



JÖNKÖPING INTERNATIONAL BUSINESS SCHOOL

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Evaluation of IT- investments

A case study of the PENG-model

Bachelor's thesis within Business Administration

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Utvärdering av IT- investeringar

En fallstudie av PENG-modellen

Filosofie kandidatuppsats inom Företagsekonomi

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Abstract

Three senior consultants, that primary work with organisational development and project management has created a model, named PENG, specially adjusted for evaluation of IT-investments. The purpose of this model is to evaluate both the financial and the “softer” values of IT. According to IT's major role of supporting the business concept, “soft” values like; improved customer service, fewer complaints, more reliable deliveries and et cetera becomes very important. An interesting feature of the PENG-model is that it promises to, as the name indicates (PENG means coin in Swedish), transform all aspects of IT into monetary terms. This makes it possible to quantifiably measure all the aspects of IT, not just the ones that can be counted for as reduced costs. This attribute makes PENG different compared to other models that we have found. In this thesis we have chosen to study how the use of PENG affects evaluations of IT-investments, by focusing on both restricting and enabling aspects.

The studies that have been performed are mainly based on qualitative methods. We have used a literature study to see which aspects that are of most importance when evaluating IT. Further on we have studied descriptions, by the originators of PENG, to see how an actual evaluation process is supposed to be done. Based on this we have performed an interview at Kalmar county council, who have used and are using the model in several of their IT-projects, in order to see how PENG serves in real life situations.

We have found out that the PENG-model certainly has good intentions in capturing the complexity inherent in IT, by valuing “soft” and “hard” aspects and for illustrating an investment from different perspectives. The model involves a working procedure consisting of ten steps that serves as a guideline for the evaluator. However, the model lacks a clear framework describing how the actual work in each step shall be performed.

The model generates in a clear and easily understandable result that can be understood through out the organisation, this mostly due to the use of money as the unit of measurement. The quality of the result is however largely dependent on the judgements of the persons involved. Depending on how you value the benefits and costs of IT, you will end up with diverse results. From this, we can see that the model has problems in terms of trustworthiness. We believe that PENG, despite its credibility issues, can be useful when discussing IT in order to illustrate the implications of an investment. We can also see the worth of the model when comparing different kinds of IT-investments; to see where the money can be of best use. The study further shows that PENG can be used in any type of organisation, even though it may be better suited for the public sector, where “soft” benefits are an essential part of the business concept.

Kandidatuppsats inom Företagsekonomi

Titel:	Utvärdering av IT-investeringar–En fallstudie av PENG-modellen
Författare:	Bengtsson Marcus, Wredenberg Daniel
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Sammanfattning

Tre senior konsulter som primärt arbetar med organisationsutveckling och projektstyrning har tagit fram en modell speciellt utvecklad för utvärderingar av IT-investeringar. Modellen heter PENG och har som syfte att utvärdera både finansiella och kvalitativa aspekter av IT. Då IT har som primärt syfte att stödja kärnverksamheten, så blir ”mjuka” aspekter såsom, ökad kundservice, färre klagomål, säkrare och mer spårbara leveranser et cetera mycket viktiga. En intressant egenskap som PENG-modellen besitter är att den utlovar att, som namnet antyder, värdera alla aspekter av IT i monetära termer. Detta skapar möjligheter att kvantitativt mäta IT:s totala påverkan i en organisation, vilket gör denna modell annorlunda från övriga modeller som vi har funnit. Denna uppsats har som syfte att studera hur användandet av PENG-modellen påverkar utvärderingen av IT-investeringar.

Studien är baserad på kvalitativ metodik. Till att börja med har vi genomfört en litteraturstudie för att undersöka vilka aspekter som skiljer en IT-investering från andra typer investeringar, samt för att ta reda på vad som krävs för att en IT-utvärdering skall bli så rättvisande som möjligt. Efter detta har vi studerat beskrivningar, gjorda av upphovsmännen bakom PENG, för att undersöka hur modellen är tänkt att användas. Baserat på detta har vi sedan genomfört en intervju vid Kalmar läns landsting, vilka har använt och fortfarande använder sig av denna modell i flera av sina IT-projekt, för att undersöka hur väl modellen fungerar i realiteten.

Baserat på detta drar vi slutsatsen att PENG-modellen har goda intentioner i att återspegla komplexiteten i IT, genom att värdera ”mjuka” och ”hårda” nyttor och att beskriva investeringar från olika perspektiv. Modellen består av tio steg som syftar till att guida utvärderaren genom hela processen. Modellen saknar dock tydliga riktlinjer som beskriver hur varje steg av utvärderingen skall gå till och många beslut blir därför godtyckliga.

Modellen genererar i ett klart och lättförståeligt resultat, vilket beror på att alla aspekter av IT omvandlas till kronor. Kvaliteten på resultatet är dock till stor del beroende av de bedömningar som de involverade personerna gör under utvärderingsprocessen. Beroende på hur nyttor och kostnader av IT värderas så kommer detta att resultera i olika resultat. Av detta drar vi slutsatsen att modellen har trovärdighetsproblem. Vi menar dock att modellen, trots detta, kan vara användbar för att illustrera innebörden av IT-investeringar. Vi kan också se att modellen har potential att jämföra olika IT-investeringar, i syfte att utvärdera var pengarna kan komma till störst nytta. Vidare visar vår studie att PENG kan användas i alla typer av organisationer, även om den troligen är bäst lämpad för den offentliga sektorn, där ”mjuka” nyttor är en viktig del av kärnverksamheten.

Preface

This is a Bachelor's thesis in Business Administration written at Jönköpings International Business School.

We would like to thank our tutors Caroline Teh and Mikael Cäker for their support and guidance when writing the thesis. We would also like to thank Peter Alvinsson for participating in our interview, your experiences in PENG was of great importance for our work.

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1 Introduction

This is a bachelor thesis within the subject of business administration written at Jönköping's International Business School (JIBS). On the basis of that, we primarily are informatics' students; we have chosen the subject for this thesis to be a combination of both business economics and informatics.

There is today an ongoing discussion about whether investments in IT are too costly or if the money can be of use in a better or more efficient way. The discussion exists both on governmental and organisation level. This has led us into the area of how organisations can evaluate their IT-investments from a monetary and a qualitative point of view.

1.1 Background

IT has today developed to be one of the most important components of a successful business. During 2006 the Swedish IT-market had a turnover exceeding 70 billion Skr. (Dataföreningen, 2006), which makes it interesting to investigate what foundations companies use to motivate and justify their IT-investments.

When discussing these types of matters it is important to know how we define an IT-investment. We have chosen to use a definition by the US. Department of Health and Human Services (2007) who describes an IT-investment as "An organisational investment employing or producing IT or IT-related assets. Each investment has or will incur costs for the investment, has expected or realised benefits arising from the investment, has a schedule of project activities and deadlines, and has or will incur risks associated with engaging in the investment". We would here like to point out that we primarily are interested in IT-investments that, as the definition indicates, will incur costs and that has expected or realised benefits arising from the investment.

The most of us today agree about IT as an essential part of the daily business. There is however, research showing that 70 to 80 percent of all IT-investments fail to fulfil its potential benefits (Dahlgren, Lundberg & Stigberg, 1997). This area can obviously be a subject to large improvements. We believe that the potential of IT is great, even though there historically have been several disappointments. Many problems with IT-investments are based on that IT is treated as an isolated phenomenon, separated from other parts of the organisation. It is also common with unrealistic expectations of IT, which in turn are founded in the lack of evaluations or insufficient assessments of what IT can and cannot do (Dahlgren et al., 1997).

This discussion has led us into the subject of how companies can evaluate their IT-investments. We are interested in this subject from two different points of view, which is; how can a organisation evaluate an IT-investment before the system is installed, and when the system is installed, how can the organisation determine whether the investment really delivers what the organisation had expected or not? The evaluations that are of interest here, is the ones that takes both the qualitative aspects and the economic standpoint into consideration. A solid evaluation of what an information system can contribute to in terms of; improvements of effectiveness, customer satisfactions, and eventual monetary savings et cetera, will result in better data for decision-makings. It will also result in a more consistent view of what changes that can be expected and in a clearer basis to be used when following up projects afterwards.

1.2 Problem discussion

It is obvious that IT-investments are not an end in itself, but rather aims to support the business and increase the profitability. From this, it is quite apparent that IT-support can be hard to separate from the results of the core business. Moreover, if you try to do this, how are you supposed to value the different aspects of IT? You can of course measure increased revenues or a reduction of costs, but it is more problematic to value the “softer” aspects of IT, for example, how do you value better customer service? According to an article in computer Sweden (2007), less than half of the western European companies do evaluate their IT-support. It is probably the mentioned complexity that makes companies avoid evaluations of IT-investments. Johan Tömmervik, the CIO of Systembolaget, does also mention that there is a lack of business ratios to compare different kinds of IT-investments. He further claims that IT is very abstract, and thereby hard to evaluate. Nevertheless, it is a great need for evaluations in order to make the IT-support more effective (Danielsson, 2007).

When considering different tools for evaluating IT-investments we have found several models, for example; Internal Rate of Return (IRR), Return On Investment (ROI), Payback Period (PP), Economic Value Added (EVA) et cetera. We though not totally satisfied with these models, based on their lack to show qualitative aspects of IT-investments. After further search within the area, we found a Swedish model named PENG. This model is shaped by three senior consultants that primary works with organisational development, project management and benefit-evaluations of IT-investments. PENG is a Swedish acronym for “Prioritering Efter Nyttogrunder”, i.e. Prioritising based the contribution of benefits.

The purpose of this model is to evaluate both the financial as well as the “softer” values of IT-investments. The PENG-model is based on a framework consisting of ten steps where you evaluate an investment from different perspectives in terms of benefits and costs. This is interesting due that information systems imply a lot more than just monetary savings. It is commonly the “softer” aspects of an investment that constitutes the most important benefits for example; improved customer service, fewer complaints, more reliable deliveries et cetera (Dahlgren et al., 1997).

Another aspect of PENG that got us further curious is that it tries to put a monetary price tag even on the “softer” values of an investment. This makes it possible to quantifiably measure all the aspects of IT, not just the ones that can be counted for in reduced costs. The PENG-model can also be used for evaluation of both individual systems as well as an organisation’s total IT-support, before and after an information-system is bought and installed (Dahlgren et al., 1997).

Based on the above information about PENG, it seems to fulfill our demands for evaluating both tangible and intangible aspects of an IT-investment. But does the theory about PENG really meet up when it comes to practice. Is it really possible to put a price tag on all the intangible aspects of an IT-investment, in order to make them measurable? Many questions arise in the beginning of our thesis and in order to structure the work we have come down to the following research question.

1.2.1 Research Question

Based on the above discussion, we will during the research process try to answer the following question:

- How can the PENG-model contribute to evaluation of IT-investments, focusing on both restricting and enabling aspects?

1.3 Purpose

The purpose of this thesis is to describe how the use of PENG affects evaluation of IT-investments, by analysing both the descriptions of how PENG is supposed to be used and by a case study of how PENG is used in practice.

1.4 Delimitations

There can be many different reasons for investing in IT-services. In this thesis we will mainly focus on IT-investments that are seen as beneficial by an organisation, not the ones that they may have been forced to, for example by their main customers or the headquarter et cetera. We have made this delimitation based on that you cannot evaluate forced IT-investments in the same way as you evaluate desirable projects. That is to say, investments that is supposed to be of good use for the organisation and not just work as an adoption plan in order to fit other parts of the corporation. This does however not indicate that these types of investments do not need to be evaluated.

1.5 Interested parties

The ones that can make use of this thesis are primarily companies that already work, or the ones that has plans to start working, with evaluation of IT-investments. Moreover, it may be interesting for those who today only evaluate their IT-investments from an economic point of view and that has recognised the need for also assessing the intangible results of IT. In addition, the creators of the PENG-model may find use of this research in order to see how their method is used in practice.

1.6 Disposition of the thesis

This thesis is structured in a traditional way, which means that we have started with an introduction chapter, in which the reader was introduced to the main issues of the subject. Further on, the problem specification was presented and followed up by the main purpose of the study. Thereafter, delimitations and interested parties were discussed. The next chapter will describe the methods that we are going to use in order to gain knowledge to fulfil our purpose.

A theoretical chapter, in which we will outline the most important aspects of evaluations of IT-investments, will follow this. It will involve both the use of information technology in organisations as well as the results that IT can have in terms of monetary savings as well as intangible effects. We will also discuss different approaches to use when evaluating IT-investments, that is to say quantitative and qualitative standpoints when searching for pros and cons of an information system.

In the fourth chapter, we will present the main outcomes of the empirical research, which we later on will analyse from a theoretical point of view in the fifth chapter. This will then be followed by a presentation of the main conclusions that we have acquired during the analysis. In the ending part of the thesis, we will try to evaluate our research process and discuss what we could have done better or in another way to improve the result of the study. Finally, we will give some proposals for future studies within the subject.

2 Method

A method is a tool, a way to solve a problem and find new knowledge (Holme & Solvang, 1997). Saunders, Lewis & Thornhill (2007, p. 602) gives another definition of a method and state that a method is “the techniques and procedures used to obtain and analyse research data, including for example questionnaires, observation, interviews, and statistical and non statistical techniques”. The use of a method will not in itself lead to new knowledge, it is therefore important to bare in mind that the method is just at tool to facilitate the work that needs to be done in order to find new knowledge (Goldkuhl, 1998). This chapter will describe the different methods and techniques used in this thesis, but firstly we will talk about the research process.

2.1 Research process

Research is often illustrated as a process (Ghauri & Grønhaug, 2005). This can be explained by that all research requires a lot of time and reflection. As a researcher, it is useful to look at it as a process consisting of different stages with different tasks (Ghauri & Grønhaug, 2005). For example, as researchers we first have to decide in what area we want to do our research in. Then we have to formulate our research problem, before we can decide what data to collect and how to collect the information. In the figure below, you can see an example of how the research process can be illustrated.

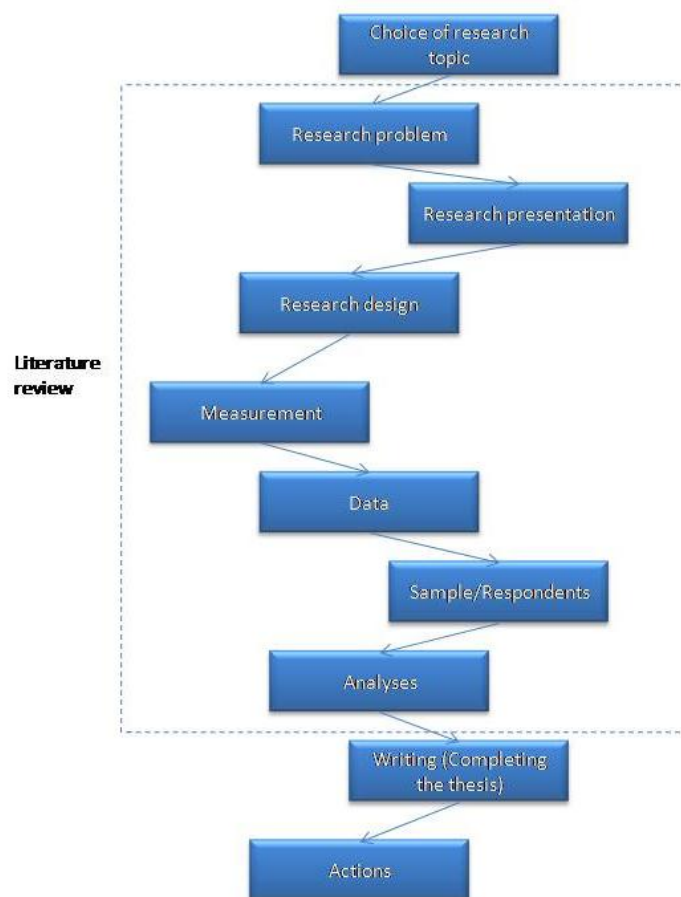


Figure 1 - The research Process (Ghauri & Grønhaug, 2005, p. 29) (Reworked figure).

As a researcher, you should however not be surprised if your research process is not as systematic as presented above. You often have to go back and forward in this process during the work (Ghauri & Grønhaug, 2005).

We have chosen to use this figure to illustrate that the thesis work is not a linear process, rather a progress performed in cycles. During the research process we will gain new knowledge that further on will be added to the parts already written. This will primarily occur after the different seminars where we will get feedback on what we have performed so far. Another reason for adding new information is that we will be more versed in the subject of IT-evaluations during the working progress. In the following section our research methods will be described.

2.2 Qualitative versus Quantitative methods

Authors often draw a distinction between qualitative and quantitative research (Saunders et al., 2007). Even though distinctions are made, attempts to define the distinctiveness of qualitative research, and therefore the way in which it can be distinguished from quantitative research, can be problematic. However, when looking at the data produced by qualitative research it is possible to draw some significant distinctions from the results based on quantitative work (Saunders et al., 2007). These distinctions can be seen in the figure below.

Quantitative data	Qualitative data
Based on meanings derived from numbers	Based on meanings expressed through words
Collection results in numerical and standardised data	Collection results in non-standardised data requiring classification into categories
Analysis conducted through the use of diagrams and statistics	Analysis conducted through the use of conceptualisation

Figure 2 - Distinctions between quantitative and qualitative data (Saunders et al., 2007, p. 472).

As mentioned in the beginning of this chapter the method is just a tool to find new knowledge. Hence, it is important to choose a method that is well suited for our purpose. If we not carefully think about this before we start our research we might end up using the wrong methods and techniques, which might result in us not getting the right type of data needed for the analysis. The questions below can be useful to think about when deciding which method to use.

- *Do we want to have a total perspective or a complete understanding?*
- *Do we want to put up hypothesis and make distinctions of interpretations?*
- *Do we want to build up theories and frame of references?*
- *Do we want to understand different social processes? (Holme & Solvang, 1997, p. 77).*

In this research, we want to get at deeper understanding of how an organisation does successful IT-investments. Our opinion is that IT-investments involve complex processes that

need to be fully understood, for us being able to understand and describe the consequences. To reach this understanding we need to create a frame of references containing well recognised theories explaining the effects of IT-investments. Another important issue for this thesis is to gain a deeper understanding of how the different social processes of an organisation are affected by information technology. Based on this, the qualitative method will be used, and therefore described below.

2.3 Qualitative methods

According to Holme and Solvang (1997, p. 91) “Qualitative methods can be seen as a concept for an approach which more or less combines the following five techniques: direct observation, participated observation, informant- and respondent interviews, and analysis of sources”. Ghauri and Grønhaug (2005) means that the data collection and analysis procedures often are conducted simultaneously and in an interactive way, where collected data are analysed, initiating new questions, and initiating further data collection.

In this thesis, we will obtain our data from both primary and secondary data. Primary data can be seen as new data, collected for the purpose that you are interested in, while secondary data are data collected for other purposes (Saunders et al., 2007). In this thesis the primary data will be acquired from an interview. Our secondary data will be obtained from literature studies. Both of these techniques will be described in section 2.4.1 and 2.4.2.

However to say that we just are going to use a qualitative method is not enough. To be more precise we will use a case study. “Historical review, group discussions and case studies are mostly qualitative research methods. These qualitative research methods use relatively more qualitative techniques, such as conversation and in-depth, unstructured or semi-structured interviews” (Ghauri & Grønhaug, 2005, p. 119). In the next part, we will describe the case study and the reason why this method is suitable for our purpose.

2.4 Case Study

According to Saunders et al. (2007, p. 139) a case study is “a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence”. The case study can be useful when the concepts and variables under the study are difficult to quantify (Ghauri & Grønhaug, 2005). So why have we chosen to use the case study strategy?

The power lies in that the strategy gives us a rich understanding of the context of the research and the process being enacted (Saunders et al., 2007). Since we are going to investigate the PENG-model and as stated above, want to get a rich understanding, this method will suit our purpose. The case study will make it possible for us to see how IT-investments are performed in organisations. This will further create a natural environment where we can study IT-evaluations, and in this case the PENG-model. Our assumption about why choosing the case study method is also strengthened by Ghauri & Grønhaug (2005) who claims that the case method is useful for theory testing, which is what we will do in this thesis.

We have also found support for choosing this method in a statement from Ghauri & Grønhaug (2005, p. 116) where they say; a case study is preferred “if we want to follow a theory that specifies a particular set of outcomes in some particular situation, and if we find a firm which finds itself in that particular situation, we can use the case study method for a

critical test of theory and its applicability to the organisation”. In this case we will test the usability of PENG in an organisation to see how the model contributes to evaluations of IT.

The techniques for collecting data in a cast study can be for example, interviews, observations, and exploratory research. In this thesis, we will use interview and literature review as our techniques to gather data, these will be described below.

2.4.1 Literature review

According to Ghauri & Grønhaug (2005), a literature study helps the researcher to discover relevant variables and relationships between them and to put together these variables in a new way. A critical review of the literature is also necessary to help us develop thorough understanding of, and insight into, previous research that relates to our research questions and objectives (Saunders et al., 2007).

Primary information can be of different quality and character (Holme & Solvang, 1997). However, if we are aware of the limitations and if we ask the right questions to the material we can get good quality information. An example of a limitation that we have to consider is for example the origin of the source (Holme & Solvang, 1997).

In this thesis, we will use the literature study to examine relevant theories. The theories will help us understand how IT-investments affect an organisation in terms of qualitative and quantitative aspects. The theoretical framework will also cover the most important parts of IT-evaluations and investments. In the empirical part of the thesis, we will perform a further literature study of the PENG-model based on a book written by the originators of the model. This will then serve as the foundation for the analysis when interpreting the primary data (interview).

The sources for the literature review will mainly come from scientific articles and books, collected both from libraries and from the internet, videlicet different databases. We have reviewed all literature according to Holme & Solvangs (1997) four phases; source-observation, -origin, -interpretation and -usability to increase the trustworthiness of the theoretical framework. See the reference for more information about this review.

2.4.2 Interview

We will use interviews to collect the main part of the data used in this thesis. The reason for this choice is that it will help us to get a deeper understanding about our case. The first thing we have to consider is to decide what sort of interview we are going to perform. There exist many types of interviews, for example semi-structured, in-depth, and group interviews.

In this thesis, we will use semi-structured interviews, which often are referred to as qualitative research interviews (Saunders et al., 2007). When using a semi-structured interview the researcher has a list of themes and questions to be covered, although these may vary from interview to interview. “This means that you may omit some of the questions in particular interviews, given a specific organisational context that is encountered in relation to the research topic. The order of the questions may also be varied depending on the flow of the conversation” (Saunders et al., 2007, p. 312). During our interview, it is possible that new aspects of the studied phenomenon might arise and thereby we need to shape additional questions. The semi-structured interview also gives us the possibility to structure the

themes that we want to discuss with the respondent, so that none of the important areas are left out or forgotten.

Throughout the interview, we will take notes from the respondents' answers. These notes will then directly after the interview session be reviewed and compared. This will result in an interview document that further on will be sent back to the respondent for confirmation. By doing this we will eliminate the possibility of misunderstanding parts of the interview.

2.4.2.1 Sample

The sample is often a critical task of a thesis, since much of the research credibility (see chapter 2.5 Research credibility) is linked to this. When using a qualitative method the selection of respondent will be decisive. If we get the wrong person from our sample, it can lead to that, the whole interview will be worthless (Holme & Solvang, 1997). The purpose with qualitative interviews is to increase the value of the information and to create a base for deeper and more complete understanding. This means that the sample will not be random or temporary, but done in a more systematic way based on predefined criteria (Holme & Solvang, 1997). This involves that we will search for an "extreme" case, and not the average, to get as large width in the material as possible (Holme & Solvang, 1997).

However, how large sample do we need? In the book by Ghauri & Grønhaug (2005, p. 119) they state that; "Students often ask how many cases they should include in their study. The answer to this question is very difficult, as there is no upper or lower limit to the number. Often one case is enough". To be able to find a case that would be useful in this thesis we contacted the persons who developed the PENG-model. We asked them if they could provide us with contact information to persons who had used the model several times and recently and that they thought would be suited for our thesis. We are fully aware that this selection might be biased, since the developers of the model most certainly will not give us a case where the use of the PENG-model has showed to be unhelpful. However, this is the only chance to access cases. We will deal with this problem by questioning the use of the model both according to the real life use and further on in the analysis where we will assess the model in terms of our theoretical framework. More about how we will treat the risk of bias is described in the next chapter.

2.5 Research credibility

All researchers endeavor to produce data or material that is as close to the truth as possible. However, how can a researcher be sure that what he/she writes is the truth? The answer is of course that he/she cannot. All he/she can do is to reduce the possibility of getting the answers wrong. This means that we as researchers have to pay attention to two particular emphases on research design: reliability and validity (Saunders et al., 2007).

2.5.1 Reliability

The term reliability refers to the stability of the measurement (Ghauri & Grønhaug, 2005) or it "refers to the extent which your data collection techniques or analysis procedures will yield consistent findings" (Saunders et al., 2007, p. 149). Robson (2002) asserts that there may be four general threats to reliability.

The first one is subject or participant error. One example of this may be that you will find that your questionnaires will reveal different results if they are done at different times of

the week. By choosing a more “neutral” day this problem should be solved (Saunders et al., 2007). In our case, we choose a Wednesday that we thought of as a neutral day since it is in the middle of the week, i.e. not linked to something positive (near a holiday) or negative (in the beginning of the week).

Next threat may be subject or participant bias. This can be explained by that the interviewees are saying what they thought their bosses wanted them to say. It is important to be aware of this when designing the research (Saunders et al., 2007). To minimize this problem we will interview a CIO (IT-manager), which makes it less probable that he/she will be restricted in his/her answers.

The third threat to reliability is observer error. One example of this might be that three persons conduct three different interviews, but with the same questions. However, these three persons might ask these questions in three different ways and in that way end up with a biased result. In our case we are two persons at the interview and both will take notes in order get as much and as correct information as possible. The questions will be asked of one person so that the other one can listen and take notes even more carefully.

The last threat is observer bias. This threat deals with that there might be many ways of interpreting the answers. As mentioned above we were two persons taking notes from the interview. These notes are then directly after the meeting written down in a document, where we will discuss all the answers so that all the received information is covered. This document will then be send to the respondent so that he/she could confirm, add or remove parts, which he/she believes are incorrect. However, since the interview will be performed in Swedish and then later on translated into English, there is a possibility that some parts can be mistranslated. This is a problem that we will take into consideration when performing the translation and which will lead to us being extra careful in this process to avoid errors.

2.5.2 Validity

“Validity is concerned with whether the findings are really about what they appear to be about” (Saunders et al., 2007, p. 149). It is here common to separate between inner and outer validity, the later is often referred to as generalisability, see the next section. As mentioned before, our intention is to interview the most “extreme” case, and not the average. This means that we have to find a person that has “the right” knowledge about PENG. We will then, based on our purpose, create a number of interview questions that further on are used to collect accurate data. Our intention is that these measures will generate in a high validity.

2.5.2.1 Generalisability

This part of the research credibility is concerned with whether the findings may be equally applicable to other research settings (Ghauri & Grønhaug, 2005). In this thesis, we will not be able to achieve a high generalisability. This due to that we have performed a case study and from that we are not able to draw general conclusions that will be the same for all other settings where the PENG-model is used. On the other hand, we think that our conclusions can be applicable into similar settings, as the one we will use in this case.

3 Theoretical framework

In this part of the thesis, we will bring forth theories that are of interest in relation to the purpose. The theoretical framework is also supposed to introduce the reader to the major theories that are of importance within the subject of IT-investments and evaluations.

3.1 What is IT?

In order to understand evaluations of IT-investments, it is vital to be familiar with the area of information technology. In this section, we will give a short background to the evolution of IT and how it has become an essential part of the daily business. The first programmable computer was invented during the Second World War. In this time, most of the computers were used to crack enemy codes or to solve different types of complex differential equations. Since then the development has gone pretty far and computers as well as Internet is today a natural part of the daily life (Beekman & Rathswohl, 2001).

According to Answers.com (2007) IT can be defined as “The collection of technologies that deal specifically with processing, storing, and communicating information, including all types of computer and communications systems as well as reprographics methodologies”. The definition of IT can be a bit hard to comprehend. However, the modern IT has come very far in terms of usability, which in turn means that many persons today use IT without even noticing it.

IT has also become a significant tool for doing business and many firms would not function without it. The most of the corporations use some kind of IT every day. It can be everything from writing an e-mail to more advanced administrative functions using an ERP-system (Enterprise Resource Planning-system). These kinds of information systems handle the most of the information flow within the organisation for example; ledger, the creation of invoices, administration of personnel, handling of salaries et cetera (Beekman & Rathswohl, 2001). From this, we can draw the conclusion that IT is major part of a modern corporation, and that these kinds of investments are of utmost importance to maintain a market position and for further development of the organisation.

3.2 How IT-investments affect a corporation

Since IT has a central role in most organisations, it obviously has effects on the organisation. This need to be considered already in the evaluation-phase of an eventual implementation of a new system. Leavitt (1965) claims that there within an organisation are interdependencies between actors (people), technology, structure and the tasks to be performed. By this, he means that a change within one component would result in a change in some of the others, see below.

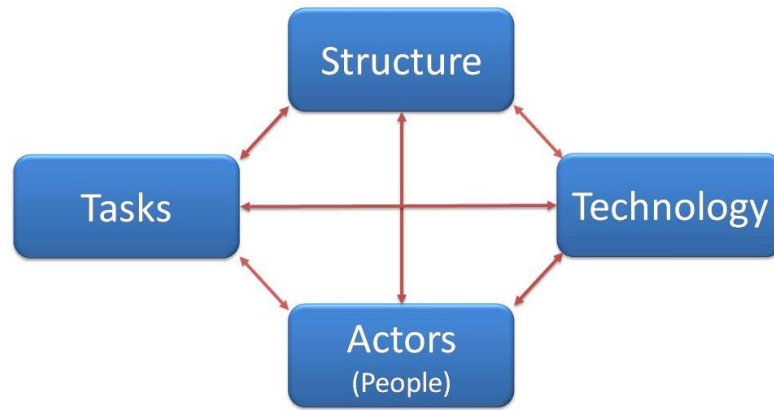


Figure 3 - Interdependencies within organisations (Levitt, 1965).

Levitt (1965, p. 1145) further writes that “the introduction of new technological tools-computers, for example – may cause changes in structure (e.g. the communication system or decision map of the organisation), changes in actors (their numbers, skills, attitudes and activities), and changes in performance or even decision tasks may now be feasible of accomplishment for the first time, and others may become unnecessary”. To conclude this you can say that if a change takes place in any of the mentioned parts, the change will sooner or later also be spread to the other elements of the organisation.

Wahlsman (1993) has created a model that shows the information system in relation to its surroundings.

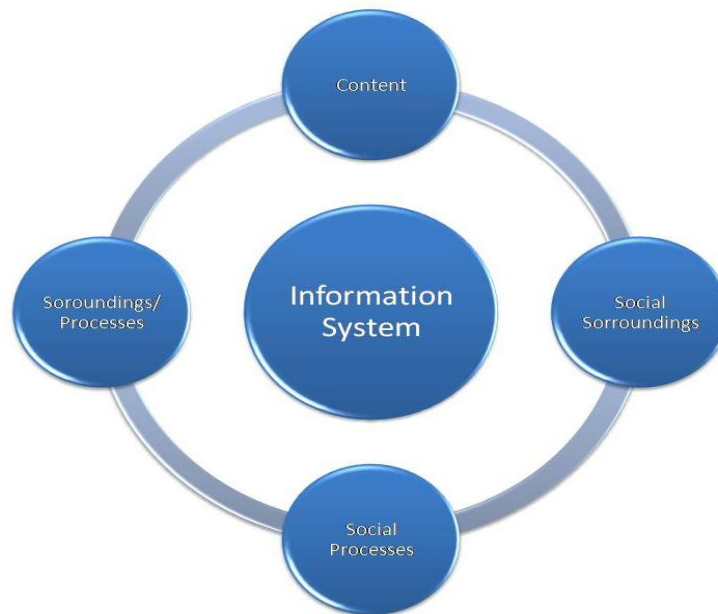


Figure 4 - Model for implementation of information system (Walsham (1993) (Reworked)).

According to this model, components around the Information system can be evaluated according to different focuses:

Content: The organisation, the business concept and the exiting problem before a new Information system is set.

Social surroundings:	Social relationships, infrastructure of the organisation, concentration of power etc.
Social process:	Organisational culture and sub-cultures, policies, self-governance, and moral.
Surroundings/Processes:	People make actions (communication, power struggles and sanctions) based on accessible means (interpretation, resources and norms). (Walsham, 1993)

This model by Walsham shows that information systems have a great influence on people, organisation and structure. The above mentioned factors, used to understand organisational implementation, are multidimensional and needs to be studied deeply and over a long time (Walsham, 1993). From this, you can see that Information systems are implemented in a very complex environment that needs to be analysed in order to find an appropriate system to use.

3.2.1 Different perspectives

An IT-investment can be performed from different perspectives. These perspectives have shifted from the “early strong cost reduction perspective” towards assessing the strategic and business value of investments. As the name implies, the first perspective has a clear focus on reducing costs for the organisation (Svavarsson, 2005). This can be done by for example reducing the numbers of systems used in the organisation. By doing this you will reduce the costs for maintenance, licences fees, education, et cetera.

The next perspective deals more with how the organisation can attain strategic benefits by using certain information technology (Svavarsson, 2005). This can for example be the opportunity for customers to buy products via the internet or remove the workload from the employees by eliminating paper-pushing.

When evaluating an IT-investment it is important to be aware of which perspectives that is of most importance. For example, if the investment perspective is customer oriented, it might be inappropriate to evaluate IT from a cost-reduction perspective. However, most IT-investments involve multi-dimensional perspectives and thereby needs to be evaluated in accordance to these.

3.3 What makes IT-investments different?

In order to grasp the complexity inherent in IT, you have to understand the characteristics of IT-investments. IT-purchasing has a lot in common with other types of investments, but there are some important dissimilarities, which Bannister (2004) has identified as the following.

- One major difference is that an IT-investment often is a never-ending investment, which means that only a few decisions can be made, without affecting other parts of the business.
- There is also a great need for technical skills when purchasing IT. This means that an organisation needs a management with good technical skills and often additional help from outside advisors and suppliers.

- Information technology changes very fast, which means that the systems needs to be changed or updated at a fast pace. This requires solid replacement strategies.
- It is hard to determine the costs of IT, due to that it for example is almost impossible to forecast, in beforehand, how much education, support, system failures et cetera will cost the company.
- There are difficulties to measure the benefits of IT expenditures, due to that IT is so integrated in the day-to-day operations and many benefits might not be visible to the users, for example increased security.
- The expenditures of IT can be hard to control. In ordinary investments, there is often one manager with the overall control. IT-purchasing is however more decentralised to its nature, which means that it is being done at every level of the business. This due to that IT is relatively cheap and that the employees often, by themselves, decide when to invest in a new computer and so on.
- It is common that the users of IT have insufficient knowledge in stating requirements. Users are also often unaware of what the technology can do for them, which results in a gap between what the systems can do and what the users expect them to do.

From this, it becomes quite evident that IT-investments are a bit more complex, compared to other types of purchase and that it demands large financial and technical insights from those who are involved. By this, we can see that an evaluation model for IT-investments needs to grasp all the aspects of IT and provide a structured way to find and deal with them.

3.4 Foundations for successful IT-investments

Lundberg (2004) has identified three major aspects that need to be fulfilled in order to perform a successful IT-investment. The fundamental question is whether the solution is in line with the conditions and ambitions of the organisation. In order to find this out you need to compare the direction of the organisation with the direction of the system. If they match, the potential of IT is great. The three aspects to evaluate a solution from are: the market, the strategies and the organisation (Lundberg, 2004).

3.4.1 IT in line with the market

An investment in IT that does not fit into the conditions and business models of the market implies a larger risk to fail. There are both general and specific trends on the market. An example of a general trend could be to perform customer communication through the Internet. A more specific trend could be to create electronic communications to other actors on the market, in order to handle customer mobility that may be enforced by law (Lundberg, 2004).

According to market theory, this is all about a balance between the market demands for new solutions as well as how the new solutions create new demands. Here it is important to invest in new solutions in an appropriate pace. There are many examples of unsuccessful investments in the early 1990, when many companies focused too much on the Internet before the market was mature enough. It is off course neither good to be too slow accord-

ing to the market development, and then there is a risk that the customers already have chosen other suppliers (Lundberg, 2004).

3.4.2 IT in line with the strategies

To be in line with the market is usually not enough, the organisation's ambitions are also of great importance when doing IT-investments. The organisation needs to be aware of what they expect of the investment in relation to its strategies. This can be exemplified with an organisation that works on a market with a decreasing price level. The strategy of the organisation is then to consolidate, save and reduce the personnel. To start with large IT-investments to realise new sophisticated services would be directly wrong and not in line with the organisational strategies (Lundberg, 2004).

The mentioned example contained a radical deviation from the organisation's strategies. In other cases, it can be harder to differentiate between what is an accurate investment and what is not. The important lesson from this is to at least always consider the strategy when discussing new IT-investments. One way to find investments that are in line with the strategy and with great potential of improving the business is to search for the parts of the organisation that contribute the most to its revenues. Many studies shows that the productivity and usefulness of IT mostly depends on in what parts of the organisation you invest (Lundberg, 2004).

3.4.3 IT in line with the organisation

The investment has to be, as mentioned before, in line with the market and the strategies. This is however not enough; it shall also fit with the organisation. It is important to be aware of what kind of culture the organisation has. Is it an open and innovative culture or a more rigid and careful when facing new technologies? This question is usually not very simple due to deficient self-recognition. Many companies would not admit, even to their selves that they are conservative. This aspect is nevertheless important, due to that change work can be very hard to perform in an inflexible organisation (Lundberg, 2004).

In order to successfully implement a new information system, the structure of the organisation needs to be adopted. There also needs to be a mutual agreement about the future development between the management and the personnel (Lundberg, 2004).

3.5 Time frame

When performing IT-evaluations one important thing to bear in mind is the time frame for the project. This due to that a very time consuming IT-evaluation will delay the introduction of new information technology into the organisation and in that way result in a competitive disadvantage.

“The classical theory behind evaluation of capital investments stipulates that an investments should be performed as soon as the net present value is positive or when the internal rate of return (IRR) is larger than the discount rate” (Svavarsson, 2005, p. 26). However, when performing these types of investments, there is not enough to say that it is a “now or never” opportunity, if the IRR is positive. As a decision-maker, it can be more beneficial to delay an investment to a later date when more information has been obtained, or when demand has grown to a satisfactory level (Svavarsson, 2005). To delay an investment can in this case be particularly beneficial since the development is so rapid. Before the manager

takes the decision to perform an investment he or she must ask questions like, “What will happen in three years? Will this software be too old then? Will there be new technology in the near future that will suit our needs better?”

Another thing to consider is how much time the actual evaluation process acquires. If the evaluation goes too fast you might wonder if all the aspects are covered. If it took too long, what happened during the evaluation? Are there new things to consider at this point in time? By this discussion we can draw the conclusion that an evaluation model has to cover all the aspects of IT and at the same time be time efficient.

3.6 Benefits and costs of IT-investments

Lundberg (2004) argues that in order to see the total effect of an investment you need to evaluate all the aspects of IT. He further defines two kinds of IT-benefits; the ones that IT creates within the business activities and the benefits that are visible in terms of reduced costs. Both of these benefits are important, especially within large corporations with a great IT-dependency. The cost reduction is however often not as great as the benefits within the business (Lundberg, 2004).

When considering IT-investments, the literature makes a distinction between “hard” and “soft” benefits. Hard benefits are usually associated with efficiency gains as a direct result of the implementation and are in the most cases relatively easy to calculate. The soft benefits on the other hand are more difficult to measure (Svavarsson, 2005). “Many of the companies do not formally evaluate their IT-investments because they maintain that many of the important benefits cannot be quantified in monetary terms and are hence left out of the evaluation” (Svavarsson, 2005, p. 116). However, the soft benefits are often the most important due to that IT often is used as a support to realise the business concept, and not the business concept itself. Therefore it is vital that also these, hardly evaluated benefits, are taken into consideration in the evaluation model

IT-investments can be evaluated from many different points of view. Lundberg (2004, p. 68) has identified four ways to view the effects of an IT-investment:

Reduction of costs:	The cost of running an organisation before an IT-investment, reduced by the costs after the installation is set.
Increased income:	The income after an IT-investment reduced by the incomes before.
Qualitative benefits:	Improvements in the qualitative business ratios that are used within the enterprise e.g.; customer satisfaction, staff turnover, comfort and so on.
IT-benefits:	The costs of IT before the change, reduced by the cost after.

The different posts in the table above are used to compare the costs, revenues and ratios before and after an investment are accomplished. This results in an estimate of the net-benefits of IT. From this, it becomes quite evident that IT-investments can be reviewed from many different standpoints and that persons from unlike divisions of the organisation can come to poles apart conclusions when evaluating the result of the investment. However, in order to get the total picture of an IT-investment, you need to evaluate all the different aspects of an investment (Lundberg, 2004).

Bannister (2004) claims that long-term control of costs and benefits require investments in management, which in turn involves suitable evaluation and monitoring procedures. He has particularly identified the following aspects to be important; clear identification of all costs and benefits, ways of measuring costs and benefits, methods of evaluating proposed expenditure, and appropriate evaluation measures and techniques (Bannister, 2004). This makes it evident that an evaluation model must offer ways to identify, measure, and value costs and benefits of IT.

Many studies show that organisations often do not understand costs and benefits when it comes to IT. All costs and benefits of IT are not always fully realised, which means that they are not fully known. A solid evaluation can however only be done if the costs and benefits are totally understood. Bannister (2004) names some examples of potential benefits (decreased costs) when investing in IT:

- Competitive advantage – *Provide a service that the competitors can not match.* Depending on how an organisation combines their unique competence with information technology, they may be able to gain an advantage that their competitors can not match.
- New products or services – *IT can facilitate the creation of new products or services.* One example of this can be to provide video rentals through the internet, which is an example of how IT can offer an old product through a new medium. This results in increased service for the customers, and lower costs for the lessor.
- Increased productivity – *Removing steps in the production by automating procedures.* Many tasks can be automated, which leads to decreased costs in terms of reduction in staff, inventory or working capital.
- Improved product delivery – *For certain products electronic delivery can be effective.* An example of this is the possibility to upload digital photos, get them developed and send to your mailbox.
- Better decision making – *Decision support systems.* Services like business Intelligence systems can provide real-time data and customised reports in order to support strategic decisions.
- Improved communication – *The use of email, intranet and Internet for internal and external communication.* This facilitates the spreading of information inside the organisation and to external customers.
- Reduction of errors – *Computers makes no errors.* Working tasks performed by routine can be automated, which leads to fewer errors caused by the human factor.

Haverblad (2006) also states that measuring the performance regarding IT is essential to be able to follow up, verify and evaluate what has been achieved in relation to set up goals. These measurements shall be linked to the IT-strategy and be integrated with planning and budgeting. “What is not measured can neither be improved” (Haverblad, 2006, p. 96).

Many of the above mentioned benefits are quite easy to identify and comprehend. It is much harder to assess the expenditures of IT. The cost-evaluation is often made before the investment or in retrospect. Hidden costs are a major problem within IT-investments. In this case, hidden costs are the ones that are not perceived at the time when the investment is planned. Examples here can be costs for training, maintenance, support, testing, installation and different adjustments. These are costs that might be visible, but which are not al-

ways recognised as IT-costs and may thereby be overlooked when evaluating a project (Bannister, 2004).

Conventional methods to use here are; return on investment, payback period, net present value, internal rate of return, cost-benefit analysis et cetera. A problem with these evaluation methods is however that their result can be misleading. The figures do not create any measure of the effectiveness of the investment. Is the money effectively spent or could the investment have been done in a better way? It can also be useful to benchmark IT-investments against peer organisations in order to compare the effectiveness of different IT-solutions (Bannister, 2004). Based on this, we can see that a model used for IT-evaluations must be able to measure the effectiveness for each aspect of an investment and provide ratios for these.

3.7 Tools for Change

The PENG-model is, according to Dahlgren et al. (1997), based on Business Process Re-engineering (BPR), which is a radical technique used for change work in an organisation. In order to grasp PENG you need to understand the concept of BPR. A technique, with a different approach, is Total Quality Management (TQM), which in contrast to BPR, is based on gradual improvements in the organisational processes. The reason why we also will describe this method is that it often faces less resistance from the involved employees. And according to our knowledge, we do not see any restriction why PENG could not be used also for TQM-projects. In the following parts, we will discuss these two different techniques used for business development..

3.7.1 Business Process Reengineering

BPR is best suited when the organisation shall perform major changes. This technique enables the organisation to attain aggressive improvement goals, defined by a set of metrics. The difference over time between BPR and TQM is illustrated in the figure below (Pearlson & Saunders, 2004).

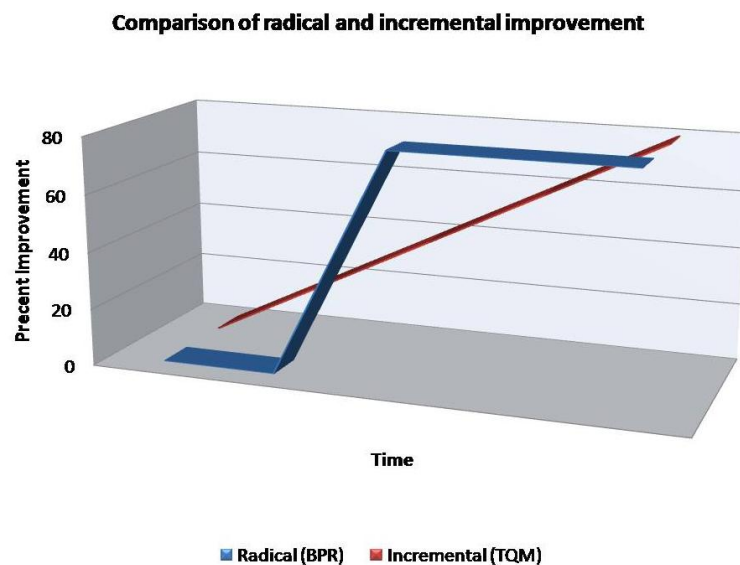


Figure 5 - Comparison of radical and incremental improvement (Pearlson & Saunders, 2004, p. 111) (Re-worked).

The vertical axis measures how well a business process meets its goals, and the horizontal axis measures time. According to Pearlson and Saunders (2004, p. 111) “BRP typically faces greater internal resistance than TQM”. Moreover, by looking at the figure you might understand why. To make large changes in an organisation in a short period of time might raise resistance to change and cause problems for the organisation (see further section 3.7.3). This is why BPR should be used only instead of TQM when the organisation requires a radical change. This can be for instance when the organisation is in trouble, or when it must change significantly in order to outpace its competition (Pearlson & Saunders, 2004). IT-investments are often thought of as being radical improvements in terms of organisational development. However, IT can be introduced into the organisation by successively implementing minor parts of the system and hence face less resistance, see next section.

3.7.2 Total Quality Management

The managers’ goal when using TQM is to improve business processes through small, incremental changes (Pearlson & Saunders, 2004). The process of improving the business generally involves the following activities:

- Choosing a business process to improve
- Choosing a metric by which to measure the business process
- Enabling personnel involved with the process to find ways to improve it according to the metric (Pearlson & Saunders, 2004, p. 110).

According to Pearlson and Saunders (2004) the personnel often reacts favourably to TQM. This because it gives them control and ownership of the improvements and, therefore, renders a less threatening change (Pearlson & Saunders, 2004). An important factor when performing successful IT-investments is to get the employees involved and supportive of the organisational change. If the future users of a system are not satisfied, it does not matter how well the system is perceived to improve the organisation, the system will anyhow not reach its full potential and the result of the evaluation will thereby be misleading. From this it is possible to draw the conclusion that an evaluation model needs to take the future users into consideration in order to reach a trustworthy result. In the following section we will go deeper into the area of resistance to change.

3.7.3 Opposition to change

Change work is a critical factor when it comes to quality projects and implementation of strategies (Haverblad, 2006). How the organisation reacts on the change plays conclusive part in the difference between a successful and unsuccessful initiative. Change is a continuous process where importance of information should not be underestimated (Haverblad, 2006).

To succeed with a change work within an organisation the manager should bare these issues in mind:

- When can the change work be implemented?
- How large changes are reasonable to do at the time?

- How will the change affect the individual and the organisation?
- How will the change affect the organisation's customers?
- What will the personnel lack when the process is changed or a new process implemented? (Haverblad, 2006, p. 55)

When the manager is able to answer these issues, he/she then has to develop an information- and communication plan. This plan should answer the questions, Why?, What?, Who?, When?, How?, and Where? The information from these questions should then be mediated to the concerned personnel in order to create an understanding of why the changes are made, and in that way prevent possible restrictions to change within the organisation (Haverblad, 2006). This part merely discusses how IT-investments shall be executed, however when performing an evaluation you need to understand how well the system was received by the users in order to be able to estimate the future contribution to the organisation.

4 Empirical findings

In this part of the thesis, we will present our empirical findings. It will start with a presentation about how the PENG-model is supposed to be used according to the founders of the model. Followed by this, we will present a case study at Kalmar county council, which shows how the PENG-model is being acquired when it comes to practice.

4.1 The PENG-model in theory

In this section we will introduce the reader to the PENG-model by describing both the areas where it can be used and the sequence of work when performing an evaluation. The information that we use comes from a literature study of a book titled “Make IT-profitable” written by Dahlgren et al. (1997).

4.1.1 Areas where PENG can be used

The figure below illustrates the different occasions where PENG can be useful.

Areas of Application	PRIORITISING	PRICING	EVALUATION OF A COMPANY
Benefits			
ATTAINED BENEFITS	Follow-up	Follow-up	Main information
POTENTIAL BENEFITS	Information for decision-making	Information for decision-making	Supplementary information

Figure 6 - A matrix illustrating the areas where the PENG-model can be of good use (Dahlgren et al., 1997, p. 44).

To start with, we will explain the concept of *attained* and *potential benefits*. Attained benefits imply the benefits that a certain system generates right now. A benefit is however not a constant, it rather changes along with its surroundings. According to the authors this means that it can be suitable to perform a benefit evaluation yearly, if the organisation is present in a frequently changing market.

Potential benefits on the other hand view the expected benefits of a new or revised information system. The reliability of these benefits is lower than that of the attained benefits. The potential benefits are often dependable of that some conditions in the surroundings are realised.

The first area where PENG can be applied is for *prioritising* that is to say as supportive information when choosing among different investments. This is supposed to help the organisation to invest their money, where they will lead to most improvements. Another use of the model is to calculate how much a certain investment is worth, that is to say; to see if

the *price* of something is relevant. In this case, you use the potential benefits as the base for the decision-making. If the investment is found to be profitable, then you can follow up the potential benefits afterwards and see if they are realised. According the authors, PENG can further be used to calculate how much a project might be worth and thereby be used when considering outsourcing. A third use of PENG can be *evaluations of companies' total IT*, in order compare attained benefits of the present system to the potential benefits. If there are a large discrepancy the companies IT might not be maximally used, thereby it can be room for improvements without further investments.

4.1.2 Sequence of work

In this part we will give a brief explanation of the working method used in PENG. The model is based on the ten following steps:

1. Determine purpose
2. Create awareness
3. Determine area (processes/systems)
4. Define and describe processes/systems
5. Identify effects of benefits
6. Clarify links in an objectives structure
7. Valuate benefit effects (gross benefits)
8. Estimate reliability of the evaluation
9. Define and evaluate IT costs
10. Calculate net benefits

According to the authors the above mentioned steps do not necessarily need to be performed in this order and iterations of some steps can be helpful. When concerned personnel have become more experienced, it can be helpful to go back and revise some of the earlier stages of the evaluation, in order to see if any of them can be performed in a better or more consistent way. There is also a possibility that some of the steps can be performed simultaneously to increase the speed and the efficiency of the evaluation. In the following chapters, we will give a description of the steps.

4.1.2.1 Determine purpose

A benefit evaluation can have several purposes. An example can be to perform an estimation of potential benefits of a future investment. Another purpose could be to generate data for decision-making, used to approximate the price of a certain product or service. It is also common to evaluate an already performed project in order to see if the set goals were achieved.

A more general purpose can be to evaluate the total benefits of IT in an organisation in order to perform future IT-investments more strategically, i.e. to invest money in projects where you can maximise the return. The descriptions of the model indicate that it is important to determine the purpose early in the evaluation, due to that it has effects on the rest of the process.

4.1.2.2 Create awareness

According to the authors, the foundation for a successful benefit evaluation is that the persons involved in the evaluation are aware of the advantages that it might imply. It is also crucial that the participants performing the evaluation are informed about why the evaluation is done and how to work in order to reach an as correct result as possible. To do this, the authors explain that you need to introduce the foundations of the model, the methodology and its possibilities. The higher up in the hierarchy you reach, the better impact you can expect.

A common problem when it comes to projects is that they often are limited to include only IT. It is however very important that the effects of the information system also are connected to change work within the business in order to succeed, see the figure below.

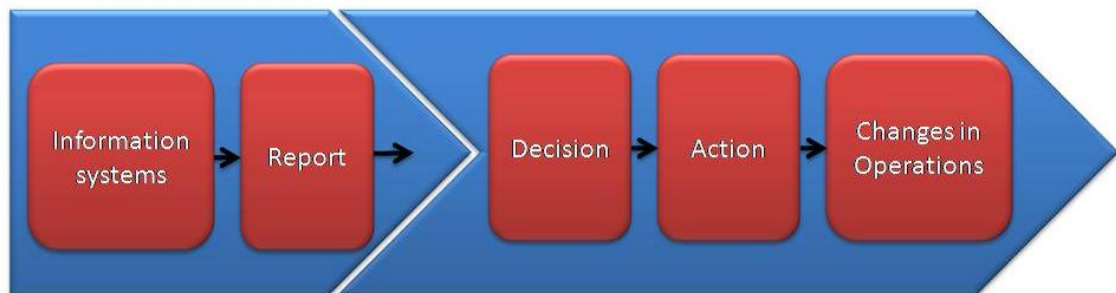


Figure 7 - The effects of the information system has to be connected to the organisational development (Dahlgren et al., 1997, p. 35).

According to PENG the ideal way to perform change work is to have IT as a natural part of the entirety. This way the benefits and fulfilment of the objectives becomes a matter of course in the organisation.

4.1.2.3 Determine area for benefit evaluation

The purpose of the benefit evaluation does partly give a hint about which area that is of current interest. The purpose can be either to evaluate a total organisation or just to lift out some systems or processes that are of special interest. It is common that a particular benefit might arise from collaboration between many different systems or processes. In the process oriented world of today many companies primarily look at the processes and from that point look at the information systems involved. If the organisation chooses to perform an evaluation of the total IT, it might later on be interesting for them to focus and dig deeper into some parts of the evaluation based on the results of the broader analysis. An example can be that one area, for example a system, has shown to have very low or negative net benefits. The authors mentions that it can be useful to further study this problematic area, in order to improve the benefits of the system or otherwise to terminate that special part.

4.1.2.4 Define and describe the processes / systems

To get a successful benefit evaluation, when using PENG, it is very important to define and describe the chosen processes or systems. A solid documentation of a process or system makes the evaluation easier and this also makes it possible to perform the valuation more exact. According to the authors, it often is easier to structure change-goals within a

process oriented business and thereby less complicated to perform a relevant benefit evaluation. During the description process, it is common to minimise or expand the evaluation area. It can also be useful to use modelling applications to visualise the process; there is however, no special notation included in the PENG-model.

4.1.2.5 Identify effects of benefits

In this stage, the organisation needs to engage the persons in charge and control that all parts of the firm affected by the process/systems are represented. According to the descriptions of PENG, it is not a good idea to have only the IT-specialists identifying all the benefit effects. The evaluator also needs to be aware of that the processes/systems can influence other parts than the organisation, i.e. customers or suppliers et cetera. Alternative methods in this step can be brainstorming or objectives analysis. Brainstorming means that a group with a balanced competence is assembled, i.e. competences from all different parts of the organisation are represented, to search for benefit effects without restricting thoughts. Objectives analysis implies that you have a starting point in a quantifiable main goal that you subsequently compare to different sub goals. From this, the organisation studies how diverse parts of a system affect the fulfilment of the sub goals.

In order to get a trustworthy PENG-evaluation it is important to identify as many benefit effects as possible. Aspects of less importance are phased out later in the valuation process.

4.1.2.6 Clarify links in an objectives structure

All identified sub goals aim to directly or indirectly fulfil the main goals of the organisation. In this phase, the evaluator shall relate all the sub goals to the main goal. This can be illustrated graphically by putting the main goal in a box to the left and then structure the sub goals in relation to this. The illustrations will then clarify eventual connections between the goals, see the example below.

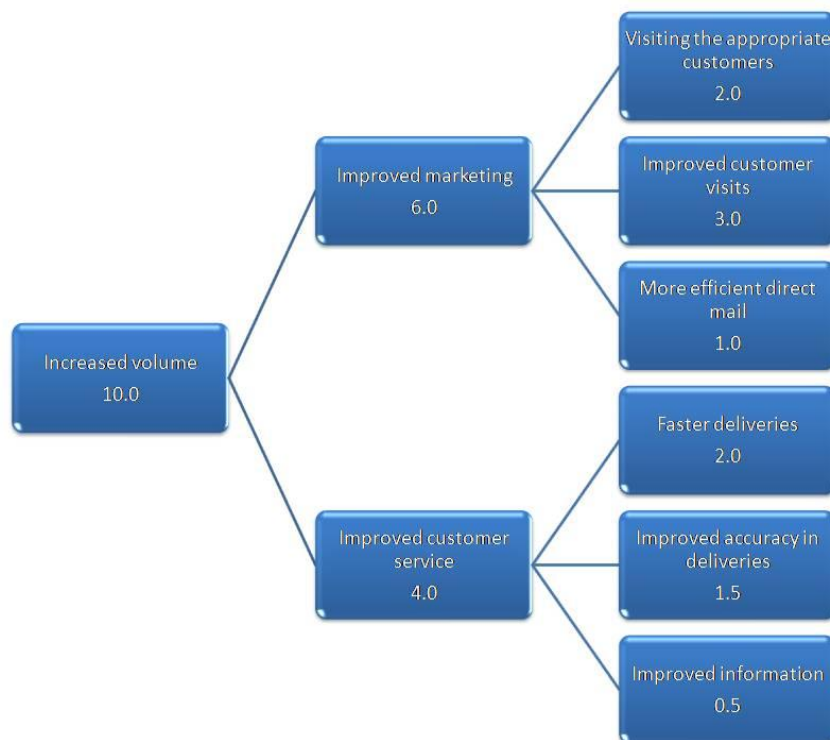


Figure 8 - Example of an objectives structure. The numbers shows the value of the benefits in million Skr (Dahlgren et al., 1997, p. 40).

The objectives structure will also eliminate the risk of counting for an objective more than ones. It might however be possible that a goal can show up at different places in the structure, which can be correct. According to the authors, an advantage can here be that the structure might help to identify forgotten effects of a benefit, which will improve the quality of the evaluation.

4.1.2.7 Valuate benefit effects (gross benefits)

It is essential that the people in charge take responsibility for the valuation. A key issue here is the aspect of time. Shall an existing benefit be compared to the status before a certain system was introduced or shall you evaluate the benefit based on a non-existing IT-support? Well, the answer is always that the PENG-evaluation shall compare the benefit to the current situation.

A question that the organisation can ask is for example; how do we benefit from this system today and what consequences would it be if the system did not exist? To make this question easier to value you can, according to the authors, think about it in terms of “how much would the organisation loose every day if the system would be out of order?” The PENG-leader can here ask questions like; is it worth 5 million – No, is it worth 500 000 Skr. – Absolutely, is it worth 1 million – maybe, and so on. A benefit does not always have to result in improved sales. It can rather be to maintain the sales within the same level as today or even to decrease the sales where the reduction would have been even greater if the benefit were not achieved. PENG does not include a framework for how these numbers should be calculated; it is rather up to the persons performing the evaluation to make their own assumptions.

The values are then to be filled in to the objectives structure. This can easily be done in a calculation program, for example Microsoft Excel, in order to facilitate the calculation of the total benefits.

4.1.2.8 Estimate reliability of the evaluation

The identified benefits are to be classified into three different categories:

- Direct benefits
- Indirect benefits
- Hardly valuated benefits

This categorisation is done to illustrate the reliability of the valuation. An estimation of what IT contributes with compared to other factors, is necessary in order to reach a relevant result. A question to ask here is whether the value of the benefits is appropriate compared to the total value of the firm.

4.1.2.9 Define and evaluate IT costs

Costs of IT can arise within many different parts of the organisation. The authors of the PENG-model have identified three different types of costs:

- Local hidden costs

- Local visible costs
- Central costs

The hidden costs are, as the name states, the hardest ones to identify. Examples here are the time spent by the personnel on adjusting the applications, in addition to the ordinary use of the system. Another example is the data communications costs, which often disappears in other types of telephone expenses. This is a complex stage, where the organisation needs to shape their own norm for calculating the IT-costs. The organisation has to be very careful when creating the norms so that every cost is calculated in the same way.

4.1.2.10 Calculate net benefits

The final and the least complicated step is to calculate the net benefits. Here you reduce the gross benefit by the IT-costs, see below.

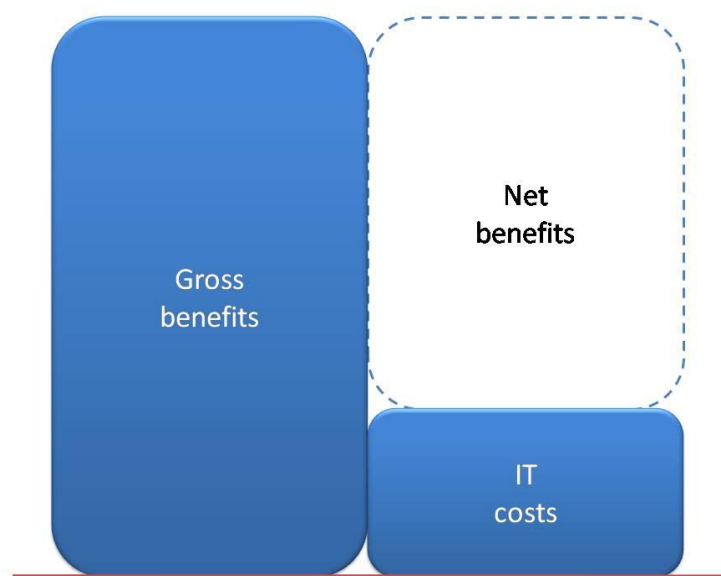


Figure 9 - Net benefits = gross benefits reduced by the IT-costs (Dahlgren et al., 1997, p. 23).

An interesting business ratio that can be calculated here is the benefit factor, that is to say the gross benefit divided by the IT-costs. A frequently calculated benefit factor, according to the authors, is five, that is to say the gross benefits are five times the size of the IT-costs.

4.2 The interview

In this part, we will present the findings from the interview with Peter Alvinsson (P. Alvinsson, personal interview, 2007-11-14) conducted at Kalmar county council.

4.2.1 The respondent

Alvinsson works as a director of IT-strategy. 60 percent of his time is spent in Stockholm and the rest in his office in Kalmar county council. His main commission is to work with strategic IT questions on both national and local levels, which means that he coordinates and drives the development of the county councils IT-projects. Alvinsson has been working with this the last seven years and has been employed by the county council since he got

his bachelor in Business Informatics from Jönköpings International Business School in the early 1990s.

Within his work at the county council, Alvinsson has had different types of systematising tasks, but has later on worked with more strategic assignments. He has been involved in several IT-projects, and the first evaluation that he mentions was done in Oskarshamn. The evaluation was performed in order to motivate a budget issue within the medical care service.

4.2.2 Care IT – Patient oriented IT-support within health care

“Kalmar läns vårdadministrativa projekt” also known as “Vård IT – Patientorienterat IT-stöd i vården” (“Care IT – Patient oriented IT-support within health care”), will further on be referred to as Vård IT. This implies the introduction of a computerised journal-system where the customer (patient) is put in focus. The journal-system contains a system where patient journals are stored with good security and where there is possibility to access patient-information between different departments. This project also implies a large “hidden” investment in the form of a new IT-strategy. This IT-strategy implies that you invest in increased:

- Hard security – double lines to and from the hospital, redundant storage of information etc.
- Soft security – log in and authentication via for example electronically ID-cards etc.
- Base-services – a part of a system that is not involved in the systems direct functionality and with a great probability of also being used in other systems. For example registers, authority systems et cetera.

The project will be completed in the last of December 2007. However, some implementations will remain, but this will be taken care of by the newly created administration. The project started in September 2004 and the political decision was taken in the summer of 2004. The new system used for managing the patient-journals is called Cosmic.

A strongly simplified PENG-evaluation, conducted before the project started, emerged that it was possible to save 9.8M Skr. by making it easier to print out recipes and by using a cheaper fabricate of medicine if there were similar products, 34M Skr. by more efficiently getting access to patient information, and 4.8M Skr. by decreased copying and paper distribution. All this added up to a total of 90 jobs.

The reason behind the investment was that it did not exist any previous computerised journal-systems. Another reason was that they wanted to use a more process oriented working method, where the system illustrates the patient’s way through the county councils medical institution. Alvinsson also emphasises the importance that every instance should have access to the necessary information about the patient. A further reason for the investment was increased accessibility to the county council through new channels, for example email, Internet, in order to book medical examinations or renew recipes. One more important element was also to get a balance in the economy. By this Alvinsson means, among other things, that information should only be collected from the patient one time, for example should patient samples only be done at one occasion instead as it is now when new samples has to be performed at every instance. This leads to savings in both tax-money and decreased suffering for the patients.

Everyone will be affected by this project some way or another. This is due to that the IT-structure changes. However, not everyone will see the direct benefit. Totally about 5000 persons within the medical care service will be affected and of those the majority will be aware of the benefits that the new system creates.

In the project “Vård IT” a rough PENG-evaluation was done before the project started in order to create basis for a decision. Thereafter evaluations have been performed for some of the activities that uses/shall use Cosmic, both under and after respective introduction.

When performing IT-investments, Alvinsson stresses that the benefit-perspective always should be in focus. You should always ask yourself the question, “why is something worth to carry out?” Alvinsson also considers that there is too much technical focus within the area of IT, and that the customers (patients) often become somewhat neglected. He summarises this by saying that the IT-strategy should be driven by the organisation, and not the other way around.

4.2.3 The PENG-model

Alvinsson considers that there are some difficulties in the evaluation of IT-investments, in comparison to other types of investments. By this he means that other types of investments often are more visual, for example building a property or buying a car. IT-investments are often invisible for the large amount of users and it can therefore be hard to motivate why you should stake such large sums on IT. This applies both when convincing politicians and personal. As an example, Alvinsson mentions the investment in double lines, forth and back to the hospital, which costs approximately 28M Skr. This is something that the personnel will not get any direct benefit from in their daily work, but it is necessary to maintain a good patient security. According to Alvinsson, IT-investments are marked by something that only costs money, and not of the benefits and the effectiveness it can create.

When motivating why Alvinsson have chosen to use the PENG-model, he explains that the model was appealing because of its simplicity to illustrate the effects and costs of an IT-investment. Another advantage is, according to Alvinsson, that the result from the analysis can be evaluated differently based on that the benefits can be categorised depending on the certainty of the valuation. Another very important synergy effect is that the PENG-evaluation leads to that the responsible persons from the different parts of the organisation meets and starts to discuss how they together can work to develop the organisation.

It was Alvinssons own decision to use the PENG-model; however the decision to use the model in all organisations that uses Cosmic was taken by the project management group of “Vård IT”. Alvinsson consider that the analysis of IT in fact should not be performed by the IT-department, but it is rather a question for those who work with development of the organisation. He mentions that the persons, who are using the systems, should participate in the evaluation of the investment.

Alvinsson mentions that they did not choose among other types of models for this type of analysis. They are however using the Balanced Scorecards within Kalmar county council. Alvinsson means that the results from the PENG-model can be used together with the Balanced Scorecard due to that PENG contributes with different ratios.

When Alvinsson explained the work procedure when using PENG, he said that the certified PENG-consultant (PENG-leader) start with presenting the ten different steps in the

model. The PENG-leader then guides the discussion according to the different phases in the model, and at the same time as you come to different conclusions, these are inserted into different tables (Excel-sheets). The PENG-leader then, from the different meetings, compiles a report, which is then handed out with those responsible for the different parts of the organisation. Alvinsson stresses that the work from the involved persons put into the analysis conclude how “correct” the result of the analysis gets. So to speak, the more work they do, the better the result will be. Alvinsson also points out that no deviations were made from the work procedure; however they did not follow all the steps to the letter.

According to Alvinsson there are some disadvantages when using the PENG-model. One thing that he mentions is that the model lacks “one last step” which should guide the continued work, after the analysis has been performed. Here he mentions that you should have follow-up meetings where you discuss how to proceed, i.e. how the work should continue. Another limitation is the costs to have a PENG-leader. Alvinsson mentions that they are thinking about certifying one of their own, who in the future can perform PENG-evaluations. Another limitation with the model can, according to Alvinsson, be that the persons who might be affected by the outcomes, i.e. streamlining/cost-savings, participate at discussions which might be sensitive to discuss.

When we asked Alvinsson how active the remaining personnel was in the evaluation he said that, at the evaluation of Psychiatry- and Child care project the evaluation group consisted of: 4 representatives elected by the health centre (with demands on geographical- and professional scattering plus demands that one person should have a management position), and 4 persons was elected from the project management group (a personnel strategist of the county council, a chief doctor, the hospital chief, and the project leader). In addition to this Alvinsson and the PENG-leader also participated.

At the evaluation of the Surgery- and the Rehabilitation project the composition of the group was changed. The project management group were at this point more familiar with the model and had realised that it was better to give more space to representatives from the organisation. The group instead got the following appearance: 6 representatives elected by the health care, 2 persons from the management group and in addition to this Alvinsson and the PENG-leader. Alvinsson stresses that persons who have participated in several evaluations finds it easier to perform an evaluation and contributes to a more reliable result.

We wondered if Alvinsson thought that using a certified PENG-consultant affects the evaluation and/or if it can lead to lost control over the evaluation. However, Alvinsson meant that this was not a limitation, rather an advantage. He mentions for example, that it can be valuable to have a person with an “outside” perspective i.e. that the person does not have any connections to the organisation and with that, no preconceived notion about how things should be done. Alvinsson also mentions that the PENG-leader never takes part in any decisions but only give recommendations to drive the discussions further.

At a PENG-evaluation, Alvinsson explains that the group should meet in at least four occasions (complete days), where they together work through the different steps in the model. Between every occasion the involved persons shall gather additional information to be used for further discussions. According to Alvinsson an evaluation takes at least six weeks to perform. However, it has shown to take more time since the involved persons has a lot of other things to take care of and therefore needs more time to prepare before the different meetings. He also has experienced that four meetings is not enough, and that they often need to meet at five to six occasions to be able to cover all the aspects in the evalua-

tion. Alvinsson considers that the additional meetings should not be seen as something negative, but rather that you put more time and effort to get an as correct analysis as possible. He also mentions that it often can be many and long discussions at the meetings, for example questions like “what is the patents integrity worth?”, which can be problematic to answer.

Alvinsson explained that evaluating the ”benefits” of IT-investments in cronos, makes effects become more evident. This can for example be that a secretary, whose only task is to find journals in an archive, completely disappears when a computerised journal comes in to use. This then, directly leads cost savings corresponding to the personal costs for the secretary, under the condition that you choose to reduce. You can also think that the secretary can get other tasks to perform, which leads to savings in another place. Alvinsson also mentions as an example, the use of electronic recipes, where much of the information is already filled in and where the doctor has the possibility to see cheaper alternative drugs. This can also be a cost saving, however this one is harder to value.

When evaluating the “soft” benefits Alvinsson mentions that you have to do many assumptions based on discussions where you try to get an as correct representation as possible. An example of this can be how to value a human life? Here he mentions that one possibility is to use a definition used by The National Road Administrations, which states that a life is valued to between 13 and 14M Skr. Another example is how to value the image of the county council? For example, if a citizen chooses care in another county instead of “ours”, how much does this cost? Here Alvinsson explains that Kalmar county council, like other county councils, has to pay other county councils for the care of these patients. From this it is quite easy to calculate how much you can save by having satisfied patients through good image within the local care. Alvinsson stresses that the “soft” benefits often can be broken down into smaller and more concrete sub-benefits, which part from another easier can be valued. However, this type of evaluation sometimes becomes very complex and to a certain amount arbitrary.

When evaluating the costs (hidden/visible/central) in the project, Alvinsson mentions that they try to consider all the costs that can be attributable to the project. As an example on a central cost he mentions the costs for maintenance of the journal system, which later on is allocated to the different users within respective bailiwick. The mentioned hidden costs are lost working hours at different educations. Another aspect that Alvinsson points out is that, if the users are satisfied with the situation and the system they are working in, this leads to fewer resignations, and with that fewer costly hirings.

Alvinsson explains that before the introduction of the “Vård IT”-project a rough analysis was done, which at the follow-up showed to be correct corresponding to the second decimal. At the evaluation for the Psychiatry project, calculations showed that savings could be done at a certain amount of posts, which later on at the follow-up showed to be very exact. Alvinsson stresses that eventual personal resignations at the county council are managed in a natural way via retirements. The follow-up for the Child care project also showed a good correspondence, however not as good as the ones mentioned above. Alvinsson here mentions that he has thoughts of performing a total-evaluation when the whole project has been implemented and running, in order to analyse the total benefit for the county council.

Alvinsson emphasises the importance of that the results from the evaluations are assigned to the operational managers and not used in political purposes. He exemplifies this by explaining that if it is possible to save 25 000 working hours through an IT-investment, this does not mean resignation of posts, but rather that these hours can be used in other areas.

This implies that the profits from a project not always should be used only to savings, but also for continues quality improvements in the organisation.

If the result from a project differs too much from the analysis, Alvinsson explains that he would talk to the concerned operational manager to discuss why the goal(s) have not been realised.

According to Alvinsson, the evaluations are always performed from three different perspectives; patient, organisational, and society. He says that the patient perspective is the most important since it is here the benefit should be most evident. After that, comes the organisational perspective where they want to increase the efficiency, which leads to lower taxes for the citizens (the society).

To spread understanding about the evaluation the respondent mentions that they have used a PENG-consultant to give an account of the model and to increase the knowledge about the purpose. He also mentions that they always send a book and other information to all who will participate in the evaluation in good time before the project starts.

To conclude the interview Alvinsson mentions that they will use the model at several future evaluations. He also mentions that the model probably will be used also for projects at a national level. Alvinsson consider the PENG-model to be particularly suitable for evaluations in the public sector, and then in front of all for "IT-investments" within the health-care, where a lot of "soft" benefits can be found.

4.2.4 Interpretation of the work procedure

In order to clarify how PENG was used for evaluations at Kalmar county council we will in the following section, based on the interview, discuss each step of the model.

4.2.4.1 Determine purpose

As mentioned previously there can be many purposes for an evaluation. This is also true in this case. The main purpose for the evaluation was to get an estimation of the potential benefits of "Vård IT". The result from the evaluation would then serve as a basis a decision-making. However, several sub-evaluations were performed afterwards. For example, follow-up evaluations have been performed in order to see how well the result turned out. Besides these purposes, Alvinsson has thoughts of performing a total-evaluation once the whole project has been implemented, in order to analyse the total benefits contributed by IT for the county council.

4.2.4.2 Create awareness

The evaluation team consisted of 4-6 persons elected from the health centre, 2-4 persons elected from the project management team, and in addition to this Alvinsson and the PENG-leader. The purpose of this group was to represent all levels of the organisation, so that all aspects of the investment were covered. In order to create awareness among the personnel at the different evaluations, the PENG-leader was invited to talk about the model, the different steps, and why the evaluation should be performed. In addition to this, everyone involved in the evaluations received a book and other information about the model.

4.2.4.3 Determine area (processes/systems)

As mentioned above, several evaluations were performed with different purposes. The first evaluation, which had the purpose to generate a basis for a decision, had the whole system as its area. Other evaluations only looked at parts of the system, for example the part of the system used in the Psychiatry project.

4.2.4.4 Define and describe processes/systems

One of the main reasons behind the investment was that they wanted to use a process oriented working method, where the system illustrate the patient's way through the medical institution. In order to get an understanding of the different processes, the evaluation team were involved in discussions about how to perform things better and how to develop the different processes within the organisation.

4.2.4.5 Identify effects of benefits

In this step, the evaluation team gathered to brainstorm about the different benefit effects that the investment involves. Due to that all levels of the organisation were represented in the evaluation team, benefits with different perspectives were identified.

4.2.4.6 Clarify links in an objectives structure

In this step the evaluation team together with the PENG-leader collected information from the brainstorming and structured the different benefits in relation to each other. The objective structure then served as the foundation for the coming valuation process.

4.2.4.7 Valuate benefit effects (gross benefits)

When they compared the current situation to the benefit that the investment would bring, they estimated that it was possible to save up to a total of 90 jobs. This could be done by saving 9.8M Skr. in making it easier to print out recipes and use cheaper fabricates, 34M Skr. by getting better access to patient information, and 4.8M Skr. by decreased copying and paper distribution. According to the case study these estimations were based on discussions within the evaluation team. The evaluations were sometimes very complex and to a certain amount arbitrary.

4.2.4.8 Estimate reliability of the evaluation

Some of the costs and benefits in this case were hard to value, i.e. attain a good reliability. An example mentioned by Alvinsson was the use of electronic recipes, which makes the procedure go faster and also involve the possibility to use cheaper alternative drugs. This is a cost saving for the county council; however it was hard to value and thereby classified as a "hardly valuated benefit".

4.2.4.9 Define and evaluate IT costs

In the interview Alvinsson explained that they always tried to consider all the costs derived from the investment. The valuating process was based on discussions within the evaluation team, which resulted in estimations for identified costs. To give an example of a central cost he mentioned the costs for maintenance of the journal-system. Local hidden costs in this case were for example lost working hours due to different educations et cetera.

4.2.4.10 Calculate net benefits

In this step the PENG-leader created a report for each of the different evaluations, which illustrated the net benefits of the IT-investment. The reports were later on presented to the operational managers. We will here denote that we did not get access to the actual results of the evaluations, not more than the figures that Alvinsson mentioned in the interview.

5 Analysis

In this chapter, we are going to analyse the PENG-model based on the description of how it is supposed to be used, the outcomes of the case study and the theoretical framework.

5.1 IT-investments requires a specialised evaluation-model

IT-investments are more complex than other types investments due to; their demand for great technical skills, the problem to comprehend the expenditures in advance, the fast technology development, to only name a few (Bannister, 2004). IT cannot either be seen as an isolated phenomenon within the organisations. Leavitt (1965) claims that there are interdependencies between the actors (employees), technology, structure and the tasks to be performed. From this, we can see that the organisational processes needs to be adjusted along with the changes in IT, in order to realise all the benefits of an investment. This implies that IT raises different demands in terms of evaluation-models, compared to other types of investments. A model for IT-evaluation has to be able to capture this complexity and transform it into an understandable and measurable result. A discussion about how well PENG manages to deal with the inherent complexity of IT will be discussed below.

The PENG-model offers a specialised framework for evaluations of IT-investments. According to Danielsson et al. (2007), the PENG-model can be used for several means, such as prioritising between different IT-investments, pricing a system and evaluating an organisation's IT from a total perspective. It is also possible to use it both before and after an IT-investment is set. Our case study verifies this information; Kalmar county council has used PENG to motivate investments, to identify possible outcomes of an IT-investment and for following up different projects. They also have the intentions to evaluate the effects of the total IT in the organisation.

PENG can and have certainly been used in all the above mentioned situations. However, our first impression of PENG was that it offered a specialised framework for valuing and transforming all the aspects of IT into monetary terms. This is true in that way, that all ratios of the model are illustrated in actual amounts. However, the process of getting the results lacks a clear approach in how it shall be performed. The model leaves much of the valuation work into the hands of the evaluation team. Based on the descriptions of PENG in our empirical chapter, PENG offers a framework for evaluating IT-investments, but it does not give sufficient instruction for how the evaluations should be performed.

5.1.1 The framework

In order to perform a PENG-evaluation ten steps has to be covered. The steps serve as a guidance to help the evaluator through the evaluation process. Our impression is that the steps are relevant and useful in terms of the outline. However, when going deeper into the different steps, no clear guidelines for the procedures can be found. In addition to this we have in the case study found that the PENG lacks a final step, which gives propositions for how the work shall go on after the evaluation is set. Based on this, a project might fail to incorporate the results of the evaluation into the continuing work. The extra step may therefore be a valuable complement to the model. If this step shall belong to the evaluation model or not can be discussed, nevertheless this is a vital issue for the organisation. Our opinion is though that a follow up meeting after any type of evaluation is essential, so that an organisation can introduce the gathered information into the project(s).

Another characteristic of using PENG is that it demands the use of a certified PENG-consultant to perform the evaluation. This can be considered as both a strength and a weakness, due to that the consultant comes to the evaluation with an open mindset, which is not restricted into some special way of thinking, i.e. “how we do things around here”. The weakness is however the cost of using a consultant. It is possible to certify a person within the own organisation to lead the evaluations, but this is only an alternative if you use PENG frequently, and in that case you also lose the “outside” perspective of a consultant.

The case study at Kalmar county council shows that the PENG-model is especially suited for imaging the effects and costs of IT-investments. The implementation of the model and the results of it are also easy for everyone to grasp and to draw conclusions from. This appears to be extra important when it comes to organisations, like Kalmar county council, which are governed by political forces. In this case, the politicians need to be convinced by delivering concrete and easily available information, in order to motivate the IT-investments and put them on the agenda. However, the evaluations are, as mentioned earlier, very dependent on the knowledge and experience of the evaluators. The result of the evaluations is easy to grasp, but how can you know that they are correct when there are no concrete rules for the valuation process? To us, this decreases the credibility of PENG. Depending on which persons performing the evaluation, you can end up with poles apart conclusions.

5.1.2 A broader basis for evaluation

Lundberg (2004) has identified four important aspects that needs to be reviewed in order to grasp the total effect of an IT-investment; that is *reduction of costs* (The cost of running a organisation before an IT-investment, reduced by the costs after the installation is set), *increased income* (The income after an IT-investment reduced by the incomes before), *qualitative benefits* (Improvements in the qualitative business ratios that are used within the enterprise e.g.; customer satisfaction, staff turnover, comfort and so on), and *IT-benefits* (The costs of IT before the change, reduced by the cost after.) All these aspects are in one way or another counted for within the PENG-framework. Reduced costs are measured by mapping all the local hidden costs, local visible costs and central costs. The increased income and the qualitative benefits are calculated for by identifying all the potential and attained benefits. The benefits can further on be separated based on the reliability of their estimation into the following groups; hardly evaluated benefits, benefit with indirect influence on the result and benefit with direct influence on the result. This issue is seen as a great advantage within the case study. The IT-benefits are taken into consideration within the final step of PENG, which is when you calculate the net benefits (attained benefits + potential benefits – IT-costs).

This comparison makes it obvious that PENG has the intention to cover all the important aspects of an IT-investment identified by Lundberg (2004). However, since many of the important aspects are hard to value, the results becomes to a large extent based on estimations. An example from the case study is; how to calculate the number of lives a system will save. This is of course impossible to predict and will only be an assumption. PENG’s intention to value all aspects in monetary terms is good, but how shall the model be able to value things that can not be bought.

5.1.3 Involving all levels of the organisation

A good aspect of PENG is that it makes managers from different departments come together to discuss their problems and how they can be solved. This makes it possible to involve all the managers and to make them gather around the same objectives. These aspects can be recognised as two of the foundations for successful IT-investments by Lundberg (2004); i.e. IT in line with the strategies and IT in line with the organisation. The PENG-model also, besides engaging the managers, involves other members of the staff, which reinforces the changes to be spread and positively acquired within the different levels of the organisation.

There can though be difficulties in the involvement of all levels of the organisation, e.g. the concerned people can be present when discussing savings in the business. This can be exemplified in for example a discussion of personnel reduction among the secretaries when a secretary is present. This can lead to that, the concerned person gets frustrated and tries to emphasise their own importance within the organisation, instead of thinking about what is best for the organisation. In the case of Kalmar county council, these kinds of personnel reductions are looked after by natural causes (retirements) and changes in working tasks. Nevertheless, we still believe that this can be a problem, on the other hand the organisation will lose the broader perspective in the evaluation if not every level is represented.

The results of a PENG-evaluation becomes to a large extent dependent on the personnel's attitude towards change work in general and the current project in particular. Haverblad (2006) means that; how the organisation reacts on the change plays a conclusive part in the difference between a successful and unsuccessful initiative. How does the PENG-model deal with this? Well, it involves personnel from all divisions and levels of the organisations, which make the employees feel involved in the change work, and it also helps to spread information through out the organisation. However, as mentioned earlier, sensitive subjects as savings can be discussed, which also can lead to a dismal atmosphere within the organisation. This is though a natural part of all evaluations, due to their purpose of making the processes and the organisation as a whole more efficient.

IT-investments are often thought of, as in the example above, being radical improvements (BPR) in terms of organisational development. We imagined that this could lead to much resistance among the employees, and thereby a successive implementation (TQM), could be more beneficial. However, PENG partly overcomes this problem by involving all levels of the organisation into the evaluation process and in that way increases the understanding for the effects of IT. PENG is described to be suitable for BPR-projects, but we do not see any restrictions for it to also be used for evaluating the results of TQM change work.

5.1.4 Evaluating IT from different perspectives

An important aspect when evaluating an investment is to look at it from different perspectives (Svavarsson, 2005). The model by Walsham (1993) shows that an information system has great influence on the employees, the organisation, and its structure. These perspectives can further on be used to understand the organisational implementation, which is multidimensional. Kalmar county council do always evaluate their IT-investments from three different perspectives: society, organisation and their customers (patients). The main perspective here is the patients, due to that; this is where the major change shall take place, at least in the projects of "Vård-IT". In the organisational perspective, it may be possibilities of streamlining processes in order to increase the efficiency in the use of human and monetary resources. The societal perspective might benefit from a more effective health care, which

can lead to tax reductions or increased service for the citizens. The PENG-model has no limitation in whatever perspectives to use for evaluating an investment. The only requirement is that the perspective can be counted for as belonging to either the benefit or the cost side of the balance sheet, or both. PENG does not give any instructions for which perspective to be used. It seems to us like this is dependent on the people performing the evaluation and probably also in which branch the evaluation is being done.

5.1.5 Hardly evaluated benefits and costs

The conventional models for evaluating IT mostly focuses on the hard parts of IT-investments, that is to say monetary savings and increased incomes. PENG adds a “softer” aspect of IT, as a complement to the traditional measurement. This is a major advantage due to that an IT-investment implies a lot more than monetary effects. The IT-benefits are often greater within the business activities compared to the reduced costs (Lundberg, 2004). In the case study, we found benefits such like increased customer service, improved working situation of the employees, enhanced quality in service et cetera. Lundberg (2004) further argues that you need to evaluate all the aspects of IT in order to grasp the total effects of it. By this, it is quite clear that PENG provides a broader basis for evaluation compared to traditional evaluation methods, which are more restricted. The model also offers the possibility to measure the “softer” values by putting a price tag on each of them, in order to make them comparable.

It can be difficult to decide the value of a benefit when performing an evaluation. The framework of PENG adds another arbitrary decision, i.e. to value the “softer” aspects of an investment in monetary terms. As mentioned before the most of the effects of IT are calculated for within softer values, so this part surely belongs to the evaluation in order to grasp the total picture of the investment. Nevertheless, this is a very complex moment of the model where different persons can come to dissimilar conclusions. If you compare this to research methodology this phenomenon would be counted for as reliability. Saunders et al (2007, p.149) explains reliability as “the extent to which your data collection techniques or analysis procedures will yield consistent findings”. If you think about PENG in terms of reliability, the result would most probably not be consistent if diverse persons performed the evaluation due to arbitration, i.e. occurrences have different values to various persons.

According to our empirical investigation of PENG, the model does not offer much guidance in the different steps of the evaluation process. This is to us the major dissatisfaction of the model. PENG tells you which steps to perform, but it does not provide further information for how the actual work shall be done. PENG has the intention to cover much of the complexity inherent in IT through its ten steps, and at a superficial glance it does. But when you analyse each step more deeply, the model seems to be lacking a concrete framework. It may be possible that the PENG-consultant can further structure the steps of the model. However, according to our case study the PENG-consultant was merely providing an outside perspective instead of a structured framework to approach the evaluation. It is thereby rather up to the persons performing the evaluation to do their own judgements. The only guidance you can have, is that the benefits can be separated into three sub groups depending on the security of their valuation, i.e. direct, indirect and hardly valued benefits. The case study at Kalmar county council supplemented that the result of the evaluation is better the more time spent and that those who have performed PENG-evaluations before are better in valuing different aspects of IT. We believe that this is a consequence of the models ambiguity when it comes to the working procedures of the evaluation phases.

The above discussion might as well be mentioned within the phase of PENG where costs shall be monitored and valued. According to Bannister (2004) all costs and benefits of IT are not always fully realised, which means that they are not fully known. A solid evaluation can however only be done if the costs and benefits are totally understood. In PENG the most of the costs can be categorised as central or local visible costs. The major problem here is the hidden costs, which in accordance to the “soft” benefits are hard to evaluate and would probably be valued differently by diverse persons. The hidden costs can though be a large part of the costs and is thereby a necessary part of the evaluation. The model also here lacks a structured approach for how the work shall be done. There is a step for defining and evaluating IT-costs, but there is not much substance behind the step. You can split the costs, as mentioned above, into three different categories. The rest of the work is up to the evaluator, and this seems to us like a very treacherous game.

5.2 Timeframe

It is evident that a PENG-evaluation demands a great effort of the persons involved and according to the case study, it often takes 5-6 meetings during a period of at least six weeks. In this aspect, PENG is very time-consuming compared to other methods that are merely focused on “measurable” aspects as Return On Investment (ROI) et cetera. On the other hand, the result of PENG is much wider and is probably better to mirror all the aspects of an IT-investment, by not just focusing on costs and incomes. This might, according to the case study, make the model especially suited for evaluations within the public sector and primary within health care, where “softer” aspects of IT are the main reason behind most of the investments. In organisations outside the health care area, the “softer” values are important but merely in terms of attracting customers and generating in savings or increased returns. Nevertheless, this does not mean that other types of organisations cannot find the PENG-model to be suitable for evaluating their businesses.

5.3 The results of a PENG-evaluation

Kalmar county council has performed several PENG-evaluations and the results of them have turned out to be very exact compared to the outcomes. In terms of the project “Vård-IT”, the result came out to be as precise as corresponding to the second decimal of the result in the evaluation. The other evaluations that have been performed did also turn out to be very exact compared to the reality. Based on this information, the PENG-framework seems to be quite precise in valuing the hard aspects of IT, i.e. reduced costs. However, much of the benefits of IT are, as mentioned before, counted for in terms of “soft” benefits. The “soft” benefits are hard to estimate in the evaluation process, and they do not often result in monetary savings. It is thereby hard to know if they are realised or not. Kalmar county council were satisfied of the result of their evaluations, and the respondent mentioned that they saved x number of employments. However, the “soft” aspects cannot be counted for in lowered personnel, and the result of the “soft” aspects was thereby not followed-up after the projects. Our opinion is further that “soft” aspects of IT cannot be more accurately measured afterwards, than they were before. And how shall you then know if the result of the evaluation agreed to the reality or not.

6 Conclusions

Based on the analysis, we have drawn the following conclusions.

First, we have found out that IT-investments are very complex in relation to other types of investments. This implies that the model used for these kinds of investments, have to be adjusted for the particular circumstances. The PENG-model certainly has good intentions in capturing the complexity inherent in IT, by valuing “soft” and “hard” aspects and for illustrating the investment from different perspectives. The model involves a working procedure consisting of ten different steps that serves as a guideline for the evaluator. However, the model lacks a clear framework describing how the actual work in each step shall be performed. A certified PENG-consultant can probably give some guidance for structuring the evaluation process; on the other hand he/she also implies a large cost for the organisation.

The model generates in a clear and easily understandable result that can be understood through out the organisation, this mostly due to the use of money as the unit of measurement. The results of the evaluations have also shown to be very precise, in terms of “hard” aspects of IT. However, the quality of the result largely is dependent on the judgements of the persons involved and to reach an accurate result, a lot of time and effort has to be put in. We do question PENG’s ability to value “soft” aspects of IT, due to its lack of concrete valuation rules. The intention to value all aspects in monetary terms is good, but how shall the model be able to value things that cannot be bought, for example a life. Depending on how you value the benefits and costs of IT, you will end up with diverse results. Based on this, we conclude that the model has problems in terms of credibility.

Even though that the PENG-model is based on many arbitrary decisions, we can see that it can be useful for discussing IT and in order to illustrate the implications of an investment. The model shall though not be used for comparisons between different companies or maybe not even between diverse systems, i.e. if it is not the same persons performing the evaluation. Nevertheless, we can see the usefulness of PENG when comparing different kinds of IT-investments, in order to see where the money can be of best use. This is also one of the purposes behind the PENG-model. We further believe that the model can be used in any type of organisation; even though it may be better suited for the public sector, where “soft” benefits are highly valued and an important part of the business concept. The model does also have an important synergy-effect, by merging people from all levels of the organisation and letting them unite under the same strategies and objectives.

To summarise this, the PENG model fails to fulfil its major advantage, i.e. to evaluate “soft” aspects of IT. “Soft” aspects are important, but they cannot properly be measured in monetary terms. This is probably the reason why the model does not provide any clear framework for how this is supposed to be done. The worth of a “soft” aspect is very personal and a result of an evaluation-model that are based on so many arbitrary decisions, can hardly reach credibility among investors.

7 Closing discussion

In the ending part of this thesis, we have chosen to look back at the work performed in order to discuss what we could have done better or in another way. We will also give some proposals for further studies within the subject of IT-evaluations.

7.1 Reflections

From an overall perspective, we are satisfied with the research process. Nevertheless, there are things that we could have done different. The first thing that crossed our mind when evaluating this research is that it would have been interesting to perform more than one interview. We are though pretty sure of us getting a fair view of PENG, by interviewing the IT-manager of Kalmar county council. This due to that Alvinsson is a person that has performed several PENG-evaluations and has a clear focus on the usefulness of IT, and not the technique in itself. However, it would have been interesting to perform interviews at other types of organisations, such as private companies. This would probably have resulted in us getting a more generalisable result.

Based on the knowledge we have today, we would probably have written our interview questions in another way. It would have been suitable to question the model more, based on its lack of concrete working procedures. When performing the interview we did not have enough knowledge about each step of the model. This resulted in us getting reduced opportunities to question the answers we got and in order to get the respondents view of the credibility of the model.

Another factor that we have reflected upon is that it could have been useful to record the interview, instead of just making notes. This would probably have resulted in us getting empirics that were more detailed. The reason for us not doing this was primarily that it would have been too time consuming to transcribe the whole interview.

Finally, we do believe that this thesis has provided us with a lot of new knowledge, in terms of IT-investments in general and the PENG-model in particular, and off course in thesis writing.

7.2 Proposals for further studies

In accordance to us learning more within the field of IT-evaluations, many new questions have arisen. In the following section, we will give some proposals for further studies within the area.

Firstly, it would have been interesting to compare PENG to other evaluation models. We have, during our research, identified that there are a few more models used for evaluation of IT-investments. Are these methods different compared to PENG, do they have other areas of interest et cetera? PENG was introduced around 1996; we can imagine that new methods have been developed in the last ten years.

If we return to the PENG-model, it would have been beneficial to participate in an evaluation in order to study the model in its real life context, without having any person retelling the working procedures of the model. The result of a research like this would probably be more trustworthy, since there would not have been any intermediaries between the researchers and the occurrence of interest.

As mentioned earlier we believe that PENG is better suited for the public sector, where “soft” aspects are an important part of the business concept. This makes it interesting to see how well PENG is received within the private sector. Are companies interested in the measurement of “soft” aspects or are they more concerned about traditional ratios as Return On Investment (ROI) et cetera.

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Appendix 1 – Interview Questions

About the respondent

- Can you tell us a little about yourself?
- Can briefly inform us about your main working tasks?
 - For how long have you been doing this?
- What other job experiences do you have?
- Have you been involved in other IT- projects and evaluations before?

About the project

- What do you consider the most important aspects when performing IT-investments?
- Can you tell us about the project “Kalmar läns vårdadministrativa project”?
 - What is its main purpose of the investment?
 - How many people are involved?
 - How far has the project progressed so far?
 - In what stage do you perform the evaluations (before/after, or both)?

About the PENG-model

- What do you consider the difficulty of evaluating IT-investments?
 - Were there any differences in evaluating this project compared to others?
- Why have you chosen to use the PENG-model?
 - Which persons were involved in the decision-making?
 - Did you choose among other models, and in that case, which?
- Can you describe the sequence of work when using the PENG-model?
 - Did you do any deviations from the ordinary sequence of work?
- In your opinion, what would be the strengths of using the PENG-model?
- Do you think that there are any restrictions by using the PENG-model?
- How active are the personnel in the evaluation?

Appendices

- You need to use a certified PENG consultant to perform an evaluation. How do you think that this affects the evaluation (lose control)?
- How long time does it take to carry out a PENG-evaluation?
- Can you describe how you did to value the different benefits in Skr.?
 - How did you evaluate the “softer” benefits (e.g. customer service etc.)?
 - How did you evaluate costs for the project i.e. hidden/visible/central costs?
- Have you done any follow-up evaluation after the project?
 - How do you act upon the result from the evaluations (positive/negative)?
 - Do you have any margin of error, from which you accept variance in relation to the stated goals?
- Which perspective is the most important when you perform the evaluations, i.e. customer perspective (the patient) or organisation perspective (minimise expenses etc.)?
- Will you use the PENG-model at more occasions?