice when it comes to initiating or modifying an IT/IS system. A CBA can be a very important input for the investment review that should take place before proceeding with a new project. These are the steps suggested to take place:

1. **Define the problem.** Start by defining a problem and documenting it. Documentation must exist and is a very important step. It shall clearly describe the current work process.
2. **Evaluate the work process.** Two questions shall be considered: Should this be done? Can the process be improved?
3. **Define the process requirements.** Define the information process requirements for the proposed work process at a general level.
4. **Determine IT/IS performance measures.** Identify indicators for measuring and assessing performance of the process and the IT/IS system in relation to the perspective mission.

The purposes of a CBA (IRMD, 1995) are:

- To ensure that investments in certain projects are prudent and cost effective
- To methodically document a project's costs and benefits
- To demonstrate the costs and benefits of a project over the estimated life cycle of the resource
- To address viable alternatives and to aid in the selection of the best solution

It is very important to understand that a CBA should be updated several times during the life cycle of a system. The first time a CBA is run is when to get concept approval to proceed with a detailed CBA. After the detailed CBA has been completed, the development and implementation plans may call for a prototype system or a pilot phase to test the costs and benefits on a limited scale before the full system is implemented for all users. If that occurs, a third version of the CBA shall reflect revised costs and benefits, and would be used to decide whether or not to proceed with full implementation of the system. The ex-post implementation review of a system may also require an updated CBA to determine if the expected benefits have been achieved, and also, to decide if the operation of the system should continue as implemented, or if the system should be modified to achieve the benefits to justify continued operation.

According to King and Schrems (1978), one of the problems in a CBA is that the computation of many of the benefits and costs is intuitively obvious but that there are other components for which intuition fails to suggest methods of measurement; therefore some basic guiding principles are needed. To be able to reach a conclusion, all the aspects of a project has to be taken into consideration, both positive and negative. These must be expressed in terms of a common unit. In reality all benefits and costs of a project are measured in terms of their equivalent money value. But benefits and costs do not have to be expressed in terms of equivalent monetary value. The valuation of benefits and costs should reflect an understandable picture of the situation by which choices have been made. By evaluating both the positive and negative aspects of a project, a CBA can verify if a specific project is worth pursuing.

CBA does not provide significant insight into strategic objectives since it focuses only on economic factors. Apart from several drawbacks, CBA could be applied in certain sectors and on certain levels where it can produce significant data and consistent actualization rates along with tangible outputs.

Return On Investments (ROI)

The basic idea with ROI is that an investment today shall give a positive return in the future. That is why time value functions are used in full extension in developing analytical frameworks. There are at least three different ROI-methods: Net Present Value (NPV), Discounted Cash Flow (DCF) and the Payback method. NPV and DCF base their discounted cash flow at a rate that is decided by the management within the actual company, while the payback method does not demand any assumptions about the rate of interest. A method that is based on payback only needs an IT/IS-project that has a predetermined repayment time to work. When using other rates of interest, these methods can be used to evaluate different investment alternatives. From a general point of view all the ROI-methods are built on estimations of the interesting cash flow rates. ROI-methods do not consider the indirect advantages that an investment brings. The methods favor instead the advantages that are directly measurable, which often shows in form of direct cost-savings. The methods that are built on ROI can be said to be more theoretical correct and practically more suited for evaluation of capital investments. They are also accepted in many organizations as a standard when evaluating capital investments. When evaluating and comparing IT/IS investments with these methods; the investment that yields the highest interest is chosen. The main thesis is that the entire result and return can be calculated. Companies that strictly apply financial rules or expects direct measurable cost-savings

by their IT/IS-projects should therefore choose the ROI-method (Mahmood, M. A. & Szewczak, E. 1999).

Money et al. (1988) propose a methodology with four phases:

1. Identify suitable benefits
2. Group these benefits into more homogenous categories
3. Create utility scores for the found benefits
4. Decide on a decision rule by using numeric utility scores to verify value

They also suggest that for the robustness of the method to use both statistical and self-stated evaluation. This, they claim is a robust procedure to convert subjective judgments into numeric scores for further analysis.

The ROI method is easy to use because it connects the return to a capital measure as it gives a percentage measurement. (Cardano 2003):

ROI (%) = Profits / the Investment cost

Simple ROI works well in situations where both the gains and the costs of an investment are easily known and where they are clearly a result from action. The return on investment metric itself, however, says nothing about the magnitude of returns and risks in the investment. Simple ROI also becomes less trustworthy as a useful metric when the cost figures include allocated or indirect costs, which are not caused directly by the action or the investment (Matrix 2003).

In the table below are examples of benefits that can be included in a ROI analysis.

ROI	
Internal ROI	*External ROI*
Increased user productivity Decreased user errors Decreased training costs Savings gained from making changes earlier in design life cycle Decreased support to users	Increased sales Decreased customer support costs Savings gained from making changes earlier in the design life cycle Reduced cost of providing training (if training is offered through the vendor company

The advantage is that ROI takes the *whole lifecycle* into account; however, the *time value* is not considered. Risk can be entered into the model but is not applicable when evaluating mutually exclusive investments. (Milis, K. & Mercken, R. 2004) The ROI-models also does not consider the *indirect advantages* that an IT/IS investment brings to the organization. To use ROI calculations for IT/IS investments are difficult. Many companies ignore ROI because the calculations are too complex. ROI is used mainly at large companies and many small and medium sized companies make their IT/IS investments without transforming their goals to profit in money (Computer Sweden 2003). Often alternative measuring methods are used in addition so that important data can be used. Clearly the ROI-models are designed to measure the “hard”, quantitative and financial effects of an investment, but in reality it is also important to

include intangible values". Examples of soft values can be how "better control", "more effective use of the sales department", or "better work environment for the employees" can be measured in money. Most IT/IS investments today would not be classified as satisfactory if evaluation only was made by ROI-methods (Mahmood, M. A. & Szewczak, E. 1999).

Economic Value Added (EVA)

EVA is used as a tool to calculate the true economic profit for a corporation. EVA can be used in different purposes, i.e.:

- setting organizational goals
- performance measurement
- motivation of managers
- capital budgeting
- corporate valuation

The focus for the EVA methodology is to show the cost the capital managers employ. This encourages managers to assess assets as well as income. (CIO, 2004)

Total Cost of Ownership (TCO)

TCO is a method that connects to the more operational side of the business. It works well for analyzing a narrow function or series of functions. It works well together with qualitative methods to view the financial perspective. (CIO, 2004)

Payback period (PP)

According to Milis and Mercken (2004) this method should be considered the least suitable method for IT/IS-project appraisal. Projects with fast PP are favored and the returns on IT/IS investments are often long-term. They also explain that the method does not calculate risk or take the time value of money into account witch makes the method inadequate for evaluation of IT/IS projects.

Total Economic Impact (TEI)

TEI is designed to support risk and flexibility assessment. The method calls for managers to assess three key areas, cost, benefit and flexibility. For all the three areas the risk is determined. TEI works best with enterprise wide projects and when analyzing two distinct scenarios. (CIO, 2004)

Rapid Economic Justification (REJ - Microsoft)

The REJ method is a five-step process:

1. Develop a business assessment roadmap – identifying key stakeholders, critical success factors and key performance indicators
2. Together with stakeholders, identify how technology can influence success factors
3. Perform a cost-benefit equation
4. Identify potential risks
5. Run standard financial metrics

REJ is best suited for managing single projects and can be slow. (CIO, 2004)

Internal Rate of Return (IRR)

It is often difficult to determine the rate in which future benefits should be discounted to. In addition, decision makers are often more comfortable with value expressed in percentage terms rather than some other metric. The IRR is a method for determining value that does not depend on the discount rate and the calculation of a discount rate. The IRR method takes the time value of money into account although it is not possible to compare investments with different outcome or size. Also, when used as a selection tool, it is not possible to calculate risk for mutually exclusive projects. (Milis, K. & Mercken, R. 2004)

IRR is based on the assumption that the cost-benefit flows are reinvested at the internal rate of return. The use of IRR as a measure for choosing between projects is inappropriate when capital rationing exists. This problem is due to the assumption that the cost-benefit flows are reinvested at the internal rate of return rather than the cost of capital as in NPV. What this implies for the decision maker is that the ranking of the projects will depend as much on their relative size and timing of their cost-benefit flows, as it will on the actual cost-benefit flows, where the actual flows should be the only determinant of acceptance or rejection. (NCEDR without year)

Net Present Value (NPV)

Organizations often use NPV for calculating a cost-benefit analysis. This is an analysis that converts future value to their equivalent present value by discounting them at the organization's cost of funds.

The NPV analysis works well in situations where the costs and benefits are well defined or (tangible), so that it is not difficult to convert them into monetary values. Different rates can be used when comparing investments that are mutually exclusive to reflect the risk-levels. For example, if robots that produce work of comparable quality replace humans, the benefits are the labor cost savings over the stall of robots. Costs include the capital investment to purchase and install the robots, plus the operating and maintenance costs (Turban, E. et al 1999).

With IT/IS investments however, new equipment generates benefits such as increased quality, faster product development, greater design flexibility, better customer service, or improved working conditions for employees. These are very desirable benefits but it is difficult to place an accurate monetary value to them. The analyst could ignore intangible benefits, but this implies that their value is zero and may lead the organization to reject investments that could substantially increase its revenues and profitability. Therefore, analysts need to consider not just tangible benefits but also intangible benefits (Turban, E. et al. 1997).

Opposed to IRR different rates can be used to reflect risk-levels when dealing with mutually exclusive investments. NPV allow evaluation of projects where benefits have been delayed and are also seen as objective. On the other hand it is difficult coping with intangibles and it can also be difficult to select the discount rate (Anandarajan, A. & Wen, H. J. 1999).

Weighted Scoring Methods

The weighted scoring method is also known as the matrix selection method. According to Hendershot (1996) this method is appropriate for those projects that are

complicated to evaluate. The weighted scoring should be used when it is necessary to make a more complex evaluation based on a number of variables of differing importance. This method is based on identification of all variables that are relevant to the project. To be able to reflect their relative importance for the project, each of these variables is assigned weights. A total score for each alternative is then determined by aggregating its ratings on each variable, weighting it appropriately. The best alternative generates the highest total score. The generic process of deriving weights and scores is explained below step by step, covering the following stages:

Step 1. Define the decision criteria
The very first step in this method is to identify the decision criteria upon which the alternatives are scored. Decision criteria can be structured either as attributes or objectives. It is very important to define the decision criteria clearly so that the decision makers have a clear understanding of them. Both objectives and attributes are used to serve as decision criteria. Objectives have an object and direction (e.g. maximize profit, minimize environmental impact, minimize risk, minimize cost, maximize satisfaction). Attributes are characteristics and are used to measure how well an alternative fulfills an objective.

Decision makers must consider which criteria are more or less important than others. It must be decided from start which attributes and objectives shall be part of a complete set of decision criteria. It is very important that the included attributes are complete and that they capture important differences among the alternatives. It is also important that the criteria are not redundant. If criteria overlap each other, it will result in placing too much importance on the aspect represented by these criteria. Criteria shall be independent i.e., how well an alternative performs on one decision criterion should not affect how well the alternative performs on another criterion. In order to do this it may be necessary to separate very wide criteria into narrower that better distinguish one from another or to combine one or more of the criteria to eliminate overlap.

Example: In a certain computer service appraisal, the relevant attributes are identified as:

- number of cases handled
- waiting time
- customer access
- disruption to services

Step 2. Weight the decision criteria
The focus in this step is to assign a relative weight to each criterion, based on their relative importance. If one alternative performs better than other alternatives on all criteria, then clearly this is the best alternative despite of the weights on the criteria. The value of judgments is quantified by using weights to express the relative importance of one criterion over another.

Example: The group appraising our hypothetical computer services project has decided that the following weights are appropriate:

- number of cases handled 40%
- waiting time 30%
- customer access 20%
- disruption to services 10%

Step 3. Create the decision alternatives

The third step is to score each proposal for each criterion, which means score each option against each attribute on an appropriate scale. A cardinal scale can be used i.e., if option A is considered to perform three times as well as option B, then option A is given a score that is three times that of option B. The scale shows that in this case Option A is much better than Option B, but not how much better A is than B. It is important to clearly define the minimum respective maximum on the scale. Group members should have a common understanding of this.

In the example below a score 0 defines a minimum and indicates that the option offers no benefits, while a score +20 defines as maximum and indicates an ideal performance.

Example: The group members score four options against the attributes as follows:

	Option A (Status Quo)	***Option B***	***Option C***	***Option D***
number of cases handled	5	10	12	15
waiting time	8	12	14	16
customer access	10	10	15	15
disruption to services	15	5	10	5

Step 4. Score the alternatives on each criterion

This step includes calculating weighted scores for each proposal and for each criterion. Each score is multiplied by the weight for the relevant attribute. Thus weighted, the scores are fully used to achieve a total weighted score for each option.

Example: Combining the last two examples results in the following weighted scores:

	Option A (Status Quo)	***Option B***	***Option C***	***Option D***
number of cases handled	5x40= 200	10x40= 400	12x40= 480	15x40= 600
waiting time	8x30= 240	12x30= 360	14x30= 420	16x30=480
customer access	10x20=200	10x20= 200	15x20= 300	15x20= 300
disruption to services	15x10= 150	5x10= 50	10x10= 100	5x10= 50
Total Weighted Score	790	1010	1300	1430

Step 5. Determine a total weighted score for each alternative
Finally, in step 5, all suggestions are compared with each other on the basis of the total value of the weighted scores.

Step 6. Choose an alternative
The results of this comparison will consist of a set of weighted scores, including one for each option. Now the decision maker has to make a final choice and decide an alternative considering both the total weighted scores and the relative measures of the potential negative consequences. Weighted scoring methods provide a structured process and an analytic approach that is explicit and quantitative. This is one of the major strengths of weighted scoring methods. The method ”forces” the decision maker to be explicit and quantitative about preferences.

When using weighted scoring methods the decision maker must be aware with and deal with uncertainty with intuition. Scoring alternatives can be hard and difficult to perform and can lead to incorrect results when attributes are uncertain. Since the scale is not concrete and each scale can use different measures, it can be very hard for a decision maker to find the measurements proper for the project. The decision maker can experience that as uncertainty and present his judgment and feelings incorrectly. Despite difficulties with this method it may have a role in decisions that require a quick analysis without the need for sophisticated techniques and are also recommended for more complex decisions. This method is primarily used for ex-ante evaluations.

Qualitative methods

Strategic fit

Strategic fit is an approach that is built upon Porter's value chain and evaluates the alignment between the IT/IS investment and the company's goals. The method contributes guidelines for selection between investments of different kind but is of no help when choosing between investments that are mutually exclusive. (Milis, K. & Mercken, R. 2004)

Information Economics (IE)

IE is best used to evaluate a portfolio of projects, to decide how and where to allocate resources so they will be of greatest benefit (CIO 2004). This method takes into account value and risk instead of cost and benefit. It also considers people issues in conjunction with technological ones. IE attempt to offer a common language for representatives from both technology and business so that they may agree on attributes for a suggested IT/IS investment. IE uses the 7 C:s.

1. Comprehensiveness – to address all relevant issues, business, technical and economic
2. Consistency – in the decision making
3. Clarity – of the objectives, the values and the attitudes
4. Communication – improved between functions
5. Confidence – in that projects has been thoroughly analyzed and justified
6. Consensus – between managers from different business units
7. Culture – to close the gap

(Davies, D. & Powell, P. without year)

IE is a scoring method that focuses on the application of IT/IS in areas where its intangible benefits contribute to performance on key aspects of organizational strategies and activities. The information economics approach uses organizational objectives to determine which factors to include, and what weight to assign, in the scoring methodology. The approach is flexible enough to include other factors in the analysis, such as impacts on customers and suppliers (the value chain). Executives in an organization determine the relevant objectives and weights at a given point in time, subject to revision if there are changes in the environment. These factors and weights are then used to evaluate IT/IS alternatives: the highest scores go to the items that have the greatest potential to improve organizational performance. IE is primarily a method used in ex-ante evaluations.

Criticism of the IE consists of the method being over-mechanistic and time consuming; it may also lack credibility among senior managers. It relies entirely on consensus of subjective opinions (Milis, K. & Mercken, R. 2004)

This approach can incorporate both tangible and intangible benefits. If there is a strong connection between a benefit of an IT/IS investment, such as decision-making, and an organizational objective such as faster product development, the benefit will influence the final score even if it does not have a monetary value. Thus the information economics model helps solve the problem of assessing intangible benefits by linking the evaluation of these benefits to the factors that are most important to organizational performance. The approach can take risks into account, by using

negative weights for factors that reduce the probability of obtaining benefits (Turban, et al. 1999).

Portfolio Management

The important issue with Portfolio Management is for the organizations to view IT/IS staff and projects as assets managed by the same criteria a found manager would apply to any other investment. (CIO 2004)

Mixed methods

Multi-layer evaluation process

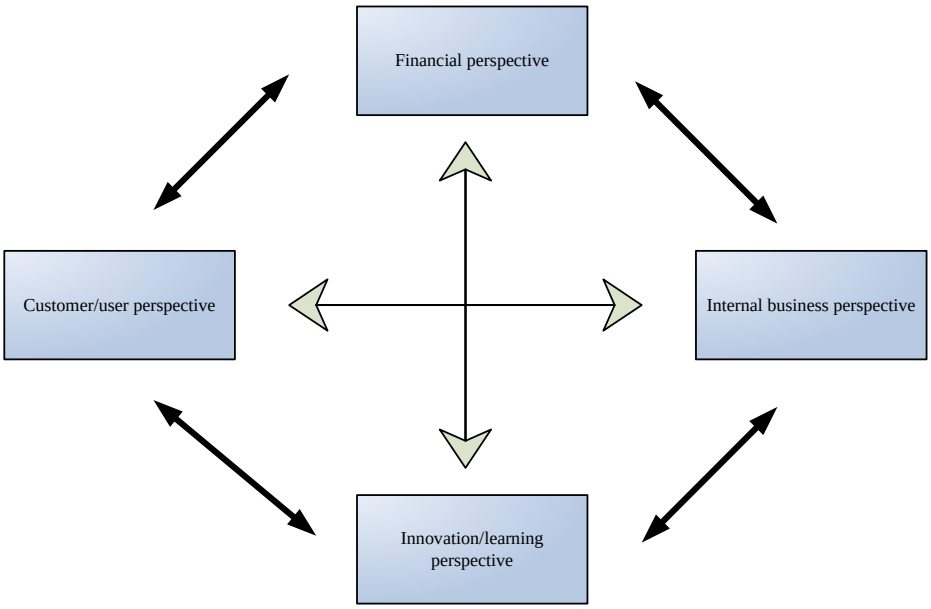
This process uses different techniques ordered in a hierarchical way. Usually the process is divided in two main steps; firstly, projects that do not contribute to the business goal or strategic fit are rejected. Secondly, based on one or more traditional (adjusted) evaluation techniques, a selection is made. Suggestions are being made to use NPV for tangible cost and benefits and to list intangibles and analyze risk and uncertainties in the second step. (Milis, K. & Mercken, R. 2004)

Silk's method

This method addresses the issue that strategic systems often are justified by acts of faith. It has an approach to quantify intangible benefits. Davies and Powell (without year) claims that, though this method might suit managers used to traditional cost/benefit analyses it may also overlook the subtleties of intangible benefits.

Balanced Score Card (BSC)

BSC presents a view over four different areas to take into consideration:



A key phrase is "translating the vision", this means it is essential that the strategy statements are expressed as a set of objectives and measures. Those must be agreed upon by all senior executives and should describe the long-term drivers of success (Stewart, A. C. & Carpenter-Hubin, J. 2001).

The BSC forces the management to take a broader view witch is an advantage of this method (Milis, K. & Mercken, R. 2004). It provides an integrated viewpoint on objectives, targets and measures of progress and ties together various perspectives so that trade-offs can be considered (Stewart, A. C. & Carpenter-Hubin J. 2001). Also, many different evaluation techniques can be incorporated into the framework. Other advantages are that the framework can be used for feasibility evaluation and for follow up and ex-post evaluation (Milis, K. & Mercken, R. 2004). Issues with this method according to Davies and Powell (without year), concerns the difficulty of

isolating the impacts of IT/IS from other factors affecting the business performance. BSC is mainly a tool for managing strategy. It is essential that managers take the time to map out the business strategy or else they may measure factors that are not linked to business performance (CIO 2004).

The IT/IS Score Card

The IT/IS scorecard is similar to the BSC but has an IT/IS-centric approach, moving towards strategic involvement for IT/IS (CIO 2004).

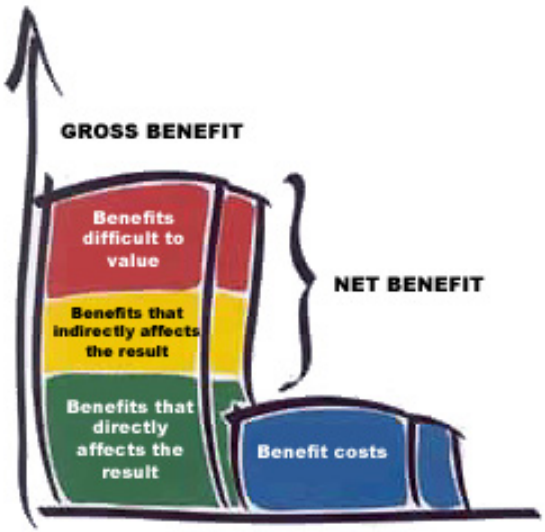
PENG model

The authors of the PENG model (Lars Erik Dahlgren, Göran Lundgren and Lars Stigberg) claims that through this model, better grounds for decisions are formed, development objectives are made clear and intangible benefits can be made visible. The purpose of the PENG model is to be able to evaluate and follow up the benefits of the IT investment benefits perceived by the business. Benefits are also expressed in monetary terms. The benefits evaluation can have three purposes:

- To form a foundation for prioritizing between different investment proposals
- As a basis to form a decision if an investment shall take place at all
- To secure that the proposed investment gives as much benefit as possible

Ten steps conducted in three phases, preparations, analysis and guarantee of quality make up the base model (Dahlgren, L. E. et al. 2003).

- **Preparations**
  Step 1; decide the purpose of the analyses
  Step 2; create insight
  Step 3; decide and delimit the object
  Step 4; describe the object (processes/system)
- **Analysis**
  Step 5; identify benefits
  Step 6; make a benefit structure
  Step 7; valuate the benefits
  Step 8; calculate the benefits cost
- **Guarantee of quality**
  Step 9; validate and assess risk and hindrance
  Step 10; calculate net benefit and establish responsible persons for the realization of benefits



The result of the PENG analysis is a diagram showing the net benefit, a benefits structure with enclosure, a list of risks and a list of personnel responsible for realizing the benefits (Dahlgren, L. E. et al. 2003)

Enclosure II, Definitions

Different terms are defined below to let the reader understand our conception of the terms.

Ex-post evaluation: An evaluation that is performed after the investment is accomplished. The evaluation is conducted to measures the outcome of the investment.

FastTrack: A tool for distribution and administration of PC environments. The challenge is to make sure that each and every one through out a company always has access to necessary operating systems and applications. The idea is to maximize the value of already made investments by utilizing existing components in Microsoft's operating systems and programs to the brim.

Intangible: We use the term intangible to denote soft assets or variables difficult to define such as: brands, software, customer satisfaction, logos, company culture, employee satisfaction and so on. These variables are often hard to measure.

IT/IS investment: A wide concept that in this paper conforms to larger investments such as IT infrastructure, platforms, systems and so on.

Mixed methods: Evaluation methods that includes different methods (quantitative, qualitative and maybe probabilistic) to even out the weakness of using one single method.

Tangible: Measurable costs and benefits which are relatively easy to incorporate in traditional investment appraisal techniques. Tangible measures are often related to cost reduction, such as the reduction in personnel/staff, time savings and so on.

Quantitative methods: Methods used for financial measurements. For example: cost-benefit analysis, ROI, payback period and so on.

Qualitative methods: Usually used to assess the value of people and processes by measuring subjective and qualitative inputs. For example: Information Economics, strategic fit and so on.

Enclosure III, Interview template

Intervju mall

Intervju med _____

Bakgrundsfrågor

1. Vad har du för befattning?

2. Dina huvudsakliga arbetsuppgifter?

3. Har företaget en egen IT-avdelning och hur stor är den i så fall?

Generella frågor om investeringar och variabler

4. Hur kommer man fram till att en IT/IS investering ska göras?

5. Är det olika tillvägagångssätt om investeringen gäller operativa behov eller strategiska behov?

6. Vilken typ av utvärderingar görs? (pre- (ex-ante), during-, ex-post…lifecycle)

(Finns en standardiserad utvärderingsprocess för investeringar i organisationen?)

7. A.) Om inte efterutvärdering görs. Varför gör man det inte?

   B.) Om efterutvärdering görs. Jämförs det faktiska utfallet med det man innan projektstart bestämt att investeringen ska generera?
(Hur gör ni isåfall för att mäta utfallet av investeringen?)

8. Vilka variabler (benefit/cost) tar man hänsyn till?
   (projekterad vs reell kostnad, benefit och riskutvärdering?)

9. Vilka fem variabler/effekter anser ni är de viktigaste att ta hänsyn till vid en utvärdering? (Specificera lite bättre än bara t ex ”ökad effektivitet” eller ”ökade intäkter”)

1. _____
2. _____
3. _____
4. _____
5. _____

10. Hur har man kommit fram till att just dessa är viktiga?

11. Hur kommer man fram till vilka mätvärden (reella mått) en variabel kan ge?

12. Hur viktigt är det att nyttoeffekterna kan kvantifieras (dvs mätas i tid, pengar eller liknande)

Inte viktigt Oerhört viktigt

13. IT-investeringar är ju ofta långsiktiga och stegvisa med uppdateringar mm. Detta kan ju skapa problem om man vill göra utvärderingar hur de har fallit ut. Hur hanterar man det?

14. Hur kan man ta reda på om effekterna härrör sig ifrån IT-investeringen eller uppstått p g a någon annan anledning?

15. Det kan finnas variabler som är viktiga men som man inte tar hänsyn till eftersom de är svårdefinierbara eller svåra att mäta. Har ni något exempel på sådana?

16. Vissa forskare anser att man bör fokusera mer på värde än på kostnader och därför titta mer på mjuka nyttoeffekter. Hur ser ni på ett sådant synsätt?

Frågor om FastTrack investeringen

17. Har du varit med och beslutat om införandet av FastTrack?

Affärsperspektiv

18. Vad upplever du att FastTrack bidragit med, vilka effekter gav investeringen?

(standardisering, automatisering, effektivisering, delegering, kostnadsbesparing, kortare ledtider och kortare projekt, klientinfrastrukturen, mindre personal för admin av applikationer, användare och datorer, lägre kostnader, nya affärsmöjligheter)

19. Vilka variabler eller nyttoeffekter är/var viktigast för investeringsbeslutet av FastTrack?

Användarperspektiv

20. På vilket sätt påverkar FastTrack användarnas arbetsplats? (positivt - negativt)

21. Hur påverkas personalstyrkan av FastTrack?

(Har deras arbetsuppgifter förändrats?)

What aspects are important in an ex-post investment evaluation?

DZENANA BEGOVAC
SANDRA FAGERSTRÖM
MARIA NOBEL

Report no xxxx:xx
ISSN: 1651-4769
Department of informatics
IT University of Göteborg
Göteborg University and Chalmers University of Technology
P O Box 8718
SE – 402 75 Göteborg
Sweden
Telephone + 46 (0)31-772 4895

[tryckeriets namn]
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