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EVALUATING THE BUSINESS VALUE OF INFORMATION TECHNOLOGY

Thesis submitted in partial fulfilment of the requirements for the degree of Master of Science in Engineering

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HELSINKI UNIVERSITY OF TECHNOLOGY Abstract of the Master's Thesis

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Evaluation and realisation of business benefits from information technology has proven to be a difficult task for organisations. IT is generally considered valuable and investments in IT are considerable, but evaluation and management of the actual business benefits is often left to too little attention. As an indication of this phenomenon, over half of IT projects do not achieve their objectives

The thesis is divided into two major parts.

In the first part, the concept of IT value, IT management and methods to manage and evaluate IT are discussed. Additionally, the effects of information technology on the economy and the evolution of the IT industry are explored. In the end of the first part, the value-creating process in IT and the elements and phases required to manage this value-creating process in it are proposed. The model suggests that in order to create value, IT must be aligned with the business strategy and integrated to other assets of an enterprise.

The second part of the thesis focuses on identifying and evaluating the business benefits of an IT investment. The evaluation process is part of the value-creating mechanism described in part one.

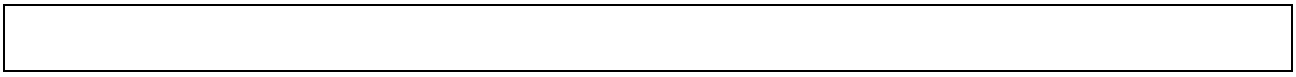
The evaluation process has five essential phases:

- Benefit identification. In this phase all new technological features and functionalities of the product or service are investigated. Business changes, that ultimately provide the business value, are then derived from these technological enablers.
- Benefit classification. Having identified the business changes the technology enables, the benefits are classified to understand the impact areas and effect types of the benefits.
- Benefit evaluation. In this phase, the financial value (or the time savings) of the benefits (business changes) is estimated and described.
- Risk analysis. Risks are inherent in business changes (benefits) and these risks must be assessed and evaluated to be able to prepare for them.
- Benefit ownership. In the last phase of the analysis process, the owners for both business changes and the technological enablers are assessed. This way, the responsibilities and roles are documented in the planning phase, which makes project implementation and the required change management easier during and after the technology project.

The IT value-creating mechanism described in part one should help the decision-makers to understand how IT creates value and how IT must be managed in alignment with business. Also, several tools that enable the company to gain business value from their IT are introduced.

The IT evaluation process proposed in part two provides a concrete tool for evaluation of any technology product or service. The methodology not only evaluates the potential financial value of the investment, but also evaluates the actions and roles required (i.e. business-driven IT management), which appears to be the single most important distinctive factor in the ability of organisations to utilise IT in its business to gain business value.

Keywords: Information Technology, Business benefits, Benefit analysis, Business value, Evaluation and management of the value of IT



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First, I would like to thank my employer Fujitsu Services oy for letting me accomplish this study along my work and for providing information, material and insights for the study. The experiences and real-life cases have given me practical understanding about the problem field in the IT services sector.

Special thanks goes to my encouraging and inspiriting instructors Mr. Tomi Kaski and Mr. Pauli Liikala who have given me invaluable advices, insights and supported me throughout the sometimes stagnated analysis and writing process.

Mr. Kaski was the one who first suggested the topic of IT value and evaluation and got the work under way. Especially for the second part of the thesis, which explores the methodology to identify, classify and evaluate the benefits of an IT investment, his ideas and insights had a major contribution. He also gave me the opportunity to test the ideas and concepts of my research on the subject in real life business cases, which contributed significantly not only to the formation of this thesis but also to the advancement of my professional career.

Mr. Liikala's aid and guidance in turn helped me to understand the big picture behind IT and to link IT investments into overall corporate development process. The first part of this thesis could not be formed without his aid and support.

I would also like to thank Professor Timo O. Korhonen for his advices and correction proposals on the structure and focus of this thesis.

Finally, an especially warm thanks goes to my beloved wife Merike for her continuous love and support throughout the entire thesis creation process.

Helsinki, April 2005

Janne Laine

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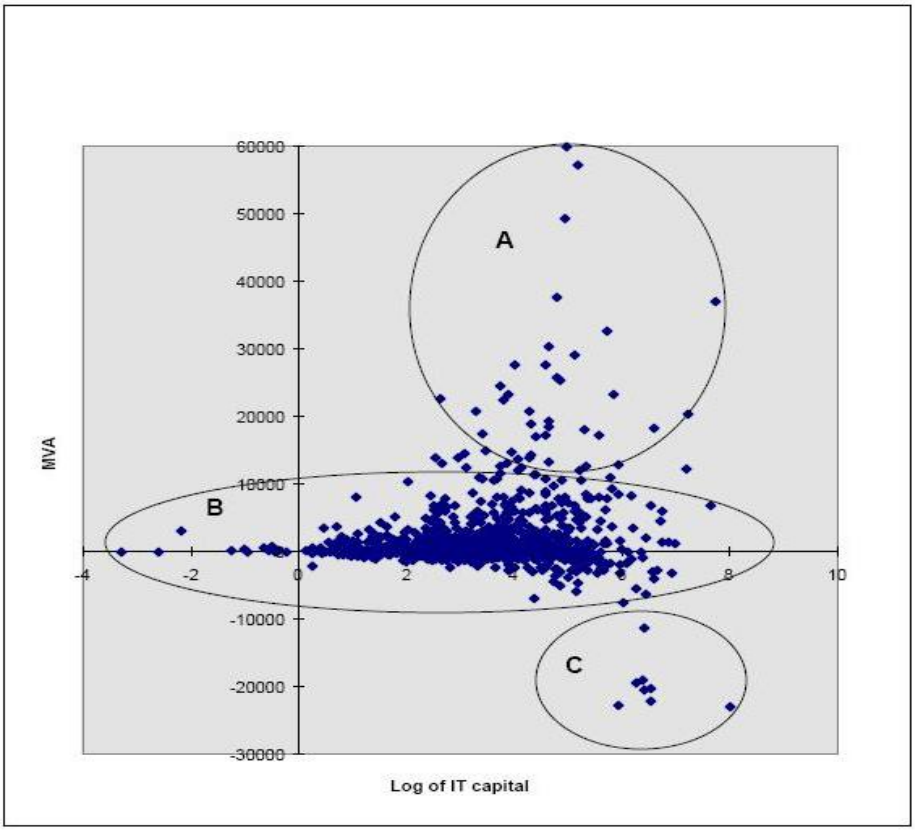
PART I: CONCEPTUAL ANALYSIS ON THE VALUE OF IT

1 INTRODUCTION

The idea for the topic of this thesis came from my former superior Mr. Tomi Kaski who asked me to develop a methodology to evaluate the benefits of information technology investments. Having developed a methodology (which is a predecessor for the model described in part II of this thesis) I felt something was still missing from the methodology. Even though it was possible to describe the business changes that the technology enables, the true business value of these benefits could not be described clearly enough.

Having studied dozens of studies and research articles about IT evaluation and IT



management in general, I started to realise that executing IT projects well is not alone enough. If IT is managed and evaluated on a stand-alone basis, the real business benefits are likely to remain modest, as the overall objectives of the IT project are not probably linked to the overall strategic business objectives. From the surveys that indicated almost random results between IT spending and firm performance with exceptionally high variance (see the picture below), I started to think about the factors that contributed to the success of some firms and the factors that caused some firms to get inferior results of their IT investments.

Figure 1 IT spending and performance correlation (Source: Brynjolfsson & Shinkyu, 1996)

According to literature survey, the difference between successful and unsuccessful IT investments seemed to be the management side rather than technology side (e.g. Rockart, 2004). It appears to be the business-IT alignment that makes the difference in the IT asset utilisation. Consequently, although the subject of this thesis is evaluation, a vast focus and concern has been given to the factors that either promote or impede the probability for successful IT implementation and management. Ignoring the management aspect cannot lead to good results, because the evaluated projects where likely to address the wrong requirements and would not thus add much value to the organisation.

A surprising observation from both literature and practise for me was that IT investments are still often considered as pure technology projects, although due to their significant effect on companies, both financially, strategically and operationally, they evidently should be considered merely as part of a larger business transformation initiative consisting of multiple complementary investments in various corporate assets. The level of integration and alignment of these assets eventually defines how successfully the company achieves its strategic objectives that ultimately are (or at least should be) the basis for all development projects and investments.

To address the problem of IT value, the mechanisms with which IT actually creates value was investigated and aspects that must be taken into account in IT project metrics definition and evaluation (part I of this thesis) were studied. The actual IT investment evaluation method is proposed in part II.

This introduction chapter describes the research problem of this study. Also, key concepts and the structure of this study are introduced.

1.1 Key concepts

This section gives preliminary descriptions and definitions for key concepts in this study.

The concept of *IT value cycle* used to summarise the first part of this thesis is defined as a continuous process of IT evaluation and management controlled by business objectives and complemented with other required actions. The IT value thus describes the value-creating mechanism of information technology.

In this thesis, *IT evaluation Process* is defined as a process used to identify, classify and valuate the benefits of an IT investments. The process identifies the enablers, enabling changes and business changes that the technology is intended to provide.

Enablers are technology products or services that provide the foundation for changes and business benefits.

Enabling changes are features and functionalities of a certain technology product or service that enable the organisation or its employees to do new things, to do things differently, of to stop doing something.

Business change is defined as actual changes in the operations, working habits, roles, responsibilities and so forth that ultimately are the source of business value. The business changes can be made due to enabling changes that the technology enables.

1.2 Research problem

The value of information technology has been historically extremely hard to quantify. The reasons for this are numerous: the benefits of IT are often intangible, proper evaluation mechanisms are not in use in many firms, the metrics for IT projects are often obsolete in terms of business value etc. Furthermore, the hype era in the late nineties, when being something "e" was enough to justify the launch of IT venture, did not help development and establishment of proper metrics for IT projects. However, nowadays IT has become normal industry and the laws of finance apply to it as well, and the need for effective management and measurement frameworks is considerable.

The role of IT in organisations and the success factors related to IT management are studied in this thesis. Also, a model for assessing, classifying and quantifying IT investment benefits (i.e. evaluation of the value of IT) is introduced based on academic theories and authors empirical experience working with retail customers as a consultant. Also the linkage between business strategy, IT strategy and IT investments is investigated and a concept of the value-generating process for IT is introduced.

This study is focused on identifying the critical factors in Information Technology needed to derive business value from IT. The study is very much business oriented which means that it looks at technology merely as an enabler for business. This may sound self-evident but in fact much of the literature concerning IT value is written from technology perspective. This is rather obvious, because IT managers and CIOs have historically had urgent need to justify the IT investments and they look at IT from their perspective which does not necessarily have very much to do with business improvement and performance (Riel, 1998).

In this thesis I try to look at IT from the high level perspective, not to get tangled in details of a single IT investment, but to look at the whole IT portfolio of a company and further IT as one of the key assets of a corporation. This is crucial, because otherwise IT investments are made independently, which leads to part optimisation of investments and does not likely lead to reasonable IT strategy. The importance of business-oriented IT development is highlighted many times. Technology is only an enabler for true business value and consequently, IT projects should not be launched without concrete business requirements (and business case) with clearly defined objectives.

1.3 Research objectives

The purpose of this study is not to compare different investment analysis methods and find the best one or even try to combine best parts of different methods to create the ultimate method applicable to all IT projects. Instead, I try to point out the crucial parts of successful IT management and find out which parts of the investment process need special attention and why.

The study has the following principal objectives:

1. To gain understanding about the research around IT Value and the approaches used for valuation and justification of IT investments and the differences in the role of information technology in corporations.
2. To provide a framework to show how IT creates value and what steps are required to put business strategy into practice in its part by effective IT management.
3. To provide analytical method for evaluating the business value of IT investments.

The first part of this thesis proposes answers the first two questions and the related problem area. In part two a process for evaluating the value of an IT investment is proposed.

The scope of this study was enormous as this study aims to understand the linkages between business strategy, IT strategy, business objectives and IT investments. Thus, the focus is not to cover issues in detail but to give the reader a holistic view on the problem field and to point out most important factors contributing to success of both business and IT.

Consequently, the study relies heavily on the results, conclusions and recommendations of the leading thought leaders, academics and researchers, such as Erik Brynjolfsson (Professor, MIT Sloan School of Management), Robert S. Kaplan (Professor, Harvard Business School), David P. Norton (President, Balanced Scorecard Collaborative), Peter Weill (Director, Center for Information Systems Research, MIT Sloan School of Management), John Ward (Professor of Strategic Information Systems and Director of the Information Systems Research Centre at Cranfield University, School of Management) and Peter Murray (Cranfield University, School of Management).

It was interesting to find out how different theories on business and IT can be utilised in both worlds and the underlying factors are fundamentally the same in both worlds. However, managing IT by the rules of business and managing IT in general is not self-evident, which can be seen by the number on unsuccessful IT projects.

1.4 Structure and focus of the study

The study consists of two primary sections (see figure 1 below).

The first part of the thesis analyses the concept of value in information technology and tries to find answers to fundamental questions on information technology industry:

- How has IT as an industry evolved and matured over the decades?
- What is the (perceived) role of IT in corporations?
- What is the contribution of IT to the general success of the corporation?
- What are the obstacles between effective IT management?
- Does IT have or provide (measurable) value?
- How can we effectively and credibly evaluate IT?
- What are the steps in the value-creation process of IT?

In chapter two, the background and research problem is described and discussed. The chapter provides a short history of IT from value perspective. Also, IT as an industry is examined and IT's role in corporations is discussed.

In chapter three, the effect of IT on the productivity of the corporations is investigated and the famous productivity paradox and its potential explanations are dealt with. Also, IT's contribution to the competitive advantage of the firm is discussed.

In chapter four, the business alignment of IT is discussed in terms of strategy alignment and business contribution. Some essential tools to manage IT (IT governance and IT portfolio management) are revised. A model to put these tools into their places in the value creating process of IT (IT value cycle) is given in chapter seven.

Chapter five investigates the concept of IT value. The term value and its applicability and inclinations to IT are discussed. The important distinction into tangible and intangible value is made. Also, the role of complementary assets in order to obtain business value from IT investments is explained.

In chapter six, the problems and methods of IT value evaluation are discussed. The focus is not on the actual metrics used for financial investment evaluation, but in the problem field surrounding IT evaluation. A more comprehensive of financial evaluation methods and metrics and their applicability on IT is given in appendix 2.

Chapter seven summarises the findings from the theory and previous research by introduction of a concept of IT value cycle, which comprises of all the elements of the previous chapters from corporate business strategy to IT project execution and the delivery of IT value. The IT value cycle describes in detail how strategic objectives can be converted into technology investments and conversely, how technology investments provide true business value that supports the chosen strategy and strategic objectives of the firm.

In chapter eight, the concepts and subjects discussed in the first part of this thesis are summarised.

Part II of this thesis focuses on evaluating the value of information technology investments, namely the IT benefit analysis. The methodology proposed in part II gives practical framework for identifying, classifying, evaluating and managing benefits of an IT investment. The methodology can be utilised to justify or reject IT investment proposals and, in the former case, to provide foundation for IT project plan and the essential change management required to materialise the potential benefits of the investment.

In chapter nine the concept of benefits management is introduced and discussed and the reasons for the development of the IT valuation process are described. Also, two approaches to IT (business-driven and technology-driven) are identified and a model to steer the actions for both approaches is proposed.

Chapter ten describes the evaluation process for IT investments used to analyse the potential business benefits of an IT investment. The described process gives both justification for the project and acts as a basis for necessary change management and also for the initial project plan, because not only the business benefits but also their value, the risks included, and the people responsible for the benefits are identified.

In chapter eleven, a swot-analysis is committed to the evaluation process proposed in chapter ten.

The major findings of the second part of this thesis are summarised in chapter twelve.

In chapter thirteen, the findings and managerial implications of the findings and proposed methods (The IT value cycle and IT investment evaluation process) of this thesis are discussed. Also conclusions and the limitations of this study are given though. Finally some further development suggestions are provided.

Literature references and appendices are in the end of this thesis.

2 BACKGROUND AND PROBLEM DISCUSSION

The incentives for this thesis came both from my personal interests and from my employer. First and foremost, I have always been interested in the information technology's role in business. As I have technology-oriented major (telecommunication systems) and more business-oriented minor (industrial management) the subject of analysing the value of IT was a fascinating possibility.

The role of information technology has evolved over the decades from computerization into strategic information systems. The rapid change in information systems, both mechanical and conceptual, causes corporations difficulties in understanding the value and contribution of their IT department. IT managers in corporations struggle with conflicting goals: they should simultaneously decrease the cost of IT and maintain corporate technology infrastructure operational and competitive, and at the same time actively support the growth of the firm and to deliver new technological capabilities for the firm.
One of the biggest obstacles is showing value of IT investment in quantifiable form. Productivity paradox has characterised IT over the last decade and even though there is common acceptance that IT is valuable, the trillion-dollar question is how valuable. Choosing the right projects is both art and science.

To be able to solve the value consideration requires both understanding the nature of IT as an asset, being familiar with different financial metrics and their applicability, understanding the situation the investment is proposed for and, finally, choosing the right approach for the situation. This thesis tries for its part shed some light on the concept of IT evaluation and IT value generation process.

2.1 The short history of IT industry

The purpose of this chapter is not to give the reader a comprehensive historic of information technology, but to highlight the fact, that information technology has developed with astonishing speed and the technological innovations, expectations and capabilities have not gone hand-in-hand during the process. This chapter attempts to show, how the industry has evolved and how the focus and value of information technology has shifted over the decades (dos Santos, 2003).

This chapter provides a short introduction about the evolution of so called information technology industry from a business viewpoint. The focus is not on the technology itself, but in the application of technology in business and the effect of IT on working habits over past four decades. The purpose of this chapter is to highlight the fact that even though IT is still closely tied to technological innovation, the role of technology development itself has changes from the ultimate source of productivity gains (the automation era) into technology infrastructure that enables the effective utilisation and synthesis of information.

As we have moved from the era of automation era to the era of information, the focus of information technology has shifted from technology focus to information and added value focus in recent years (Glazer, 1993). Pure performance improvements do not give much added value to many areas where IT is utilised. The corporations already have their basic IT infrastructure in place and they do not see any reasons to adapt the most modern technology versions. To make matters worst, the amount of data is growing in a very fast phase that even the most powerful supercomputers cannot much. The question is not about quantities; it is about the quality of IT. Finding relevant, rational and currant information is crucial to management and various business intelligence systems have been created to address the problem of information quality.

In the internet-bubble, when Internet and e-business in general were hot topics all around the world, the value of information and the visibility provided by the internet seemed to revolutionise the world. The new economy seemed to change the rules of the global market's earning logic and the consequences were astonishing. Thousands of "dot-com" businesses were founded funded by both business angels, corporations. Stock markets reacted to this and the firms on new economy business were considered more than their weight in gold. For example the Helsinki stock exchange's HEX index rose from 3031 to amazing 18277, about 500%, and the technology index in little fewer than three years! (Helsinki Stock Exchange, 2005). Surprisingly, at that time, no one wanted to see solid evidence about the value and return on his or her investment. Being involved in the booming new technology triumph was the imperative; the actual business results were not.

The situation changed dramatically after the millennium. Suddenly, the world woke up and saw that the new economy was not delivering its promises and instead astonishing amounts of cash was wasted without very little payback. Stock markets collapsed, Internet companies vanished and the traditional business rules come back. Suddenly, not only the Internet and e-business but also the whole information technology industry lost its glamour and became business as usual.

From industry evolution point of view this can be understood as that the information technology industry reached maturity. Despite the hype and the subsequent recession of information technology, it has changed the way the world works and very few would argue that IT has no value. However, corporations are now asking IT industry to show the value of IT before they make decisions about IT investments.

This means that IT department can no longer act as a separate unit, which supports business by maintaining the necessary infrastructure. Instead, IT unit should be managed according to corporate strategy as an integral business unit, which in its part provides capabilities to develop corporate assets in order to increase the overall competitiveness of the company. This requires change of mind-set in both the IT management and also other corporate units. The management of IT is further explored with concepts of IT governance and IT portfolio management.

Table 1. The evolution of the role and focus of information technology

Era	Describing elements (role)	Primary focus
The early adoption era	Productivity through automation: ❑ Computing power and automation ❑ Mainframes	Task execution efficiency focus
The mass-computerisation era	❑ Integrated circuit ❑ Change of working habits, PCs, Windows, Office tools, ERPs	Process efficiency focus
Computers to desktops era	❑ Microprocessor ❑ Personal computers ❑ Graphical user interfaces ❑ Office applications ❑ Moore's law steers the industry evolution	Work-force efficiency focus
The hype era	❑ The Internet, e-commerce ❑ Data integration	Business cannibalisation attempt through IT
The information utilisation era (”Post-bubble era”)	❑ IT as a Service ❑ Information in central role, technology in infrastructure role (enabler) ❑ Business intelligence, knowledge management, customer relationship management ❑ Inter-organisational integration and business collaboration trough information technology	Information quality and relevancy focus, seamless IT-Business integration

From the table above can be seen how the value of IT has had completely different forms during the past decades. While the Moore's law dominated the early phases, nowadays IT management is in the key role in delivering value from information technology. For IT's role this means that IT has actually become more strategic, because effective IT management gives a company a competitive advantage, an advantage, which shareholders value.

2.1.1 The hierarchy of needs in information technology

There are a variety of interesting alternative perspectives to the traditional views to the evolution of the information technology industry. Some have approached the subject from the socio-economical and psychological perspective. These approaches try to find similarities from the evolution of IT to the evolution in general.

Pisello and Strassman (2003) argue that IT has not commoditized and instead we have just moved the playing field to a higher plane where the investments are substantial, innovative, and crucial for competitive corporate success. They have also created an interesting theory in the form of four-level IT hierarchy of needs that likened the IT marketplace to Maslow's hierarchy of needs. The model illustrates that as each successive

capability is met, the competitive advantage progresses from those who know how to implement the technology, to those who know how to apply the technology to improve business processes, to those who know how to use it to share, manage, and grow knowledge. Pisello and Strassman argue that as the hierarchy of needs clearly dictates, for the fundamental needs that have already been met, the markets have commoditized, and solutions with the lowest total cost of ownership win.

In author's opinion, this last argument is rather speculative, because even though commoditized technology does not arguably deliver competitive advantage, it is not trivial to simply choose the solution with lowest TCO ignoring all other aspects like quality of service and selection of proper architecture. However, Pisello's and Strassman's point of view is worth thinking over and the levels of needs identified and their characteristics are described in the following paragraph.

According to Pisello and Strassman (2003), the levels of needs in IT are the following:

1. Computing infrastructure

Infrastructure: The prior era of IT has been focused on fulfilling the basic lower end needs – the quick deployment of the assets and infrastructure needed for computerization. Investments were implemented to deliver individual and corporate productivity, helping users get their work done more efficiently, and helping to reduce overhead. With this infrastructure in place, the corporation was free to move to a higher need, and as a result, the marketplace now views these assets as commodities.

2. The Internet and enterprise software

With the advent of the Internet and enterprise software, the battlefield moved up-stream – delivering productivity improvements beyond the corporation and to the entire value-chain. These investments allowed customers and the supply chain to effectively integrate into corporate computerization, and helped to improve the efficiency and effectiveness of these relationships through business process optimisation. Although the need is not yet completely fulfilled, markets have begun to commoditize, evidenced by the recent consolidations in the ERP space.

3. Knowledge capital management

The newest battleground focuses on the "I" in IT – the information, not the technology. IT innovation is soon to be focused more on providing the primary means for maintaining and extending the value of a firm's "Knowledge Capital". IT investments are migrating from basic infrastructure, through transaction optimisation, to being primarily focused on managing the rapidly exploding accumulation of scientific, research, customer, engineering, property and intellectual assets. Computers are the repositories of intelligence about customers, suppliers and products, the most valuable knowledge assets of any firm.

Emerging solutions include data warehouses, enterprise portals, analytics and business intelligence – which are moving towards mainstream adoption, but clearly have not reached commoditization. The company that is able to collect and apply such knowledge to effect bottom-line impact is the likely winner over the next decade.

4. Information warfare

Once the basics of knowledge capital management is covered, the focus moves still higher from reactive analysis to information, to proactive control of the information as a competitive weapon, Level 4 is the futuristic era of information warfare for corporations. This battlefield is rather ambiguous at this point, and takes its lead from military research and application – but clearly a corporate analogy to the current military shift from conventional to information warfare will occur. The focus of information warfare will be the use of information distortion or denial, and the countermeasures to fight such attacks. Several expected components include: Hacker Warfare – where computer systems are attacked, Psychological Warfare – where information is used to change the minds of friends, neutrals and foes, and Economic Information warfare – blocking information or channelling to pursue economic dominance. Information command and control systems, strategy and counterstrategies and business intelligence are the tools not yet developed to meet level 4 needs.

The visions about the future are fascinating, but predicting future in IT has proven to be hazardous. However, the role of IT is without doubt remarkable also in the future. While some parts of information technology have become commodity, like electricity and television, the opportunities of modern technology will likely give strategic advantages to those, who are capable to understand the implications of new technology on their business, and to execute the necessary actions to utilise the possibilities of information technology.

2.1.2 IT Market dynamics

More than ever-in history, companies are faced with the task of competing in an intense and dynamic business environment. The rapid pace of technological innovation has enhanced the ability of companies to produce, distribute, and market goods and services and communicate more effectively with consumers. Information technologies including Internet portals, wireless communication, advanced software applications, and general enhancement in computer processing facilitate such strategies as supply chain and customer relationship management, real time advertising and e-commerce. Technological systems such as market exchanges, electronic data interchange, and enterprise resource planning have helped accelerate this new face of commerce. (Kudyba, 2002)

IDC research on Finnish IT-services market stated that the Finnish IT-services market developed strongly in 2002 with a growth of 12,3%. IDC forecasted that in Finland IT-services market is expected to grow around 5-7% annually (Peltonen, 2003). Other surveys have found similar growth rates in other developed countries. The price of computing has

dropped by half every 2-3 years (according to famous Moore's law, see figure below). To put that figure into comparison, if progress in the rest of the economy had matched progress in the computer sector, a Cadillac would cost $5.91, while ten minutes' labour would buy a year's worth of groceries! (Brynjolfsson & Shinkyu, 1996) This amazing evolution led to automatization of operations, i.e. replacing labour with machines and programs, where ever possible in the past decades, because computerisation reduced costs significantly compared to human performed operations. However, the effect of pure computing power to efficiency has reduced and nowadays the additional computing power often does not give any added value for the business.

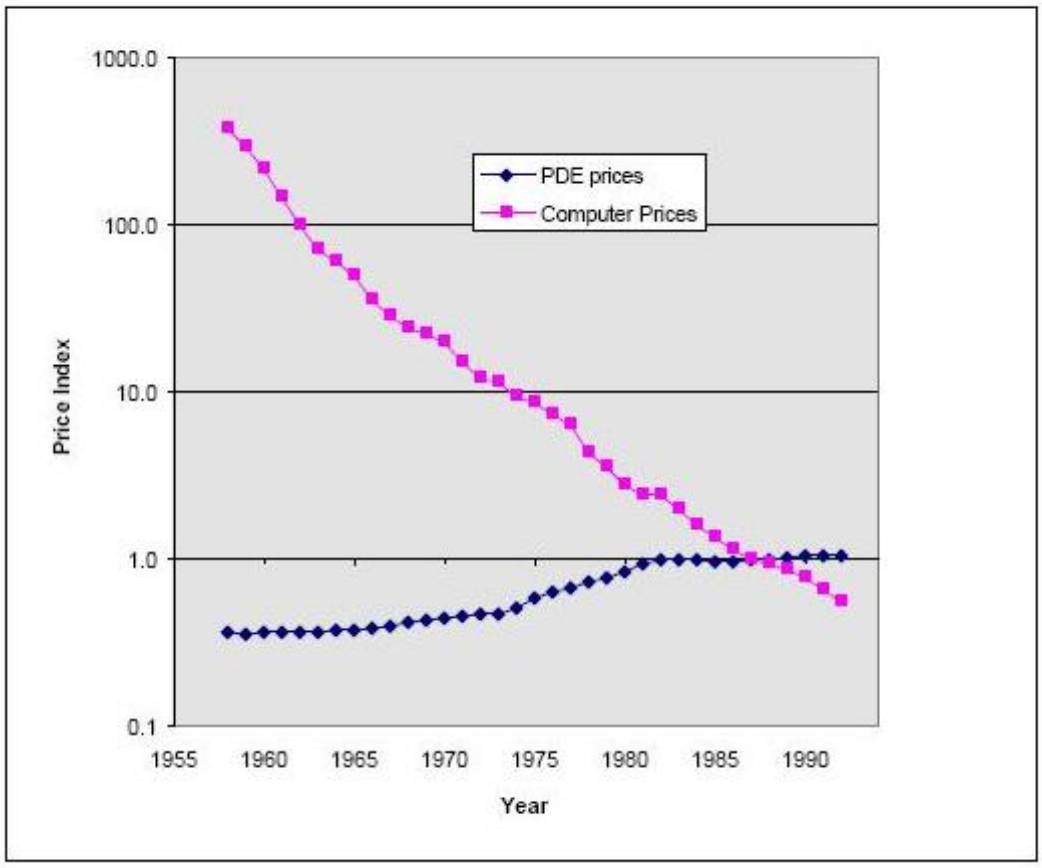


Figure 2 The cost of computing relative to other purchases (Source: Brynjolfsson & Shinkyu, 1996)

The key to success will be the ability to implement the right technologies to support those strategies that will provide continuous competitive advantages in the market. However, in order to accomplish this, decision makers must constantly be presented with analysis of the factors that impact their business. Effective analysis applied to business decisions will reduce business risks in this dynamic environment we call "the information economy." (Kudyba, 2002) Having said that, it is sometimes wise to leave new technology to others and concentrate on the core business while keeping the eyes open for tested technologies that truly add value to the operations. A second or late mover tactics are far less risky and

in traditional industries the role of IT is likely not the single most important differentiator and thus, it may be wise to leave the technology war to the others (Hitt et al., 2000).

2.2 The role of IT in corporations

Technology products, solutions and services have become commodities in many areas, and technology is seen as a business critical utility and enabler, but just a source of competitiveness, not competitive advantage. This view has given a spark to vast technology outsourcing, which has been happening in virtually all industries in recent two years. Of course, generalising is dangerous and sophisticated solutions still give some firms a competitive edge. Anyway, information technology plays a critical role in the formation and ongoing competitiveness of clusters of creative activity—both geographic clusters and more distributed clusters held together by electronic interconnection and interaction. IT is an important driver of the expanding creative industries. (Mitchell 2003)

Companies often invest in information technology to gain competitive advantage over their competitors. Previously the focus in research has been merely on the tangible value of new technologies (productivity improvements, efficiency) but recently the focus has shifted to intangible value and to the strategic value gained from altering the market equilibrium (Zhu & Weyant, 2003). The missing linkage to strategy is likely to cause investment in IT to fail, because the management of IT should be in accordance to corporate strategy (e.g. Kaplan & Norton, 2004; Weill & Ross, 2004).

Asymmetric information brings additional dynamics in technology adoption decisions beyond the full-information models typically considered in the literature (Zhu & Weyant 2003). Consequently, technology adoption strategies under asymmetric information can be very different from those under full information. Interesting finding from the work of Zhu and Weyant is that common market uncertainty may actually cause firms to act more aggressively under certain conditions.

In some companies, IT is considered as a plain cost centre, which causes inevitable costs to maintain corporate technology infrastructure. This rather pessimistic approach, which is not rare, can be a consequence of inefficient IT management. In this scenario, it is under tight cost control, and the development mode is in its minimum. For the head of IT this means hard times, because the costs of IT are considerable and it seems that company gets no added value of IT, as far as board of directors are concerned. This leads easily to the under valuation of IT, which may further lead to outdated IT infrastructure, because corporate executive board is probably reluctant to accept investment proposals on are, which is not providing any return on investment.

On the other end of the spectrum are corporations in which head of IT sits in the board of directors and IT is actively managed to utilise the potential benefits of information technology to support and develop business. In this kind of organisations IT is not seen plainly as an unavoidable cost, but rather as a strategic asset that delivers considerable

outcomes. The key is that in this kind of firms, IT is managed according to business strategy, IT projects are tied to higher level business objectives and the whole organisation is tuned to effective IT utilisation. The key is linking IT tightly to other business operations. We will return to the concept of IT-business alignment in chapter 4.

2.3 Lack of applicable measurement methods

The disproportionate IT spending ended by the millennium and the laws of finance returned to the steering role also in IT industry. Corporate executives put IT budgets under pressure and started to demand concrete evidence of business value from IT projects. The problem is, IT projects do not usually provide direct financial impact. However, they do provide measurable changes, or to be precise, they enable doing things differently. These things, the business changes, in turn will have strategic or operative implications and ultimately affect the bottom line.

Interestingly and probably due to IT boom in the recent decade, IT value measurement has been extremely difficult for the firms. There have been opportunistic measurement systems from the technology vendors that include statements like "improved customer service by x percent" or "reduced work", but the statistics do not usually support these promises after the project implementation.

The simple truth "What firms can't measure, they cannot manage" applies particularly well on IT industry. Recently, IT vendors and corporate IT departments have noticed this problem and are providing more comprehensive and realistic measurement frameworks that take into account the intangible nature of most IT benefits and also point out the complementary actions needed to realise the benefits. However, the reality level and reasonability of these methods still varies enormously, and the credibility of the results, not to mention their realisation, is a serious problem.

Systematic identification of enabling changes and concrete business changes is the key to successful IT project justification (Kurien et al., 2004). In this study, the concept of IT evaluation is examined both on strategic level (IT strategy and IT portfolio) and on operational level (IT investment benefit analysis). Understanding the crucial parts of the value-creating process on IT is essential to effective IT management, which in turn is essential to effective IT evaluation and implementation and finally actual value realisation.

However, although many managers handily speak about "the ROI of IT", the speech is usually not based on solid value analysis. Further, the benefits mentioned usually include technological features and functionalities, but by definition, benefits only arise when people start doing things differently (Ward & Murray, 1997). Only when a thorough analysis on the potential benefits is made and feasibility study and detailed evaluation is accomplished, the true value of IT investment can be evaluated. This study provides a comprehensive IT evaluation methodology in part II.

3 IT AND PRODUCTIVITY

The effect of IT on productivity has been studied intensively for some time. There have been both aggregate studies concerning with holistic view of information technology's impact on economies and information worker productivity and micro-level studies concerning certain firms or industries (Brynjolfsson & Yang, 1997).

The results of surveys about IT and productivity conducted in the past have delivered mixed results and almost random correlation that has confused both academics and business people. The distinctive factors between successful and unsuccessful IT implementations could not be identified for a long time. One problem with past research was widely, that they did not take into account the long term effects of IT, but rather tried to find direct correlation between IT expenses and productivity, which does not leave any space for necessary change that the IT investments enable (Brynjolfsson & Hitt, 2003; Qing & Plant, 2001). This is emphasised by the observation by Qing and Plant (2001) that suggested that IT investment do not directly relate to firm performance in terms of operating cost, productivity, sales growth and productivity. On the other hand, their results suggested that IT investments do correlate with financial performance on preceding years, which supports the assumption about problems understanding the causality of the effects on productivity and profitability and also the level of intangible benefits associated with IT large projects (Rai et al., 1997).

However, recent studies have taken the long-term effects and intangibles better into account and shown IT's considerable effect on productivity. In their research on the effect of computerization on productivity and output growth Brynjolfsson and Hitt (1996) used data from 527 large US firms over 1987-1994. They found that computerization makes a contribution to measured productivity and output growth in the short term (using one year differences) that is consistent with normal returns to computer investments. However, the productivity and output contributions associated with computerization are up to five times greater over long periods (using five to seven year differences). This results suggest that the observed contribution of computerization is accompanied by relatively large and time-consuming investments in complementary inputs, such as organizational capital, that may be omitted in conventional calculations of productivity (Brynjolfsson & Hitt, 2003).

Based on the results of their research, Brynjolfsson and Hitt argued, that computers contribute to output growth but not to productivity growth in the short run. Over longer time horizons (between three and seven years), computerization is associated with an output contribution that is substantially greater than the factor share of computers alone – between two and five times as much as the short-run impact. This implies a substantial contribution to long-run productivity growth as conventionally measured (Brynjolfsson & Hitt, 2003).

The outcome of various surveys is that computerization contributes to productivity and output growth as conventionally measured in a broad cross-section of large firms. Furthermore, the pattern of rising growth contributions over longer time periods suggests that computers are part of a larger system of technological and organizational change that increases firm-level productivity over time. This is consistent with the conception of computers as a general-purpose technology. Computerization is not simply a synonym for simply buying computer capital; instead it involves a broader collection of complementary investments and innovations, some of which take years to implement. (Brynjolfsson & Hitt, 2002)

3.1.1 Effect of IT on a firm's market value

In addition to productivity, IT's effect on firm market value has been studied intensively (e.g. Hunter, 2003; Brynjolfsson: 1993, 1998, 2001, 2003) and the results have recently been flattering for information technology. According to research conducted by Brynjolfsson et al (2002), each dollar of computer capital is associated with about $12 of market value. This apparent excess valuation of computers suggests the presence of substantial intangible assets, adjustment costs, or other omitted components of market value correlated with computer assets. Investigations on the subject also showed that the long run productivity benefits are approximately five times the direct capital cost of computers, which would be consistent with a valuation of IT on the order of five times the valuation of ordinary capital. (Brynjolfsson et al., 2002)

This raises several questions about the difference between company level measurement on IT projects and macro-level evidence. The role of intangible assets could solve this puzzle and is handled further later in this thesis.

However, the main findings of the research have several implications on the assumption about the value of IT from the investor's point of view (Brynjolfsson et al., 2002):

- The financial markets put a higher value on firms with more installed computer capital. The increase in market value associated with each dollar of IT substantially exceeds the valuation placed on other types of capital.
- Computer-intensive firms tend to have measurably different organizational characteristics, involving teams, more broadly defined jobs, and greater decentralization of certain types of decision-making.
- Firms with these organizational characteristics have higher market valuations than their competitors, even when all their other measured assets are the same.
- Firms with higher levels of both computer investment and these organizational characteristics have disproportionately higher market valuations than firms that invest heavily on only one or the other dimension.
- Firms with higher levels of IT, these organizational characteristics, or both have higher measured productivity in subsequent years.

The bottom line is, IT seems to have considerable effect on the market value of the firm, but only when IT is managed effectively and the objectives for IT development are derived from the strategic objectives of the firm (Kaplan & Norton, 2004).

3.1.2 The productivity paradox and its explanations

The productivity paradox refers to the early literature on the relation between IT and productivity that finds an absence of a positive relation spending on IT and productivity. Research on the paradox has existed on two levels. The first is at the industry- or economy-wide level, which Nobel Prize-winning economist Robert Solow summed up in 1987 by saying that "we see computers everywhere except in the productivity statistics". The second paradox was observed at the company level where researchers could not find positive correlation with IT investments and corporate performance. (Dehning et al., 2002)

However, since then several studies found that there where indeed positive payoffs from investments in IT (e.g. Brynjolfsson & Hitt, 1998; Dewan & Kraemer, 2000; Brynjolfsson & Hitt 2003). Identification of new data and more sophisticated methodologies have given more encouraging results about IT's positive effect on productivity. Additionally, others approach IT's contribution from different perspectives, examining its effect on intermediate measures, on consumer surplus, and on economic growth. Consequently, our presumption of a "productivity paradox" has diminished considerably. However, there are still plenty of open questions that require answers and further research is required to understand the true nature and effect of IT.

Concerning the productivity paradox and also the remaining questions, Bynjolfsson & Shinkyu (1996) surveyed research on the subject and suggested four leading explanations for the productivity paradox: measurement errors, lags, redistribution and mismanagement. In the following these explanations are gone through.

1. Measurement errors

The easiest explanation for the confusion about the productivity of information technology is simply that we are not properly measuring output. The sorts of benefits that managers ascribe to information technology, such as increased quality, customer service, speed and responsiveness, are aspects of output measurement that are poorly accounted for in productivity statistics as well as in most firms' accounting numbers, which can lead to systematic underestimates of IT productivity (Brynjolfsson & Shinkyu, 1996).

2. Lags

A second explanation for the paradox is that the benefits from information technology can take several years to appear on the bottom line and the time lags in the pay-offs of information technology make analysis of current costs versus current benefits misleading.

Thus, the studies that compare the productivity and investments of the same year do not take this causality into account and give misleading results.

3. Redistribution

A third possible explanation is that information technology is especially likely to be used in re-distributive activities among firms, making it privately beneficial without adding to total output. There are several arguments for why redistribution may be more of a factor with IT investments than for other investments. For instance, information technology may be used disproportionately for market research and marketing, activities which can be beneficial to the firm while adding little to total output.

4. Mismanagement

The last explanation assumes that the value of IT is not materialised, because the lack of explicit measures of the value of information make it particularly vulnerable to misapplication and over consumption by managers and, consequently, the benefits of the information technology are not properly managed (Brynjolfsson & Shinkyu, 1996; Ward & Murray, 1996). Many of the difficulties that researchers have in quantifying the benefits of information technology would also affect managers. As a result, they may have difficulty in bringing the benefits to the bottom line if output targets, work organization and incentives are not appropriately adjusted. The result is that information technology might increase organizational slack instead of output or profits.

Although this explanations help understanding the productivity paradox phenomenon, Brynjolfsson and Shinkyu argued, that all these results include some problems in terms of reliability and there is a strong need for further investigation on the subject on IT productivity to gain understanding about the true role of IT in both micro- and macro-level effects.

3.2 IT and competitive advantage

IT investments and information technology in general should contribute to the strategic value of firm's resources. Decision makers are challenged to understand fully the strategic value of their firm's tangible and intangible resources. The strategic value of resources is indicated by the degree to which they can contribute to the development of capabilities, core competencies, and ultimately, a competitive advantage. Resources are the source of a firm's capabilities. Capabilities in turn are the source of firm's competencies, which are the basis of competitive advantage. (Hitt et al, 2001) Technology can provide capabilities to achieve the strategic objectives of a firm more efficiently and thus, give a competitive advantage.

Proprietary technology is generally not a source of sustained competitive advantage. Factors such as the rapid innovations in IT, workforce mobility in which employees can

bring information from firm to firm, and reverse engineering in which competitors can purchase systems and discover its character through in-depth analysis mitigate this potential advantage. Technical IT skills entail knowledge of programming languages and experience with operating systems. This is generally not a source of competitive advantage because these skills are not heterogeneously distributed across firms. Again, skilled labour in this area is not immobile in the industry, and IT knowledge can be acquired through training or hiring from other firms.

Managerial IT skills, includes management's ability to conceive of, develop, and exploit IT applications to support and enhance other business functions. Many times these functions incorporate those factors that lead to resource immobility between firms. Managerial IT skills are generally developed over long periods of time through learning by doing. These skills often may include many small decisions that cannot be precisely imitated, which render them causally ambiguous, and, finally, the managerial process includes effective communications and relationships between managers in different functional areas within the firm and outside the firm, which incorporates a socially complex structure. Because IT management skills are often heterogeneously distributed among firms and given the relative immobility of this resource, the authors find this factor to be the most prevalent in producing a sustained competitive advantage for a firm." (Kudyba, 2002)

4 BUSINESS ALIGNMENT OF IT

This chapter explores the linkages between information technology and business at various levels from strategic alignment to daily activities. The ultimate purpose of this chapter is to gain understanding on effective IT management practices by introducing some methods corporations utilise to control and manage information technology. In this section some important methodologies for the effective management of information technology are introduced. The overall IT management is described in the summary section, in which concepts of IT governance and IT portfolio management are located on the IT value cycle.

The first paragraph of this chapter considers the IT-business linkage and tries to give some insights to the often-missing links between business objectives and the actions of the corporate IT department.

The second paragraph explains how IT affects business processes and how IT can be utilised to integrate and streamline business processes.

The third paragraph introduces the concept of IT governance as a framework for managing IT in the best interest of both corporate executives and the shareholders. IT governance helps identifying the important decisions and decision-makers for IT in a structured way and describes how IT governance mechanism should vary according to corporate business strategy.

The last paragraph of this chapter introduces another essential IT management mechanism, IT portfolio management, which gives managers methods to assess the relative importance and timing of IT investments from infrastructure upgrades to strategic applications.

4.1 Linkage to business strategy

In order to be successful in today's global, competitive and dynamic markets, a firm must have a solid strategy that recognises a firm's core competencies and focuses on the business segments that the firm has strengths (i.e. competitive advantage) and on which it will likely outperform it's competitors. But, as we are living the information age and the need for various technology solutions is evident, any firm needs information technology products, services and solutions to support its core operations. In other words, the firm needs an information technology strategy that is preferably well aligned with the overall corporate strategy (Kaplan & Norton, 2004).

This means, that the investments and efforts put on IT must have business objectives and must fit the overall IT portfolio of the firm. If a firm does not have understanding how separate IT systems relate to each other and what is their corresponding risk/profit profile, the firm very likely operates less efficiently and has competitive disadvantage and it's viability is endangered in the long run.

Linking corporate strategy and operations has proven to be difficult for corporations and especially difficult considering IT. The principal reason for this is that the corporations usually do not properly capture the value of the intangible of the corporation. The problem is serious, because more than 75 percent of the average firm's value is derived from intangible assets that traditional metrics do not capture (Kaplan & Norton, 2004). To address the problem of evaluating intangible assets, they introduced a performance measurement system, called the Balanced Scorecard to enable companies to quantify critical intangibles, such as people and information.

Although the scorecard proved to be successful and was widely adopted by global companies, the actual value-creation process, the connection between different parts of the balanced scorecard, was un-described. To address the problem Kaplan and Norton have created a new concept, called the strategy map, which links various perspectives of balanced scorecard to each other and shows how value is created trough different perspectives to derive finally the financial impact. The balanced scorecard strategy map (see figure below) provides a framework to illustrate how strategy links intangible assets to value-creating processes (Kaplan & Norton, 2004). The strategy helps understanding the value creating process through the different perspectives of the balanced scorecard, which should improve management's capability to produce more value out of firm's assets.

According to Namchul (2002): "Strategic alignment is related to payoffs from IT at the process level. From this, we can conclude that firms that use IT to provide greater support for the business strategy will realize greater payoffs from IT."

4.2 Linkage to business processes

According to Kaplan & Norton (2004), depending on the corporate strategy and value proposition different processes become more important. For instance, if the value proposition of the corporation is customer intimacy, customer management processes become decisive for corporate success. To the operations this means that all the operations of the firm should focus on being superior in the customer management processes, also IT. Understanding this phenomenon helps prioritising the potential IT investment proposals based on their impact on the corporate value proposition and ultimately corporate strategy.

This kind of thinking is strange to most IT organisations that have historically focused on technology and been not too concerned about the business strategies and processes. However, IT can add significant value to the firm if it is able to provide technology solutions that help it to differentiate the firm on the market on the chosen areas (in this case, customer care).

Of course, all the assets of a corporation are important (like innovation processes and operative processes) and they must be maintained competitive, but understanding the

critical processes to firm's operations may help considerably the management of IT to the best interests of every stakeholder, from corporate shareholders to employees.

4.3 IT governance

Corporate governance is defined as "a relationship among stakeholders that is used to determine a firm's direction and control its performance. How firms monitor and control top-level managers' decisions and actions, as called for by governance mechanisms, affects the implementation of strategies. Effective governance that aligns the interests of managers with those of shareholders can produce a competitive advantage for the firm." (Hitt et al. 2001)

Just like corporate governance, IT governance is essential to align the incentives of different stakeholders and to control IT's performance. Even though IT governance is considered here as a separate entity, IT should be considered as one of the six key organisational assets (human, financial, physical, intellectual property, IT and relationships) that must be governed to create value (Weill & Ross, 2004).

IT Governance systems vary greatly in large corporations and it is not rare that the corporate executives cannot describe the IT governance mechanism of their corporation. A surprising number of corporations does not have any documented IT governance method, in other words their IT is managed and controlled based on individual opinions and capabilities and actually only 38 percent of senior managers can accurately describe their IT governance (Weill & Ross, 2004)

This type of management includes various hazards. First, there is alignment problem. The IT manager is usually some technology-oriented professional who does not know nor care about corporate objectives and strategy. Consequently, IT is not likely supporting the business even nearly as effective as it could be. Secondly, without clearly described governance there is a risk that all the relevant knowledge and decision power is behind one or few individuals, which is a serious personnel risk from the corporate perspective. If the key person walks away, will every action stop in the IT department (Weill, 2004)?

To avoid these problems and to get IT under corporate control as a true corporate asset, some clearly defined, strategy aligned governance mechanism is required for IT as well. Weill and Ross (2004) argue that IT business value directly results from effective IT governance. The allocation of decision rights and responsibilities is chosen according to corporate strategic objectives and IT is managed and measured in a pragmatic way, preferably the same way in the whole enterprise.

To establish an effective IT governance mechanism it is essential to recognise the key decisions that must be made to govern IT and then identify the right decision-makers to make decisions concerning these areas. According to the research of Weill and Ross

(2004), the decision-making points and their key characteristics are the following five factors:

1. IT principles

High-level statements about how IT is used in the business. Various studies have demonstrated that enterprises with superior business value from IT have a small number of clearly articulated IT principles, which guide IT department's operations and in part align it with corporate strategic objectives.

2. IT-architecture

The IT architecture is the organising logic for data, applications and infrastructure, captured in set of policies, relationships and technical choices to achieve desired business and technical standardisation and integration. By providing a road map for infrastructure and applications (and consequently investment decisions), architecture decisions are pivotal to effective IT management and use.

3. IT-infrastructure

IT infrastructure is the foundation of planned IT capability (both technical and human) that should be available throughout the business as shared and reliable services and used by multiple applications.

4. Business application needs

Business application needs decisions require reconciling complex change and opposing organisational forces. Managers responsible for business application needs decisions must know how to design organisational change and then make it happen, which requires creative thinking and disciplined project management.

5. IT-investments and prioritisation

The IT investment decision is often the most visible and controversial of the five key IT decisions. Enterprises that get superior value from IT focus their investments on their strategic priorities, cognizant of the distinction between "must have" and "nice to have" capabilities. Having well organised IT investment portfolio and aligning IT investments with strategic priorities is at the heart of effective IT decision-making.

Choosing the right people to make the decisions described above is crucial to effective IT governance and management. Depending on corporate strategy and IT principles, IT decision-making is either relatively centralised (with cost strategy) of decentralised (agility/growth strategy) (Weill & Ross, 2004). The differences in the role of IT due to different business strategies are described in the following sections.

Table 2. IT governance decision matrix

Decision-domain / Decision-maker	IT Principles	IT architecture	IT Infrastructure strategies	Business Application needs	IT investment and prioritisation
Corporate management					
Corporate IT					
Business unit management					
Business Unit IT					
Process Owner					
Process IT					

The table above can be used to connect the decision-domains and decision-makers. Good IT governance mechanism ensures that the right groups are making the key IT decisions so that those decisions enable the desired goals and behaviours of the enterprise. It also makes clear who can make decisions and how they are accountable for the enterprise goals. Good governance thus empowers the managers in the enterprise to make decisions without seeking additional senior management approval thus making the organisation more responsive to required changes (Weill & Ross, 2004).

The most effective and profitable IT governance mechanisms are different in corporations operating based on different business strategies (Weill, 2004): asset utilisation, productivity and growth. The main properties and recommendations for IT governance mechanism creation are described in the following. It is important to note, that linkage to business strategy, which was discussed in the earlier chapters, is exactly as important here, and Weill and Ross use exactly the same approach as Kaplan and Norton (2004) which makes it possible to use these tools together, as we will see in the summary section with the concept of the IT value cycle.

Leaders in asset utilisation

Firms leading on asset utilisation (as measured by ROA) need proactive decision makers who look for opportunities to share and reuse IT across business units (Weill & Ross, 2004). The leading firms in asset utilisation typically govern IT by using a pattern of

duopoly governance (IT group and some other group together) on all five IT decisions. In the duopoly model, the IT group plays and important coordinating role as it is one of the few groups in an organisation that interacts with all business units and sees firm wide opportunities for sharing and reuse.

Leaders on profit

According to research of Weill and Ross (2004), enterprises leading on profit, as measured by ROI and ROE, tended to have a more centralised governance approach and decision-making. Leaders on profit make effective use of executive and senior management committees to achieve cost control and standardisation throughout the enterprise.

This approach resembles the cost leadership and profitability strategy at the corporate level (Kaplan & Norton, 2004). The bad side is that this strategy does not support growth and growth oriented organisations should consider organising their IT as described in the following section.

Leaders in growth

Leaders on growth have governance structures striving to balance the dominant entrepreneurial needs of the operational units with the firm wide business objectives (Weill & Ross, 2004). In growth-oriented organisations, IT decision-making tends to be more decentralised, because in this kind of enterprises operational business units want and need control over IT investments to enable fast implementations and to experiment with new products or services. In a way, cost-effective standardisation is sacrificed to speed and agility in these firms. Interestingly, high-growth firms, more than other firms, have more effective mechanisms for tracking the business value of IT (Weill & Ross, 2004).

Identifying the business strategy and adjusting the IT governance mechanism to it enables better control and more effective management of information technology to the best interests of the shareholders, which is obviously the ultimate goal of every firm's operations and actions. However, there are several pitfalls that must be avoided to create a successful IT governance mechanism. To give guidelines to the establishment of effective IT governance, Weill and Ross (2004) described eight critical IT governance success factors:

1. Transparency
- Make IT-governance mechanism transparent to all managers
2. Actively designed
- Design IT-governance around the enterprise's objectives and performance goals
3. Infrequently redesigned
- Only when desirable behaviours change, i.e. major change in strategy
4. Education about IT governance
- Making governance work at all levels, understanding accountability

5. Simplicity
- Small number of performance goals
6. An exception-handling process
- To support new opportunities, not supported by the existing IT decisions
7. Governance designed at multiple organisational levels
- Separate but connected layer of IT governance for each entity
8. Aligned incentives
- Incentive and reward system aligned with the desired behaviours the IT governance mechanism is designed to encourage

With effective IT governance mechanism, firms are able to drive out business value out of their information technology. The decisions and warnings introduced in this chapter may give enterprise a good starting point to develop their IT governance mechanism into one that better serves the overall objectives of the corporation.

4.4 IT portfolio management

Proper IT strategy and corporate governance provide a framework for managing IT to the best interest of the shareholders, i.e. according to firm strategy. However, they are not enough to assure that the firm uses its IT assets and IT budget wisely. Converting business requirements and technology opportunities into corporate assets and ultimately corporate bottom line requires careful planning and proper project selection and scheduling.

Like any other projects, IT projects have different purposes and objectives. Some projects are considered plain infrastructure replacements or additions. Their value is assessed primarily based on technological quality, applicability and price and they do not usually have strategic implications and the investment justification is based primarily on technology life-cycle management. Microsoft is an extreme example of the power of the supplier in technology adoption. Microsoft has defined an expiration date for its products after which support for the products (operating systems) expires. This leaves the client corporations and using MS products possibilities to either accept the risks included in the aging, unsupported versions, primarily due to security vulnerabilities, or to buy the newer version. Of course, they could in theory switch the supplier but the replacement costs are extremely high with little benefits. Microsoft is actually using effective lock-in strategy (Kaplan & Norton, 2004), because the costs of software infrastructure replacement are so high.

On the other hand, some IT systems are strategic for the corporation, for example advanced customer data analysis systems or production planning systems. Investment in these both business critical and strategic systems must have different objectives and requirements than infrastructure purchases – they have different risk versus return profile. On the other hand, sophisticated systems require technology infrastructure under them to operate so investing only on some part of the corporate IT portfolio and neglecting others is not feasible in the long run.

Furthermore, different corporate strategies require the firm to focus on different assets with different efforts. Firms with growth strategy do not look after every euro because the focus is on agility and responsiveness. Instead, cost strategy forces corporations to focus more on the cost effectiveness and efficiency of the technology, leaving products with high added value expectations with high fee and risk to others. Thus, there is a need to control and manage the way the firm maintains and develops its technology infrastructure and launches development projects.

To address this problem, corporations assess and classify their IT projects into a classification system, often called as the IT portfolio. IT portfolio is used to classify different projects and investments based on their risk and expected return profile. The overall portfolio must be balanced to avoid weak links, but at the same time project prioritisation should be done based on business requirements. This is not an easy task and trade-offs must often be made. However, the portfolio concept helps management to understand the role of different technology projects and also setting proper goals and objectives for different kinds of projects.

Weill and Aral (2003) found out in their study on IT portfolios that business leaders have in general four different management objectives for investing in IT:

1. Infrastructure
- The base foundation of share IT services used by multiple applications (e.g. servers, networks, laptops, databases). Depending on the service, infrastructure investments are made with the objective of either reducing IT costs via consolidation and/or providing a flexible base for future business initiatives

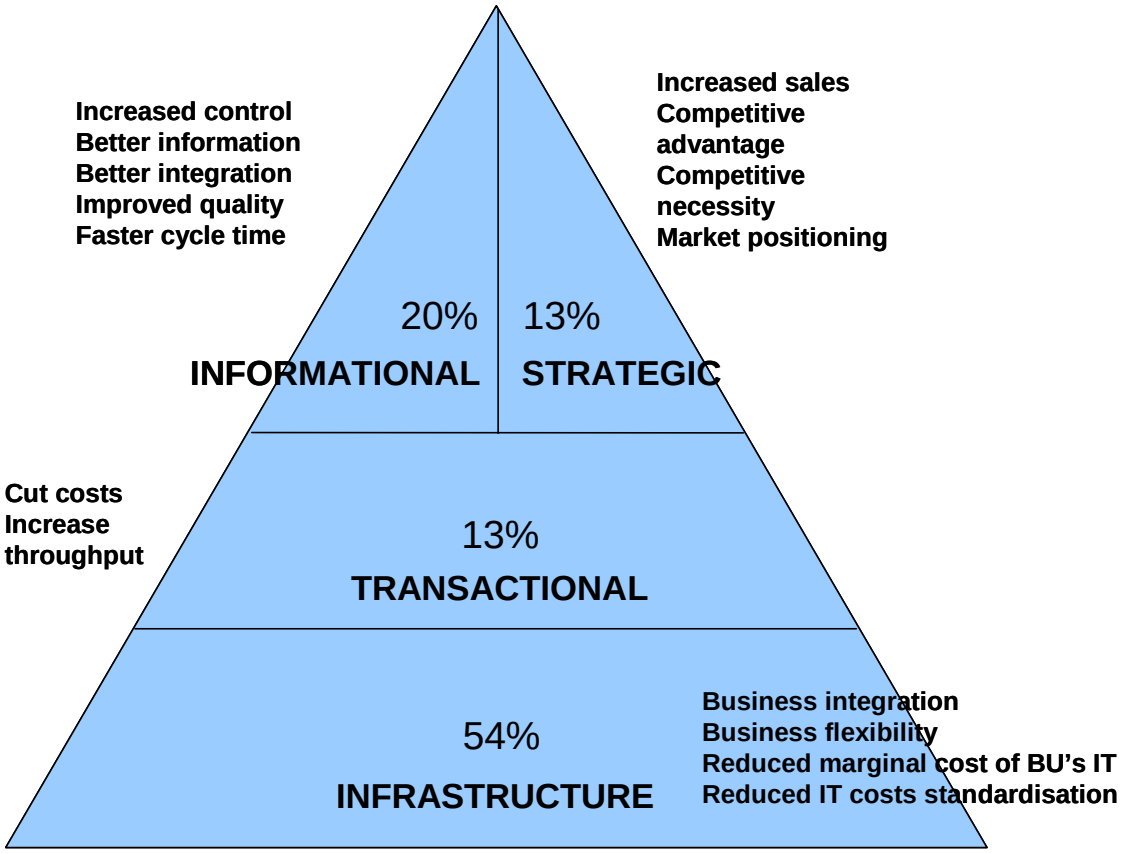
2. Transactional
- Cut costs or increase throughput for the same cost (e.g. trade brokering system for a brokerage firm)

3. Informational
- Provide information for any purpose including to account, manage, control, report, communicate, collaborate of analyse (e.g. sales analysis system or reporting)

4. Strategic
- Gain competitive advantage or position in the marketplace (e.g. ATMs were a very successful strategic IT initiative for the innovating banks increasing market share)

The IT portfolio theory urges to control and manage IT just like financial portfolio is managed in finance. IT is divided in four asset classes which each have unique risk/return profile. On the lowest level is infrastructure on which all other management objectives are based. The idea is that the upper levels of the portfolio utilise the lower levels.

The following figure shows the results of research on how IT costs are on average distributed among the four capability clusters (management objectives) described earlier in this chapter:



Source: Weill, 2003

Figure 3. IT cost distribution in IT portfolio

From the figure can be seen that although the focus on this thesis is largely on strategic benefits gained from the IT investments, the basis for benefits (the true enabling part) lies in the infrastructure, and the infrastructure part in fact comprises on average 54 percent of all IT costs.

5 THE VALUE OF IT

This section explores the concept of IT value, trying to answer the following questions: does IT have value? What are IT value types? What kind of corporations gains most value from their IT investments? How IT should be valuated?

The value of IT has many forms. The direct value trough automation, efficiency and cost reductions are relatively easy to identify. On the other hand, the intangible value, also referred as intangible assets, is much harder to identify, not to mention quantify. But, since more than 75 percent of the average firm's market value is derived from intangible assets (Kaplan & Norton, 2004) and since organisations usually struggle describing and measuring this value, we first explore the different value types and the affect of complementary assets on total output of investments. Further in the next chapter, evaluation methods for both tangible and intangible assets are considered.

In general, the beneficiary of IT investments has been the larger corporation who has managed their investment well, the small / medium sized business who have been given more opportunities than ever before to compete, and the consumer who now have more availability and choices at lower prices than ever before. Regardless of overall random correlation between spending and returns, companies who invest wisely and manage these investments for maximum returns have indeed reaped the rewards that technology can deliver (Pisello & Strassman, 2003).

In the next two chapters, the tangible and intangible parts of value are examined.

5.1 Tangible value

Tangible value is the easier part of the value that the technology is able to deliver. Tangible value can by definition be evaluated directly, because it is something material and visible (Hitt et al., 2004).

Tangible benefits (tangible value) include IT cost savings (increasing IT productivity and reducing IT capital expenses), business operating efficiency gains (increasing user productivity and reducing business unit expenses), and increased strategic advantage (increases in revenue and profitability). According to Pisello and Strassman (2003), the cash flow for the costs and benefits are compared using standard, time-honoured measures of investment performance including Return on Investment (ROI – the net benefits / total costs), Net Present Value (NPV – the risk discounted value of the investment in today's dollar terms), Internal Rate of Return (IRR - the predicted yield from the cash flows) and Payback Period (the time it takes for the project to be cash flow positive). As mentioned earlier, the methods mentioned above are described in appendix 2 of this thesis.

5.2 Intangible value

The intangible value of IT is a harder concept, because the intangible value cannot be directly measured. The intangible benefits are defined to be strategic gains derived from a project, where such gains are difficult or impossible to reliably quantify in absolute monetary terms. The intangible benefits are predicted and can be measured using key performance indicators - business metrics and key ratios such as customer satisfaction, inventory turns, sales cycle and cost per unit – used to support the projects financial analysis, or predict additional benefits (Pisello & Strassman, 2003).

Fortunately, methods are created to convert the intangible assets and benefits into tangible outcomes. Understanding the causal relationships between IT and business, and further, between different corporate intangible assets (human, organisational, informational) and ultimate corporate bottom line gives tools to measure the intangible value (Kaplan & Norton, 2004). The IT value cycle that is proposed in the end of this first part of the thesis provides a framework for understanding how IT investments relate to enterprise's operations and how value is generated through a series of serial and parallel phases. Furthermore, linking different parts of the balanced scorecard together helps understanding how value is created and in which assets should we invest to gain maximum value out of our operations and assets. The reader, who uses balanced scorecard as strategic measurement framework, is encouraged to read the book "Strategy Maps" (Kaplan & Norton, 2004) to understand the inter-relationships between the different parts of the balanced scorecard.

5.3 Role of complementary and intangible resources

Successful IT project implementation requires not only technology resources and capabilities, but also complementary resources and actions (see table below). These complementary assets are necessary, because IT projects usually affect every part of the enterprise and the benefits are realised only after changes in operations and working habits have been implemented. Both tangible and intangible aspects of IT and the related change need to be addressed.

Table 3. Complementary resources (Powell & Dent-Micallef, 1997)

Human resources	Business resources	Technology resources
Open organisation	Supplier relationships	Hardware
Open communications	Supplier-driven IT	Software
Consensus	IT training	Services
CEO commitment	Process redesign	Linkages
Flexibility	Teams	
IT/Strategy integration	Benchmarking	
	IT planning	

(Kaplan, Norton, 2004) defined information capital, human capital and organisational capital as three forms of intangible assets are decisive for sustainable value creation. Kaplan and Norton argue that the intangible assets must be **aligned** with strategy, in order to create value and that the strategic role of intangible assets cannot be addressed on a stand-alone basis. An **integrated** program is required to support the enhancement of all the organisation's intangible assets.

Complementary actions are required, because the IT department or IT project team is incapable for doing the changes required to materialise the benefits of an IT investment that usually require changes in business processes, roles, working habits and thinking. The project team can provide education how to use new features, tools, products and functionalities, but whether the tools and improvements are actually taken into use, is on the responsibility of the line managers and process owners. The business changes require business involvement; the technology is only an enabler for the potential business benefits and business value (Ward & Murray, 1997).

To address the problem of utilising necessary complementary actions that requires complementary resources, the evaluation process described in the latter part of this thesis identifies both business and technological owners for each business change the technology enables. This way, the distinction between responsibilities of technological staff and business operations should become clearer, which should enable the firm to start actions that assure that the prospected business benefits are actually gained after the implementation project.

6 IT VALUE EVALUATION

This chapter discusses the problems related to the evaluation of the value of IT. The metrics typically used to evaluate IT investments are given in appendix 2 and the actual evaluation process is described in part II of this thesis.

Historically, IT spending in business was considered an administrative expense rather than a business investment. The costs and benefits of systems were relatively easy to identify and compute. The goal of today's IT investments is more often revenue increase than cost displacement. Many of today's IT applications enable and support far-reaching changes in the industry and business structure, and can have a huge impact on organizational forms, interfaces with suppliers and customers, distribution channels, products, services, and markets. Therefore, the context of the costs / benefits equation for IT has changed immensely, and equally has, as a result, the management of this cost / benefits equation of IT. Van Der Zee, 2002). To address this problem, applicable metrics that focus more on the benefits side of the equation, and furthermore could capture the indirect value of IT investments are needed. However, this goal is still largely unmet, as organisations struggle with creating feasible and credible business cases for IT projects.

Most large Finnish organisations have practices to measure, follow and manage the value of their IT projects. However, the applicability and comprehensiveness of these practices can be questioned: corporations are not very pleased with the evaluation of business value of the IT projects. The importance of business value is recognised, but the practices and modes of action are either not comprehensive enough, or they are not utilised effectively and regularly (Market-Visio, 2002).

Why is it so hard to decide whether to invest in IT, what IT, when and how much. The following summarises some reasons (Ford, 1994):

- IT investments require significant behavioural and organisational changes to complement them.
- The stakeholders that gain benefits due to IT adoption are hard to identify exactly. IT investments often affect a whole range of organisational departments and units.
- IT investments often cause a shift in power (based on information) from one department to another (centralised to decentralised for example)

Evaluation and measurement of value is considered challenging in general, and especially challenging with intangible and indirect benefits. It has been recognized that the link between information technology (IT) investment and firm performance is indirect due to the effect of mediating and moderating variables. (Chen & Zhu, 2004). This difficulty can lead to the evaluation of costs and benefits for only direct costs and benefits (Market-Visio, 2004).

In this chapter commonly used IT evaluation methods and metrics are introduced. The purpose is to give the reader elementary knowledge about metrics. The list of metrics is not comprehensive and the aim is to provide adequate understanding of different evaluation methods and to compare their strengths and weaknesses.

A more comprehensive analysis of the metrics and their applicability on information technology investments is provided in appendix 2.

6.1 Choosing approach for evaluation and metrics

Traditional project valuation methods do not apply well on most IT investments as IT contains so many intangible elements. Moreover, the cost side of the equation is usually easier to capture, especially with IT service vendors providing IT as a service, but the benefit side is far less obvious and quantified. For example, it is easy to calculate the cost of a new server, but the benefits from using the server are usually imaginary.

Solution providers have their own methods, which usually combine the metrics described above, for example Microsoft rapid economic justification (REJ), Gartner group's business value of information technology (BVIT) and business value of opportunity (BVO).

Vivant (1999) argues that there are three fundamental types of metrics used in IT:

- Technical quality metrics identify systems and processes. In need of repair or improvement, such as defect/default rates, defect origin and defect cost.
- Process oriented metrics measure productivity and the ability to meet deadlines, such as individual productivity and timeliness.
- Business oriented metrics measure IT's performance from the perspective of end users. Examples include functional quality, response time and system availability

In addition to these metrics, the metrics should be considered on two separate contexts:

1. Implementation project metrics

These are the metrics that measure how well the project was technically executed. These include usual financial and time constraints of the project (i.e. is the project delivered according to budget and schedule), which are affected by adequacy of resources (financial, human, intellectual etc.). Another important measure of project success is how well the functionalities, features and changes that were (hopefully) defined in the project plan are actually met.

Essentially, these metrics concern the implementation phase, and are necessity for business benefits, but succeeding (or even exceeding) in fulfilling these metrics does not guarantee the successfulness of the project (and customer satisfaction). Additionally, these are the metrics that the IT group is largely responsible and able to achieve.

2. Business metrics

The business metrics measure how well the development project (in which IT implementation is an integral and necessary part as technological enabler) met its goals. The business metrics, such as improved customer service or increased responsiveness, require actions that the simple IT project cannot achieve. This is because it is the people who make the changes and deliver the business value, and technology only enables them to do so. Thus, to achieve the business objectives of the project, not only must the technology part go well, but actions must be launched also at the operational (non-IT) level. These include training, motivation and communication. After all, if people do not utilise the new opportunities provided by the implementation, the expected business benefits do not materialise.

Using a framework like the one proposed in the latter part of this thesis enables enterprise to identify the roles and responsibilities of both the technology project team and the other parts of the organisation. If we are to put financial targets to the project, careful classification and planning is required to understand the value creating mechanisms and possible bottlenecks in the process. Only after analysis and planning it is feasible to put financial goals for the project.

Analysis about different financial evaluation methods is given in appendix 2.

6.2 IT costs

Looking at the cost side, companies conduct analysis that attempt to clarify all costs included in IT. TCO is defined as the total cost of procuring, using, managing and disposing of an asset over its useful life. TCO is only useful if it the spending is compared against performance. High TCO may be warranted if it nets superior bottom-line results, or some other measurable competitive advantage. To get the lowest TCO simply throw away the computers and replace them with pen and paper. Therein lies the flaw in focusing on the cost side of the equation alone. (Pisello & Strassman, 2003)

However, there are at least three related reasons for management concern about the cost side of the cost/ benefit equation of IT (Van Der Zee et al., 2002):

- IT spending is substantial
- It is unclear how large the growth in IT investment really is
- A growing portion of the IT expenditures is invisible and therefore not (actively) managed by upper management

IT costs are not all discretionary and subject to management's decisions; they follow defined patterns as described by, amongst others, (Van der Zee et al., 2002). These patterns suggest that every dollar spent on IT development automatically generates follow-on costs

for IT maintenance and IT operations. According to Keen, each dollar of new development generates 20 cents of maintenance and 40 cents of operations in each subsequent year, indicating that the larger the existing portfolio of IT applications, the larger the proportional IT spending on maintenance and operations. (Van Der Zee et al., 2002)

The identification of IT costs is important and TCO calculations are a daily routine. However, focusing on cost tends to lead pure benefit analysis and firms should instead focus more actively on the development side (benefits) of IT (e.g. Ward & Murray, 1997; Brynjolfsson & Hitt, 2000; Croteau & Bergeron, 2001; Cotton & Schinski, 1999).

7 THE VALUE-CREATING PROCESS IN IT

Previous chapters provided us a variety of methods and view on IT management, the role of IT, the value of IT and IT measurement. However, the roles and challenges in different parts of IT value chain management are often unclear. In author's opinion, it is essential to understand the value-creating process of IT to be able to measure and manage IT effectively. Having clear understanding about the phases in the value-creating process, their inputs and outputs, requirements and contribution is essential to effective IT management and to gain potential benefits of the IT investments.

In this chapter I try to summarise the methods in a systematic way and give the reader the big picture about how IT creates value and what is the IT value generation process. The proposed model for IT value generation is called *IT value cycle* (see figure on the next page). The model describes how corporate strategy is translated into efficient IT strategy and further into effective IT project portfolio, and how IT investments should be measured and managed to gain measurable business value from IT.

Furthermore, a special attention is given to the complementary assets and actions required to drive value from the information technology investments. In the following paragraphs the most important parts of this value generating cycle are described in detail.

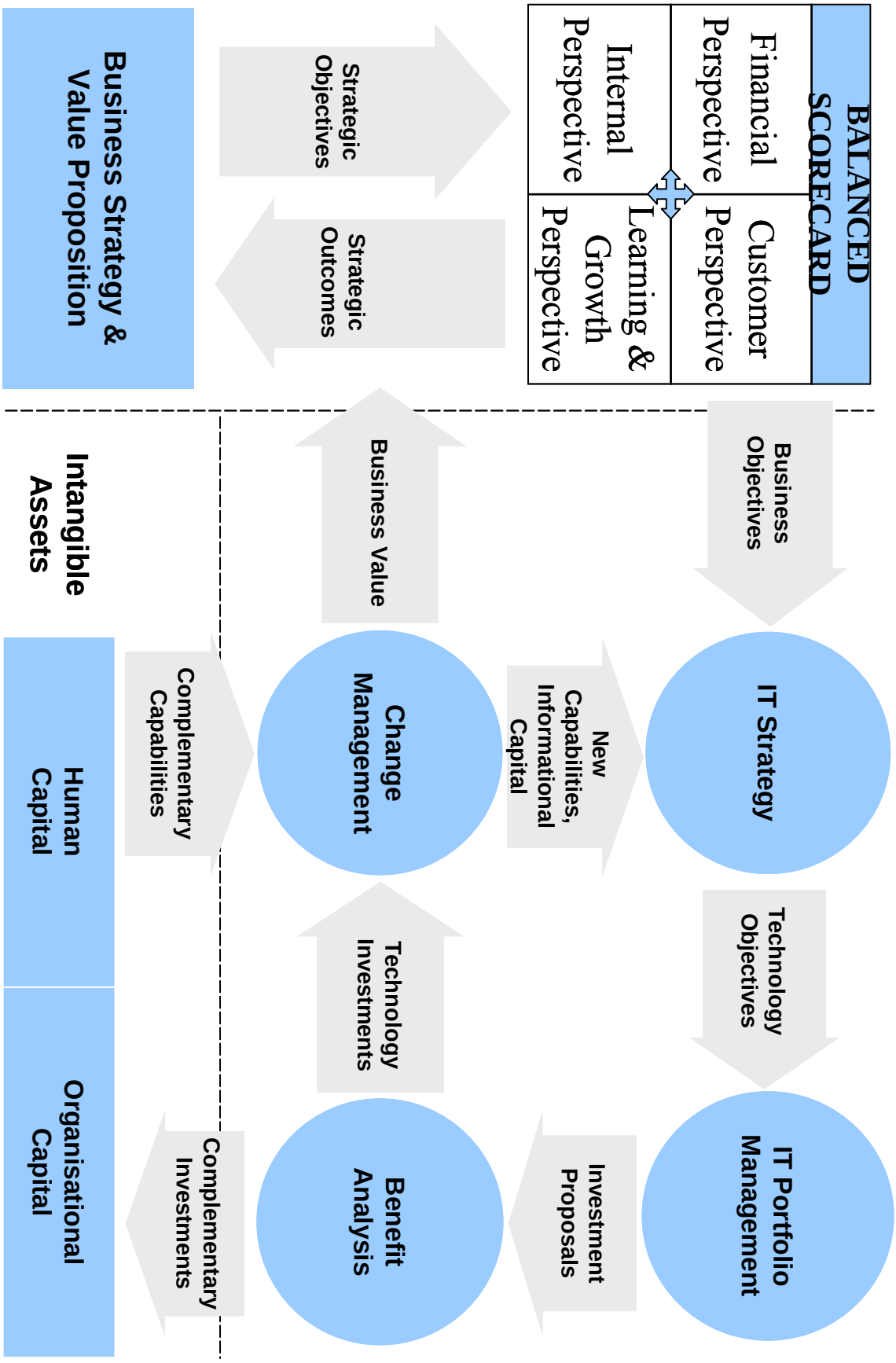


Figure 4. The IT value cycle

7.1 Business Strategy & Value Proposition

The IT value cycle starts from the firms business strategy and value proposition that describe the way the firm should conduct its business and how the firm differentiates itself on the market. Through their actions, firms seek strategic competitiveness and above average returns. Strategic competitiveness is achieved when a firm has developed and learned how to implement a value-creating strategy. Thus, IT value cycle starts from the bottom-left corner, from the business strategy and value proposition of the corporation.

Hitt et al. (2001) define strategy as an integrated and coordinated set of commitments and actions design to exploit core competencies and gain a competitive advantage. Strategy defines the overall way the firm aims to accomplish its mission. Strategy also steers the action, because the methods the firm conducts its business and organises its operations vary a great deal for firms with different strategies even though they might operate on the same industry sector.

Generally, there can be identified two generic business strategies and their combinations: cost leadership and differentiation. A firm that has a cost leadership strategy focuses its operations on efficiency and it aims to produce or deliver goods or services at the lowest cost, relative to that of competitors, with features that are acceptable to customers (Hitt et al, 2001). Successful implementation of the cost leadership strategy requires a consistent focus on driving costs lower relative to competitor. This applies also to IT and firms that utilise cost leadership strategy have a smaller IT budget as their rivals applying differentiation and product leadership strategies. This means IT has to focus on fulfilling the principal needs of the business to run, but the growth opportunities and business-specific applications are usually not in the agenda due to tight budget scrutiny. A smart IT manager of vendor should take this point into consideration and tailor its offering and story accordingly.

On the other hand, firms conducting differentiation strategy and product or customer focus more on growth opportunities than cost control and consequently they spend more on products and services supporting growth. Again, for IT this means more potential euros for solutions that provide evidence of potential growth. In this kind of organisations there is also more potential for IT department to raise its status as a strategic resource for supporting growth. This is because growth-oriented organisations should utilise customer leadership strategy (Kaplan & Norton, 2004) which means they try to understand the customer's unique needs and recognise ways to fulfil them best. This requires among other things data about the customers and their customers, which in turn usually requires some CRM and BI systems. This provides opportunities to IT savvy managers who can translate the complex world of IT acronyms and technologies into manageable business supporting utilities. When one can help business to grow considerably, the price is usually not the first issue, as opposed to priorities in IT departments under strict cost control.

7.2 Balanced portfolio

Firms measure their success with various metrics. From shareholder point of view, the most important indicators are financial, such as revenue growth, margin percent and profitability. However, in addition to these, most corporations also measure their progress on other, non-financial areas of their business. In addition to physical and tangible assets, such as machinery, premises and facilities, firms possess several intangible assets, such as employee know-how, which are invaluable to the firm, but their measurement is not as straightforward as the measurement of tangible assets (Sweetman, 2001). It is commonly accepted that all the assets, or core competencies, of the firm must be balanced to maximise the competitiveness of the firm. Focusing solely on financial figures is like driving a car from the rear mirror, because financial figures represent the past and maybe the current situation, but the future success cannot usually be extrapolated from past success. In contrast, other measures, such as employee and customer satisfaction, order backlog, employee utilisation and operational efficiency give the management information about the potential future revenues.

To address this problem, measurement frameworks, such as the infamous 'Balanced Scorecard' by Robert S. Kaplan and David P. Norton, are widely used as a way to measure the situation of the firm from all the important perspectives: financial, internal business process, learning and growth and customer. The balanced scorecard is a management system (not only a measurement system) that enables organizations to clarify their vision and strategy and translate them into action. It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and results. When fully deployed, the balanced scorecard transforms strategic planning from an academic exercise into the nerve centre of an enterprise (Balanced Scorecard Institute, 1998).

The role of IT in this overall management system is to contribute to the development of metrics by providing enabling systems and services that give the organisation better capabilities to be competitive. This requires IT strategy that is aligned to high-level business objectives and business strategy and integrated with other assets of the company.

7.3 IT strategy

IT strategy defines the way IT is managed to achieve its objectives and goals set by the business. The greatest obstacle for successful IT management is the misalignment with the business objectives, which usually causes the IT to focus on system maintenance and cost reduction. This approach ignores the potential benefits and value-creation aspect of the information technology disregarding the fact that as IT is nowadays in almost everywhere in the firms operations, its contribution to overall success is considerable and thus the role of IT can be significant also in growth. Many organisations have started to recognise that IT is not necessarily only a support function and cost centre, but rather it can be a true source of business value, when effectively managed. Thus, firms need IT strategy that is consistent with overall business strategy. This applies to responsibilities, roles, measurement and operations (e.g. Brown & Ross, 1999; Kaplan & Norton, 2004).

An important concept in effective IT management is IT governance mechanism, which should be chosen depending on corporate strategy and general corporate governance mechanisms. Based on their study of some 250 enterprises worldwide for their book "IT governance", Weill and Ross (2004) argue that IT business value directly results from effective IT governance – a firm's allocation of IT decision rights and accountability. This model must be adjusted to each firm's individual needs based on their individual desired behaviours, or key business objectives.

To sum it up, effective IT strategy integrates the IT to firm's operations and successfully converts the business objects into feasible set of technology objectives that provide both new capabilities to firm's information capital and true business value to firm's operational units.

7.4 IT portfolio management

The technology objectives generated by feasible IT management act as an input to the concept of IT portfolio management. Weill and Aral (2003) argue that just like any other investment portfolio, the IT portfolio must be balanced to achieve alignment with the business strategy and the desired combination of short and long term payoff. On the other hand, a firm has strategic objectives that require investments in strategic applications, which are in a way on the top of the IT hierarchy. But on the other hand, it must be kept in mind that the other layers that these strategic applications utilise and base on, must be in order as well. So, there are different layers or objectives with different risk and return expectations and these separate areas must be managed properly to effectively manage IT. The portfolio theory gives tools to manage corporate assets effectively (Hartman, 2004).

In their research, Weill and Aral identified four different management objectives that guide firms' investments on IT:

1. Infrastructure

The foundation of shared IT services consisting for example of servers, workstations, databases and networks. The infrastructure part is the basis for all other IT and in fact firms spend on average 54 percent of their IT budget to infrastructure.

2. Transactional

The aim of transactional investments is to cut costs or increase throughput for the same cost. For example enterprise resource planning (ERP) investments fall primarily on this category.

3. Informational

Informational systems provide information for management purposes by utilising the data gathered by the transactional systems, such as ERPs. Examples of informational systems are so called business intelligence systems (BI) that have got plenty of attention lately. Informational systems focus on the information part of technology utilising the technology part, which consists primarily of infrastructure and transactional systems.

4. Strategic

The objective of strategic IT investments is to gain competitive advantage and differentiate oneself in the market. Few IT solutions are truly strategic by definition and the author finds it difficult to separate the strategic and informational objectives in IT area. However, Internet trade (for example Amazon) is one very good example how information technology can truly differentiate firm from its competitors and consequently gain competitive advantage. Of course, sustaining that competitive advantage is another issue.

The most important point to understand is that it is not only how much one spends on information technology but also making the right IT investments that best much a firm's strategy. Understanding the profiles, expected risks and return expectations of these four different IT asset classes helps managers make more informed IT decisions and to manage the overall IT portfolio more effectively.

7.5 Benefit analysis

IT portfolio management gives managers tools to generate investment proposals that support the overall business strategy and to understand the linkages and interdependencies between different IT asset classes. However, choosing the best solution for each problem has proven to be an uphill task for many organisations. It is indeed essential to find the most suitable solutions from a variety of solutions and solution providers that often confuse their clients with fancy value propositions and glamorous product descriptions.

However, to find the solution that truly delivers the benefits it offers is hard. This claim is justified based on surveys that indicate that the majority of IT projects fail to meet their objectives. So, there is a need for a methodology that goes under the surface and examines systematically the potential benefits of the proposed offering.

To address this problem, the second part of this thesis is dedicated to describe a methodology that systematically examines the proposed investment, identifies the potential business benefits, classifies them, evaluates their value and risk and finally defines owners that are responsible for benefit realisation. This in-depth examination gives more credible and accurate knowledge about the benefits of the proposed project and furthermore helps creating a change management plan that is required to materialise the potential benefits of the investment and the subsequent IT implementation project.

7.6 The role of complementary assets

It is unfortunate that although the IT projects may be considered strategic, their execution is often left solely for the IT project staff and corporate IT department. In IT value cycle the requirement for complementary investments in addition to technology investment is pointed out. If we acknowledge that the benefits of technology materialise only when people start using the technology to do things differently (Ward & Murray, 1997), we should understand that technology project alone is not enough. The technology project represents investment in tangible assets, but in addition to that there is a need to make investments on the intangible assets of the firm, such as human capital and organisational capital.

Brynjolfsson et al. (2002) investigated the hypothesis that new, intangible organizational assets complement IT capital just as new production processes and factory redesign complemented the adoption of electric motors over 100 years ago. The results suggested that the organizational complements to firms' installed computer capital are actually treated by investors as intangible assets. The financial markets treat the organizational assets associated with IT much like other assets that increase long-term output and profits.

This finding is important, because it could mean that investors actually put more value on the intangible side than companies. Firms do not report a value for many of the intangible assets on their balance sheets, forcing investors to rely on other sources of information to value these assets. As a result, investors and analysts appear to devote relatively more time and effort to assessing the value of companies with larger stocks of intangible assets (Brynjolfsson et al., 2002).

As Kaplan and Norton (2004) found out in their research, two-thirds of organisations do not create strong alignment between their strategies and their HR and IT programs. Consequently, these investments do not facilitate the organisation's ability to execute their strategies. And these organisations are unlikely to generate a positive return on their HR and IT investments. To address the problem of aligning the intangible assets to strategy,

firms need to establish change agendas and build business models and organisational practices that focus on leveraging the benefits of technology investments. From the markets point of view, the financial markets recognize and reward those models that are well suited for the current technological and business environment (Brynjolfsson et al., 2002). The need for change management is further described in the following paragraph.

7.7 Change management

Large projects affect the way the firm operates and employees working habits and roles, and without planning and management the benefits due to changes in working habits and operations will not materialise. Vast changes may also require changes in the entire organisation culture, which is a major challenge, which takes both effort and time (McNish, 2002).

All these issues cannot be left on the shoulders of the implementation project or IT department. They are strategic actions the top management should own and manage. These are also potential places for major positive changes (benefits) for the organisation. It is possible that the technology implementation project turns out to be the starting point for a major organisational change. If that is the case, it is crucial to understand the role and responsibility of the IT as part of a larger business transformation initiative. Focusing solely on tangible actions is not enough.

For example, large ERP projects affect virtually every process and function of a company. This means, that there is a need for change in every part of the organisation, which in turn brings requirements to adjust roles and responsibilities, to educate employees to use the new systems and so forth.

Although, change management is not widely covered in this thesis, the evaluation process described in part II gives a solid foundation for change management, as it identifies the roles and responsibilities for benefits. Having identified the required changes (business changes) and the related responsibilities gives a firm much better starting-point for project execution, and further business value realisation, in which change management is a crucial ingredient.

8 PART I SUMMARY

IT value cycle describes how IT can be managed and steered by the corporate strategy and what is the value-creating process in information technology. In the cycle, different phases and their inputs and outputs are recognised and described. The purpose of this model is to point out the importance of effective management of IT and the role of intangible assets and change management in actual IT value realisation. The concepts discussed in this part of this thesis are huge, and the reader is encouraged to investigate the main concepts further to gain adequate understanding about the possibilities and challenges of IT management.

Understanding the nature and role of information technology is the foundation for feasible IT decisions. As one CFO in a company operating on Finnish retail industry stated when asked to comment on the payback of information technology: “It may be two days, or one hundred years.” This rather sarcastic statement highlights the role of information technology as business critical, integral part of the operations of modern corporations. It is easy to calculate the negative effects on cash flow when operations get jammed for a couple of days. Outdated technology can cause such things and within this scenario, the IT projects targeted to ensure the operational capabilities can provide instant return on investment under this scenario.

As IT clearly has strategic implications, it sometimes pays off accepting IT projects that do not provide positive NPV or acceptable ROI. The risk avoidance perspective is sometimes the most important factor affecting the decision about IT project launch.

In summary, this first part of this thesis introduced some methods to manage IT effectively and examined the traditional IT evaluation methods. Furthermore, the concept of the value of IT was discussed. Having read this part, the reader should have basic understanding about the role of IT in an organisation, the methods with which the management of IT can be accomplished, and the problems with the realisation of value due to IT investments. Once again, IT should be considered as integral part of other corporate business development initiatives, and corporate executives should not get tangled with the technical implementation of IT projects, but rather consider the contribution of IT to the overall business development and to assurance of adequate actions to materialise the business benefits the IT investment enables for the firm.

In the second part of this thesis a particular focus and attention is given to the investigation of the benefits of an individual IT project. This part should have given the necessary big picture about IT management required to understand the choices one has to make to select the right investments in IT.

PART II: IT INVESTMENT EVALUATION

In the second part of this thesis I propose a methodology for evaluating the business benefits of the chosen IT investment or IT project. The first part of this thesis focuses on identifying the factors that must be fulfilled in order to manage and govern IT successfully and the outcome of all actions regarding IT management should be a portfolio of business supporting IT investments and other activities. This part considers on single IT projects and gives a framework for analysing, classifying and evaluating the benefits the firm is able to gain from the particular investment. The methodology helps organisations to spot the actual business benefits due to new technology adoption in a detailed, systematic method. Also, associated risks, required actions and responsibilities are taken into account and the role of the non-IT functions is highlighted as an integral part of IT project benefit realisation.

The most important thing in this framework is to understand the distinction between enablers, enabling changes and business changes. All too often, when benefits are described in IT projects, people tend to focus on operative, technical aspects and describe

the enabling changes due to project implementation. There is actually nothing wrong in that, except that the true business changes (business value) the technology enables are usually not properly described, and consequently, not achieved. When business benefits are not described as objectives in the project plan, and thus, will not be assessed actions and responsibilities, it is very likely they will not materialise. In authors experience and opinion, lacking this one last step is maybe the single biggest reason why so many vast IT projects fail to meet their business objectives. There is this nagging gap between the corporate executives that define strategy and draw high level objectives and the project staff (often only IT-staff) that writes the project plan, designs the actions needed to implement it and eventually executes it.

The proposed benefit analysis methodology helps corporations to avoid such shortcomings. It forces people to classify and rationale the proposed benefits of their IT investment proposal, to consider risks involved and to describe the owners for the benefits, which enables not only feasible project approval but also feasible and successful project implementation.

Ward & Murray (1997) described this challenge with the following figure, which tries to demonstrate the gap between traditional approach to technology projects and the benefits management approach. The most important changes must be made in the mind-set of the managers in decisive positions. Ward and Murray urge managers to think IT projects as business development projects rather than technology delivery.

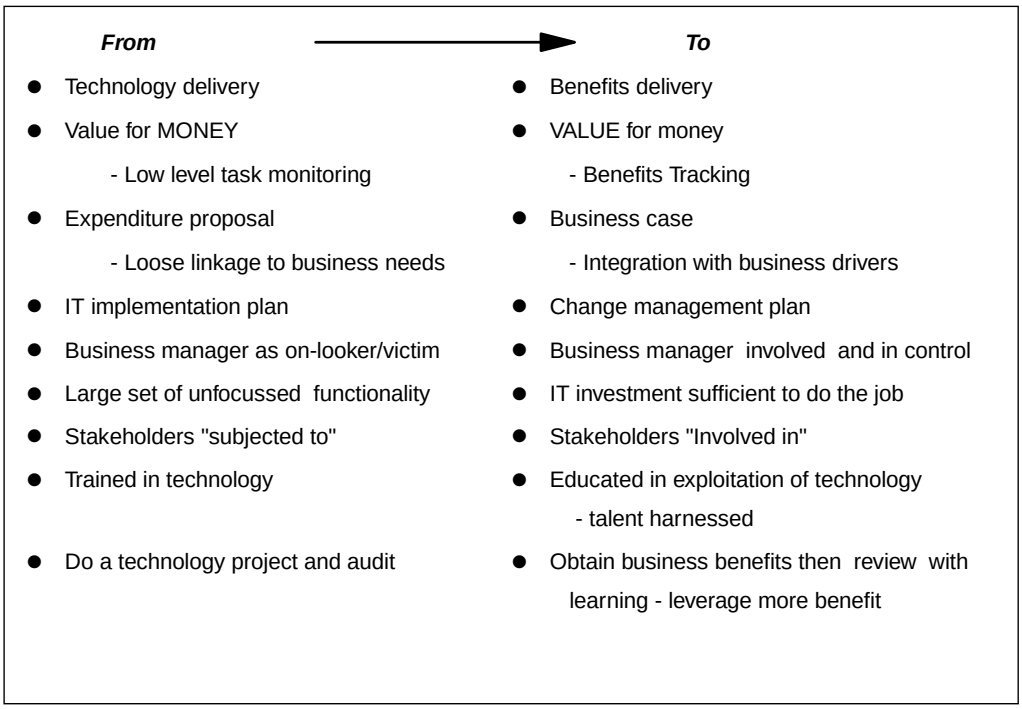


Figure 5. The Benefits Management Challenge (Source: Ward & Murray, 1997)

9 IT BENEFIT MANAGEMENT

Benefits management concept highlights the fact that the most important feature in development is change and it is people who make things happen. Thus, to ensure delivery of benefits what is needed, in addition to soundly implemented technology, is an appreciation of the capability that is being enabled, how it can be used to introduce better ways of working, identification of all those who will benefit (or otherwise) and change management processes to put the new way of working into practice and then drive out the benefits. (Ward & Murray, 1997)

In their benefits management guidelines Ward and Murray argue that whilst many interpret IT risk as either a) the risk of unauthorised access to company data, or b) the risk that the delivered system will not work properly, in fact the biggest risk of all is that the system will not deliver the desired benefits. Even though, the benefit management requires effort and thus causes costs, benefits management process is required and justified, because without it the potential benefits due to technology are not achieved (see picture below).

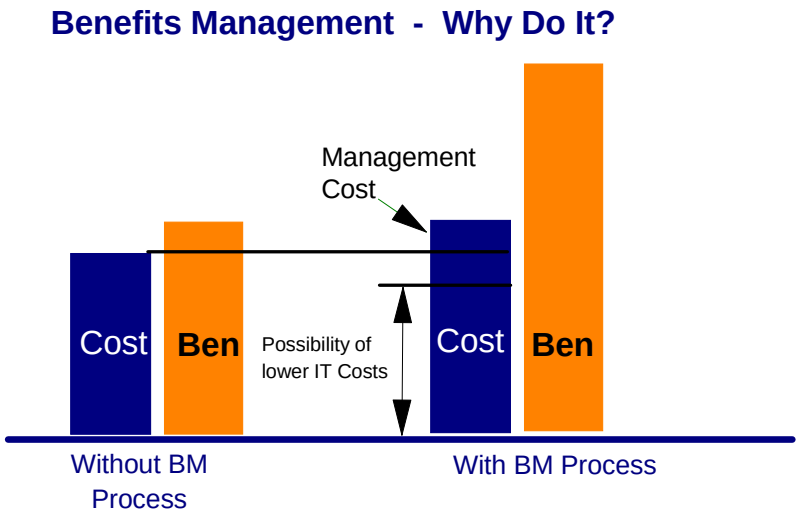


Figure 6. Benefits management justification (Source: Ward & Murray, 1997)

The benefits management ideology has three fundamental principles (War & Murray, 1997), which are first described and then commented above:

1. “There are no direct benefits from IT. IT only enables or creates a capability to derive benefits.”

This first argument highlights the role of IT as an enabler for business improvement. One can only wonder, why this message was not heard during the hot years of the Internet-

bubble in the late nineties, when the Internet and the related technologies where seen as a miraculous salvation for everything themselves, and having a website was expected to be enough to gain worldwide visibility and instant access to global markets.

2. “Things only get better when people start doing things differently.”

This argument highlights the crucial role of people and change management in benefit extraction. Also, the role of change management is essential to gain the expected results. One should always keep in mind that the benefits management process does not end when the technology implementation project ends. Actually, the utilisation of the benefits starts when the technology implementation ends – a fact that is often underrated when project plans are established. If we neglect the post-project change management and user involvement, we are wasting the most of the benefits a technology project is able to deliver. This is probably the single most important distinctive factor between the companies that effectively execute IT projects and the companies that do not get the results they are expecting from their information technology projects!

3. “Without a management process to drive benefits out they don’t appear.”

This argument further urges to establish effective change management and training programs and to define effective measurement system and to clearly define responsibilities for the potential benefits, both measurable and intangible. The role of actual business change identification is crucial when responsibilities are defined in the project implementation, and also in actions intended to address the post-project benefit materialisation.

These principles have been used as a foundation for benefit analysis and the evaluation process described in the following chapters.

9.1 Requirements

The methodology can be used as a tool for justifying it projects and to make decision making easier and enable decisions based on more accurate and currant information. Therefore, it is possible to skip some parts of the valuation process. Empirical findings indicate that at least Finnish firms in the retail sector are usually satisfied after benefit assessment and classification phase and feel they have adequate justification to go on with the investment proposal or project. It is also true that as ROI calculations in IT investments are very hard to make and the value is often of intangible nature, the actual bottom line valuation is left undone. Careful assessment and classification makes realisation easier and as such enables better ROI for the project than pure implementation project with just budget and schedule requirements.

However, it is avoidable to skip this planning section because then there is a danger for not identifying all the possible benefits of the project, no assigning actions and responsibilities

and so forth. This may lead to a situation where the implementation project fails to meet its primary goals, which usually are set by the upper business management, and the true benefits are not gained. Like discovered in part one, technology needs complementary assets, such as training, role changes, business process changes, to deliver the benefits. Failing to identify the risks and requirements of the project benefits is a crucial mistake from benefits management point of view.

Factors found to affect the success of an IT implementation project are top management support, user involvement, management of user expectations and user participation (Sherer et al, 2003).

9.1.1 Identification of objectives and expectations

Before we start evaluating any new product or service, we must have a clear understanding what we are actually looking for. Corporations do not make investments just for fun – or at least they should not. As mentioned earlier in this study, all investments, not only IT-related, should be based on some concrete business objective. Typically investment drivers are changes in organisation structure, corporate strategy, competitive landscape or economy that force corporations to adjust the way they conduct business. Fundamentally, organisations two basic reasons for investments.

In information technology, the problems usually have something to do with data. Data should be more accurate, available faster in any place, it should be analysed more effectively etc.

Another major concern is internal integration between various corporate systems (such as ERP, CRM, BW, BI etc.). New technologies create capabilities to do things faster and easier and company IT department should recognise the technologies that truly make a difference and would thus be worth the effort and money.

9.1.2 The current phase of technology life cycle

Information systems and hardware get older and must be replaced with new. When and how to do this is a major concern, for example in retail industry, which relies heavily on technology both in store level and on enterprise level. Business continuity must be assured and technology risks increase, as systems get older.

The good thing is, when investment proposals are justified to fulfil business requirements, we are likely doing fundamentally right things. To be able to answer these essential questions we need to conduct a through investment suitability analysis, which is described in the following sections.

9.1.3 Identification of business requirements

When customers approach the supplier they usually have some kind of requirement specification in which they describe their requirements for system in terms of functionality, usability, support and service. Unfortunately, these specifications are usually far too trivial and leave too much room for presumption of interpretation. Furthermore, specifications usually are very technology-oriented. They provide very detailed description on which data structures are used and what are the incumbent system's features and functions and user interface. All those things are important to know when you are in charge of a certain technology the corporate uses in its daily life, but they have virtually nothing to do with actual business requirements the investment proposal is originally made for.

In essence, requirement specifications typically symbolise the past, not the present, not to speak of future on which the senior management is aiming for. Because of this, it is wise to have some kind of checklist that links technology and business requirements together in a way that is not stuck in the past. Empirically, this is very tough for hard-nosed IT personnel who understanding everything from the technology but less from the business their actions and operations should ultimately support. This is where a tool which both parties understand and can relate to, is crucial in order to find out the true requirements that lead to business development enabled by a certain technological innovation.

9.2 Approaches to IT benefit analysis

There are generally two approaches to investments: top-down (business-driven) and bottom-up approach (technology-driven). The proposed evaluation methodology can be utilised in both cases. In the former case according to IT value cycle that was introduced in part I of this thesis, and in the latter case directly. Of course, also in the latter case the identified benefits must be checked against the business objectives to see that we are addressing the right problems and not contradicting the strategic objectives of the enterprise.

The two approaches are briefly described in the following chapters.

9.2.1 Business-driven approach

As mentioned in the previous paragraph, the business-driven approach for IT is actually described in the IT value cycle. However, it is briefly described here.

The business driven approach starts from the overall corporate strategy, which defines the strategic objectives of the company. Metrics for business are then derived from these strategic objectives by using some sort of scorecard, which identifies different corporate assets and their development requirements are quantified metrics.

IT objectives and investments should be able to support these business objectives and metrics in a quantifiable way. This is accomplished using the evaluation process described in this part of the thesis on potential IT investment proposals. The details of the methodology are explained in the later chapters.

9.2.2 Technology-driven approach

Whereas the business-driven approach starts from the top (the business strategy and business objectives), the technology-oriented approach solves the enabler side of the equation (i.e. it is used to identify the opportunities to utilise information technology to give a firm new and improved capabilities for its key operations.)

In technology-driven approach we start by looking at interesting new technological solutions and innovations and investigate, what benefits they could give us. This is done using the evaluation process described in the next chapter of this thesis. In brief, the idea is to identify the technological enablers and the advancements, which they provide, but more importantly, to think how we can utilise these potential technological improvements to support and develop our business.

Having committed this sort of benefit analysis, we then assess the effect of these benefits to corporate business targets, and if there is relevant value added in these investment proposals, accepting the investment has a profound justification.

Essentially, both approaches should lead to business benefit and business value. We either start from the enabler (technology) and see how well it fits to our operations and strategic objectives, or we start by introducing the problem (objectives) and then scan the potential investment proposals and technologies by the very same benefit analysis used in technology-driven approach. Ultimately, these approaches are just the two sides of the same coin and should be used in parallel in organisations.

10 THE EVALUATION PROCESS

The IT evaluation process (IT investment benefit analysis) consists of five phases:

1. Benefit identification
2. Benefit classification
3. Benefit evaluation
4. Risk analysis
5. Benefit ownership

In benefits assessment and classification phase we identify the benefit enablers, enabling changes, concrete business changes due to enabling changes and classify the benefits in terms of their type, focus and effect.

If the benefit is measurable and quantifiable, its value and the rationale for the estimated value are described in the evaluation phase.

Risk evaluation is also crucial and integral part of benefit assessment process since every change always includes some amount of risk. Risks related to benefits are classified in the risk assessment phase.

Finally, enablers, enabling changes and business changes are given responsibilities, i.e. people who are responsible for the different aspects in benefits realisation. The benefits appear mostly after the actual project implementation and without clearly defined ownerships the necessary changes and actions the potential business benefits are not realised, but rather we end up having people doing their daily actions the same way as earlier, only now with new equipment!

The benefit analysis flow-chart is shown in the following picture and its subparts are considered one by one in the following chapters.

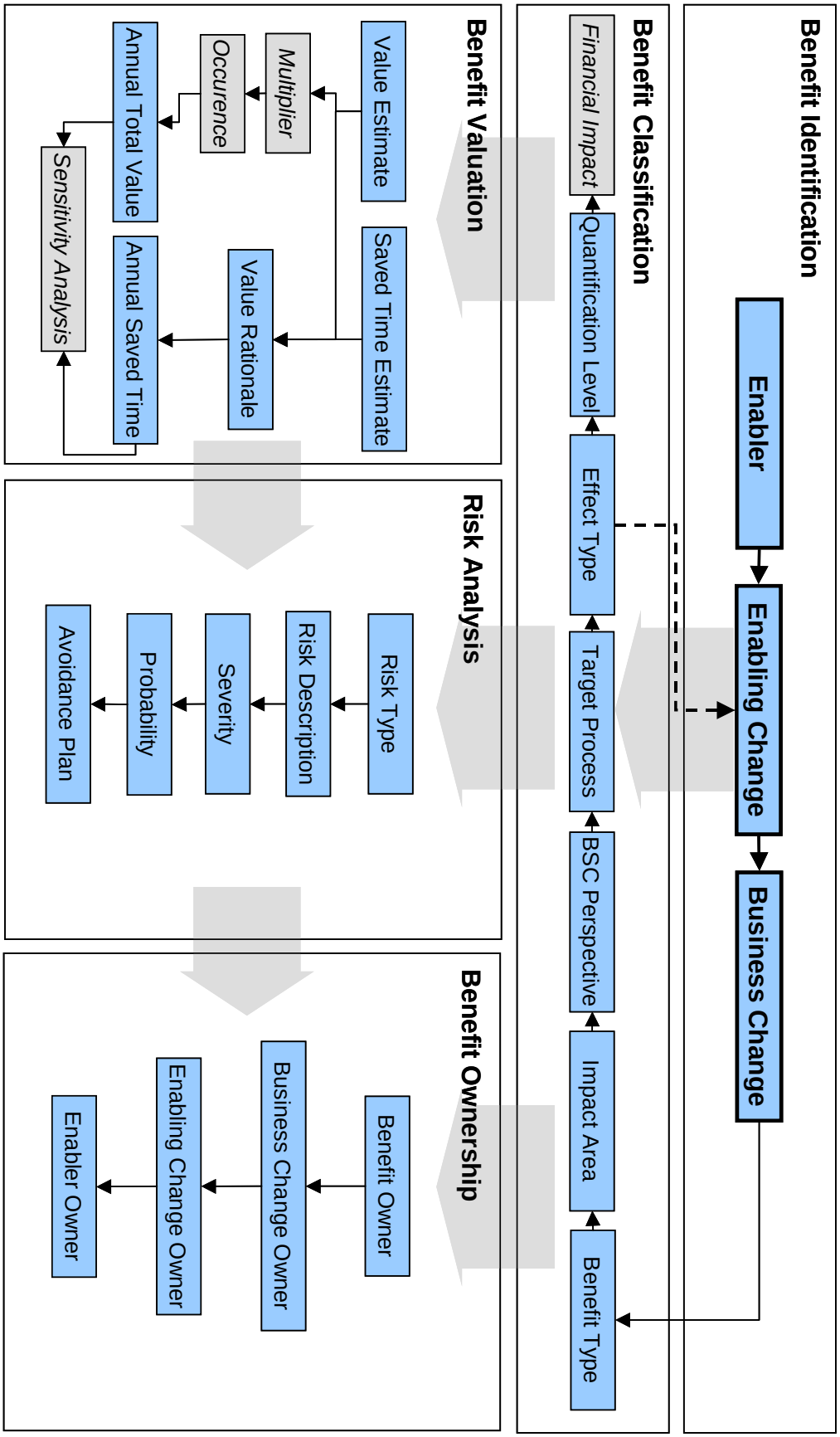


Figure 7. Benefit analysis flow-chart

10.1 Benefit identification

Benefit assessment and classification is the foundation for benefits management. The classification process starts with the identification of enablers, the infrastructure layer for benefits. It makes sense splitting large products or services to multiple enablers, because that enables us to achieve adequate detail-level for benefits. The level of detail must be decided and carefully considered before actual benefit analysis. If the scope is too rough, it is impossible to find the "roots" of benefits and the analysis becomes shallow and inaccurate. On the other hand, getting tangled with unnecessary minor details waists' time and presumably gives no added value to the analysis. The enablers differ in different projects. In the following chapter I have divided enablers according to products and service into three separate sections: pure hardware, software projects and services. Of course, large projects are usually combinations of the above but it is practical to consider them one at the time.

In hardware, product and possible related products is a good starting point for analysis. Hardware investments are relatively easy to analyse, because comparing hardware is usually about cost, performance features, quality, guarantee length, maintenance service and continuity. These features are relatively easy to quantify and compare. Hardware investments focus usually on performance and replacement investments. Firms have to update their hardware because new software programs require better performance and the amount of data is usually growing exponentially. Actually, it is usually not necessary to perform complex benefit analysis for plain hardware investments. For example, in point-of-sale hardware investment the set of enablers could be POS-hardware (PC of dedicated POS) and POS peripherals (thermal printer, keyboard, customer display, scanner etc.).

Software products and services are much harder to quantify and a detailed classification mechanism is a necessity. Large software products, such as enterprise resource planning systems, business intelligence solutions and customer relationship management systems consist of multiple modules and thousands of options. The systems are technically versatile and proper configuration is the key. Furthermore, large software system implementation projects affect the whole company. The objectives of the implementation project usually aim to gain new assets and to support efficiency, growth and better information sharing and streamlining processes.

The first action is to define enablers and enabling changes for the change the project or investment proposal is made for. Depending on IT project size and scope, the enablers are the following:

- Complete software, hardware or service products, for example PDA-device, mobile email or IT help desk service
- Parts of software or service, for example ERP-system modules

Enabling changes are those technology related features and functions of the product or service that enable the company to do something differently. Typically, in the marketing material and technical product descriptions suppliers and IT vendors describe technical innovations and new, improved features. The purpose of these papers is obviously convincing the customers about the benefits purchasing their products delivers to the buyers. The problem is, enabling changes are by definition only enablers, but they do not provide the benefits themselves. Only when people and organisations start doing things differently, i.e. using the new products, services and features to improve operations etc., the true business benefits appear. (Ward & Murray, 1997) Thus, it is crucial to understand the distinction between enabling changes and actual business changes that ultimately affect the corporate bottom line. The good thing is, enabling changes are usually easy to identify from sales material, product descriptions and investment objectives defined by the buyer organisation's management. The most important part is then to figure out and think what those changes enable the business do, to find out the true business benefits.

Table 4. Benefit identification

Field name	Objective	Typical values
Enabler	Defines product or service that ultimately enables the benefit.	PDA-device, workstation, server, WAN, software product, software module, service
Enabling Change	The feature, part of functionality of the service that enables customer organisation to do things differently.	Feature of the product or service, e.g. real time reports, automated day openings and closings, automated process phases.
Business Change	Actual (measurable) change or improvement in the organisations daily activity.	Any improvement in the way company conducts its daily business that can be observed. Note: there are also disbenefits, which can be identified exactly the same way.

10.2 Benefit classification

After enabler, enabling change and business change have been described, the benefit must be classified to understand on what parts of the company this benefit is affecting. This is crucial when we later evaluate the value of the benefit and identify risks and responsibilities.

It is important to note that the classification is done based on the business change, not the enabling change. This observation is critical, because in authors experience people usually tend to consider the enabling change when they think about the effects and requirements although the real benefits come from the business change and we should always think about the requirements for the realisation of the business benefit!

Having classified the benefit with adequate detail and focusing on the business change the enabler and enabling change enable, it is much easier to evaluate the effect of the benefit

and to assess the risks and to define responsibilities for the actual implementation. The details of each part of the classification phase are described in the following table.

Table 5. Benefit classification

Field name	Objective	Typical values
Benefit Type	To classify the benefit into three categories: new, better, stop. Typically most of the benefits gained are incremental improvements, which fall into category "better". However, depending of the maturity of target organisation's IT, also revolutionary changes are possible, which fall into categories 'new' (new capabilities) of 'stop' (cost savings).	According to Ward and Murray (1997) the benefits are described in one of three classifications: Firstly whether they are something new to the organisation or Secondly whether they are doing something that is already done but better or Thirdly whether the benefit come from stopping doing something
Impact Area	The part of the organisation the benefit occurs. This field can be used to assess the benefits due to a particular technology in different parts of the organisation.	Single business unit, corporate level, part of the company value chain
Target Process	The process the benefit is affecting to. Important when defining owners for the benefits.	Customer service, manufacturing, research and development, sales etc.
BSC Perspective	Determines the perspective of the benefit according to commonly used management framework B*alanced Scorecard* (Kaplan & Norton 1996)	Financial perspective, customer perspective, Internal process perspective, learning and growth perspective
Effect Type	Determination whether the benefit is direct or indirect. Indirect benefits are often identified later as they are successors of the direct benefits (possibly by another projects enabled by the current project).	Direct or indirect
Quantification level	To determine how explicitly the benefit can be valuated at this point of time	Financial, quantifiable, measurable, observable
Financial Impact	If the benefit is classified "financial" it is possible to further classify the effect it has on the corporate finance.	Revenue, margin, cost replacement, cost reduction.

10.3 Benefit evaluation

For measurable and quantifiable benefits it is possible to put actual number, monetary or time, for each benefit, which can then be used as a metrics in post project value evaluation. When a numerical value is put for a benefit, the value rationale must always be given, because otherwise it usually impossible to figure out on what reasoning the number is based on. This way there is no confusion with the figures ("Where did this number come from and by who?") afterwards, as is the case with "from the hat" invented values.

It is often feasible to do a sensibility analysis for given values. This can be done after the benefits assessment phase by steering committee or alike. In sensitivity analysis upper and lower levels for benefit value estimate is defined, either relative (percentage) or absolute

(numeric). For example, if the value estimate is 100 000€ annually, the steering committee states that the realisation is likely between 60% and 90% of the previously defined value. When we add up all the benefits, we can give worst case and best-case scenarios for the whole project using this type of feasibility analysis.

As we learned in the first part of this thesis, the majority of value of IT projects' outcomes lies in their contribution to intangible assets (the intangible value). If the value cannot be quantified (it actually usually can due to careful classification described in the earlier chapter), there is nothing wrong in sticking in the verbal description of the business change and skipping the monetary evaluation phase. However, one should always try to find some measure for the benefit, because otherwise the follow-up and post-project evaluation is problematic. The rule "you cannot manage, what you cannot measure" applies here as well. The fields of the evaluation phase and their purpose are described in the following table.

Table 6. Benefit evaluation

Field name	Objective	Typical values
Value or saved time estimate	Here, the actual financial value is estimated. If the benefit is intangible and does not include any direct financial value, the intangible value can be described in the field "value rationale". Note: the total annual value is calculated after the fields "multiplier" and "occurrence" are filled. Of course, if the value is already in annual figures, it can be copied into "annual total" field.	The value types for this field are either euros (additional income or cost reduction) or time (saved time due to benefit).
Value Rationale	To get explicit description for the estimated value or time saving in the field "value". This is important, because this way we do not end up guessing where did the numbers come afterwards, when senior management is asking us to explain the proposed figures.	Verbal justification for the value estimated in the previous field.
Multiplier	(Optional). The proposed benefit may affect multiple targets (workers, workstations etc.) and sometimes it is handy to implement help calculator, which calculates the annual value based on parameters in these fields. (For example annual value = 5€ * number of employees * occurrence)	Workstation Office Employee
Occurrence	(Optional) To describe how often does the benefit occur. Used with multiplier to calculate annual total value.	Annually Monthly Weekly Daily Once
Annual total value or saved time	The annual value of the benefit. With timesavings it is possible to convert them into money. However, for example extended coffee breaks due to timesaving do not give any additional value.	Either in euros or time.
Sensitivity Analysis	The senior management can re-examine the proposed benefits and give them worst case and best case boundaries to provide elementary sensitivity analysis for the overall benefits of the proposed investment.	Either percentage (e.g. 50-110%) or absolute boundaries (e.g. x-10 and x+30, where x is the proposed benefit value) for the proposed value

10.4 Risk analysis

The justification of risk management in information technology is appealing: according to studies, 90% of all IS projects fail to meet their goals (Clegg et al. 1997). In addition, investigations have estimated that between 40 and 80 percent of IS projects exhibit some degree of budget escalation. Empirical evidence also reveals that between 30 and 70 percent of IS projects are designated as sometimes or usually late. (Peterson & Kim, 2003)

Large corporations typically have risk management processes and in all project plans and investments proposals risks must be addressed. The risk management can be targeted to the whole project, as it is normally done, but it pays of linking risks to outcomes in benefit-level. Each benefit requires different actions to materialise and these actions contain inherently risks. These risks are described for every benefit, the severity and occurrence probability are determined, and some risk avoidance plan is planned.

Once again, during project implementation there are always "normal" project risks, such as technology risks, resources problems and schedule overruns, but to be realised the benefits also contain other, non-technology project, related risks that must also be addressed, for example change resistance, training requirements, operational change requirements and so forth. As benefits only occur when people start doing things differently there is always the risk that people simply do not use the new features and capabilities, either consciously or unconsciously.

Table 7. Risk analysis

Field name	Objective	Typical values
Risk Type	Most companies have some sort of risk management practise, which identifies various kinds of project and other risks. The risks included with the concerned benefit should be described here. Note that the overall project risks should considered elsewhere. The risks described here are the risks that something goes wrong in the realisation of the concerned benefit!	Supplier resources Employee commitment Inadequate training Schedule related Etc.
Risk Description	Verbal description of the risks included with the proposed benefit realisation (remember, that project-specific risks are considered preferably elsewhere and do not need to be described here)	Verbal description
Severity	How severe is the risk if it happens	Numbered or verbal scale
Probability	How probable is the risk to occur	Numbered or verbal scale
Avoidance Plan	How do we prepare ourselves for the risk	Verbal description

10.5 Benefit ownership

The final phase of the benefit evaluation process is ownership selection. Connors et al. (1994) examined the concept of accountability as a key ingredient to superior results. They emphasise the contribution of attitude and accountability in improvements. This applies to the information technology well, as not only IT managers but also business people must decide are they victims or masters of technology. In practise, the former seems to often be the case as people struggle with the technology decisions or are ignorant and hope someone else makes difficult decisions and actions to enable competitiveness due to technology.

In this methodology, all the contributors to the benefits realisation are given owners. In owner selection it is critical to understand, that neither the technology vendor nor the IT department alone can be responsible for benefits. This is because by definition "things get better only after people start working differently." (Ward & Murray, 1997) The IT is only an enabler and business process owners, business unit managers and C-level executives must provide the complementary assets for IT to flourish. Thus, the methodology names four separate owners according to the following.

Table 8. Benefit ownership

Field name	Objective	Typical values
Benefit Owner	To get senior managers committed to the project and the benefits it enables, someone from the executive board should act as a sponsor for the project and enable the changes required to realise the benefits described in the earlier phases of the benefit analysis.	Member of the board (e.g. CTO) Process owner Business unit management
Business Change Owner	To describe person or people responsible for changes required realising the proposed benefits on operational level.	Business unit manager Operational (middle) managers
Enabling Change Owner	To describe the responsible(s) for the technical part of the benefit (the enabling change)	Project group Project manager
Enabler Owner	To describe the responsible for the enabler (e.g. product or service) that enables the changes that ultimately enable the actual business benefits.	Project group (and supplier)

10.5.1 Enabler owner

IS/IT managers can usually own the enabler part, which contains usually mostly technical things, such as system implementation or hardware or data network installation. If the project is purchased from IT-vendor, the vendor is also responsible for delivering the enablers as planned.

10.5.2 Enabling change owner

Project supervisors and personnel can own the enabling changes. In some occasions, for example in ERP projects, the supplier may be also responsible for enabling changes, at least in terms of user training and configuration. However, most enabling changes require changes in working habits, and these are on the responsibility of the personnel.

10.5.3 Business change owner

Middle managers can own the business changes. These usually require changes that the personnel cannot make themselves. These include new instructions and directives, changes in roles, changes in workflow and processes etc. Also, if the business change is task automation, for example automatic day closings and cash management in retail shops, and consequently personnel have got rid of some routine tasks, the managers must assure that the extra time is used to something productive instead of extended coffee breaks. Otherwise the time saving benefit is lost.

10.5.4 Benefit owner

The top management can be owner for the primary benefits as they must be sponsors for the benefits analysis as a whole. As the benefits in different areas hopefully cumulate into financial benefits on the corporate bottom line, the top management must control and govern the benefits management process.
After the owners are clear and understand their task, they should plan the actions and required changes to realise the benefits. However, at this point every stakeholder should understand his/hers role in the process and the high level objectives are sliced into

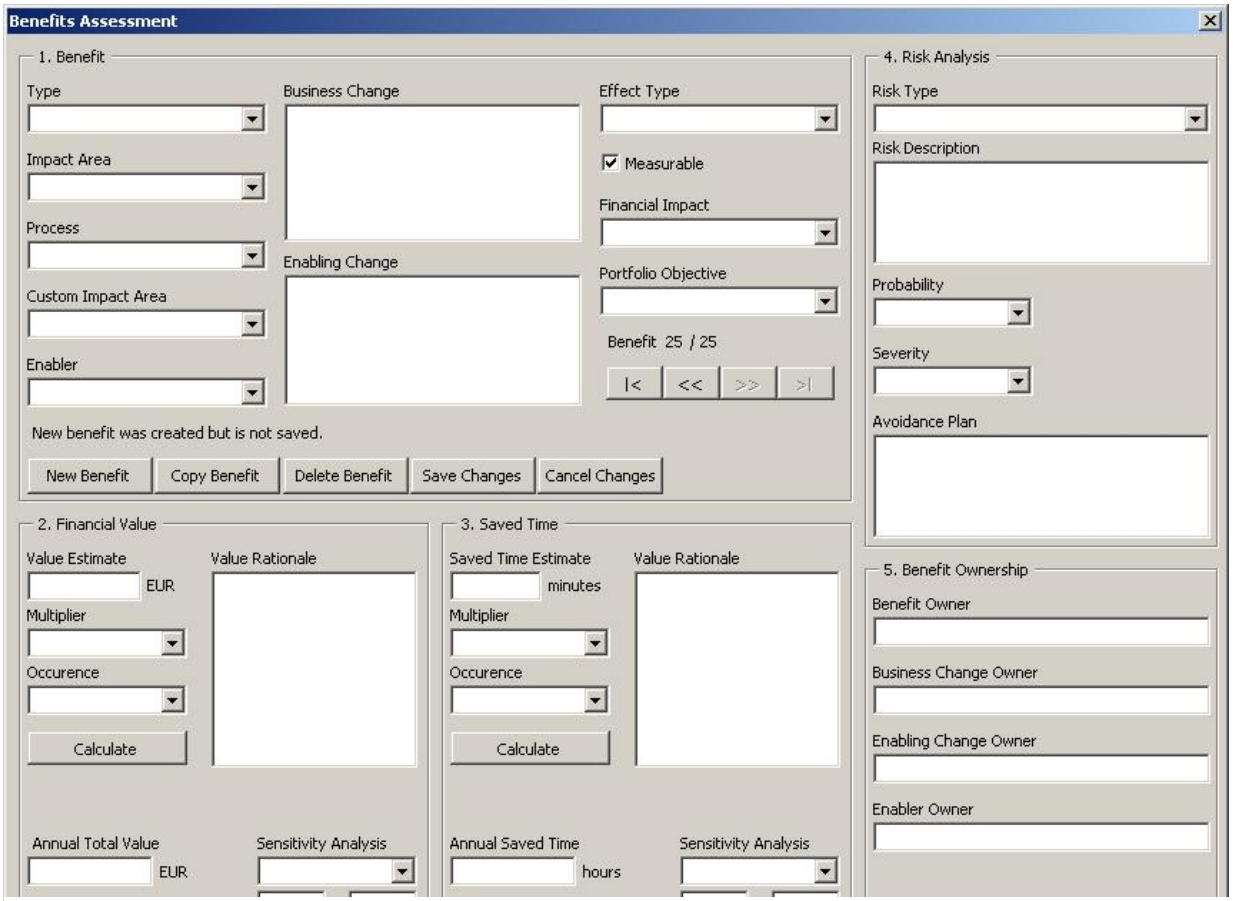


Figure 8. Example implementation of the benefit analysis tool (Source: Fujitsu Services oy)

11 BENEFIT ANALYSIS SWOT

In this chapter the strengths and weaknesses of the methodology are described using standard SWOT-analysis (see the following table):

Table 9. Methodology SWOT-analysis

Strengths	Weaknesses
▪ Links IT investment to actual business processes and objectives ▪ Benefits management forces focus of IT and Business Resources on investments that are worth making, encouraging an output-driven not input driven approach ▪ Provides preliminary goals and metrics for the project (business changes and benefit values) ▪ Systematic methodology to assess investment's benefits and disbenefits ▪ Provides detailed description of benefits, their influence area, value type and associated risks ▪ Project implications become clearer and responsibilities are clear from the start ▪ Methodology helps spotting false benefits, i.e. features that are described as benefits but are not actually useful for the business. ▪ Forces all participants to think issues from both business and technology (IT) perspective	▪ Methodology may seem complex and it requires someone, who has interiorised the concept, to manage the thinking and assessment process ▪ Risk of getting tangled with details ▪ Needs workshop(s) and requires time, which is usually scarce ▪ When conducted carelessly, the results may be biased and steer the actions in the wrong direction ▪ Methodology does not provide straightforward ROI analysis the decision makers may be expecting
Opportunities	**Threats**
▪ Revising during the project gives potential to spot further benefits (specially indirect benefits) ▪ IT and business understand each others obstacles and challenges better (common language) ▪ IT department raises it's status in the corporation, CIO takes place in the corporate management board ▪ Methodology can be used to stop bad projects.	▪ Methodology requires benefits management oriented mind-set, which may sound bizarre in the ears of technology professionals ▪ All stakeholders are not involved in benefits determination ▪ Benefits management is stopped when the implementation project is stopped. ▪ Methodology is used only to justify investment and the required actions are not thought over and implemented ▪ Benefits assessment is used as a project plan, which it is not. ▪ Benefits management is used to overcome poor system analysis and design.

12 PART II SUMMARY

In this part of the thesis, a methodology for evaluating the value of information technology investment is provided. The methodology takes both technology possibilities and business objectives as inputs, and provides business benefits as output. As mentioned earlier, the methodology assumes that the company that uses it has proper IT governance mechanisms and IT investment decision processes in place. The methodology can be used to identify and reject bad projects but it is best suited to analyse the investment project and to point out the required actions and the actual outcomes of the project and thus helps avoiding technology-enthusiastic projects that do not provide actual business benefits.

The methodology classifies benefits, their potential value, risks involved and required stakeholders in a systematic way and with proper use of the methodology projects are likely to succeed better and provide better return on investment and meet the objectives determined by the management. The figure above illustrates the idea behind the evaluation process.

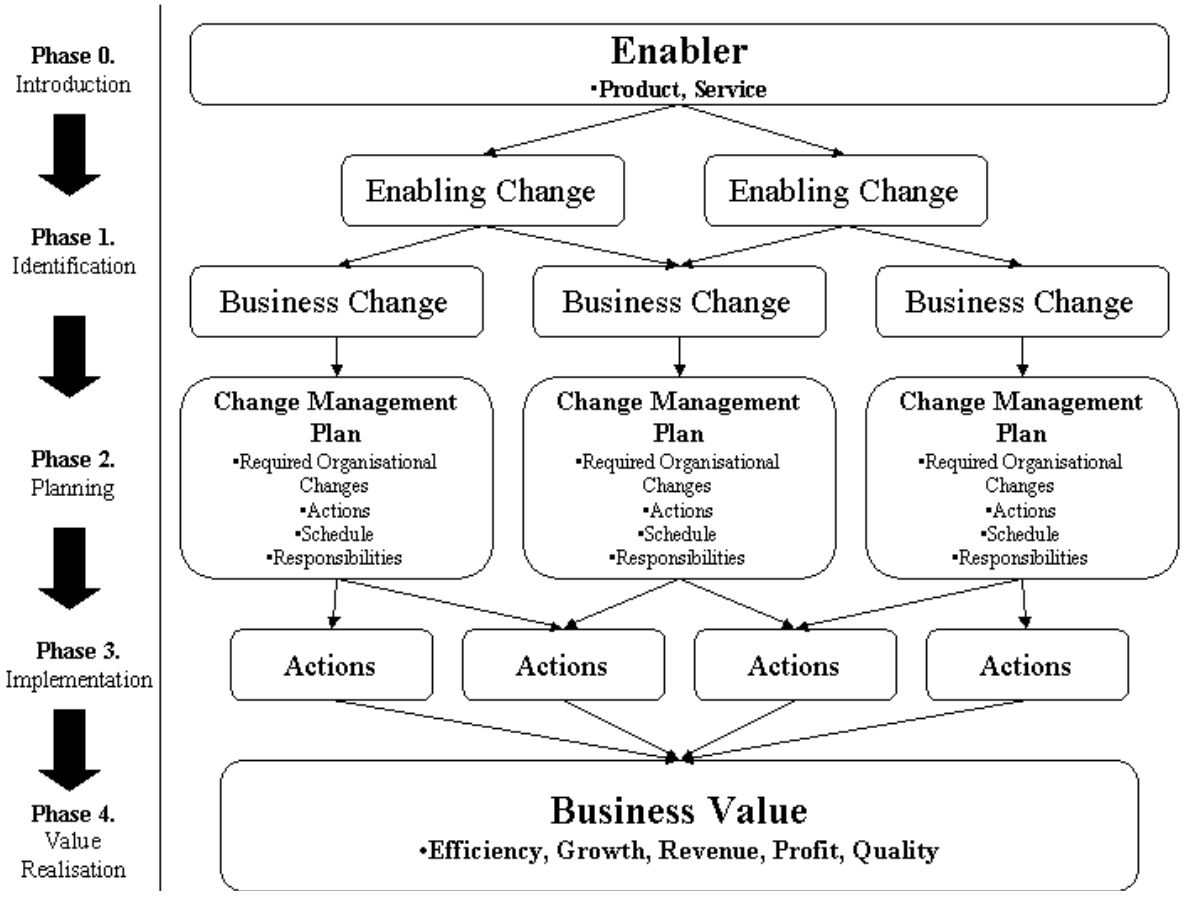


Figure 9. Value extraction mechanism of IT systems

13 CONCLUSIONS

13.1 Main findings of the study

The effect and role of IT in organisations is complex. On the one hand, IT affects virtually every part of corporations and is crucial and integral part of organisations core assets and capabilities, and on the other hand, IT is nothing more than a tool, an enabler, which can be utilised to accomplish certain tasks. To make matters worse, the approach differs in every organisation and also in different situations. Vast technology investments should not be justified based on instinct and opportunistic value propositions. Information technology, just as any other corporate asset, must be planned, implemented and utilised with care. Proper level of systematic analysis and planning is required to make wise information technology investment decisions.

Fortunately, there are tools and techniques that can help an organisation to govern manage and operate IT effectively. This study focuses on the concept of value of information technology in its different forms and tries to help looking at technology from the reasonable perspective. Similar to successful companies in IT sector is their ability to align IT investments and IT management with corporate business strategy and to be able to look at IT investments intangible benefits and their affect on different sides of corporation's portfolio of assets.

Building a link between traditional business and IT managers often requires a completely new view on IT. IT is not a separate cost function; it is an integral part of business and should be integrated to business strategy and business processes.

Another important finding is the accountability issue. IT benefits cannot be delivered solely by IT department, nor can IT department or the implementation project team be responsible for the overall benefits, the changes in the way the company conducts its business. IT has an important role in being an enabler for business changes, but the actual changes occur on the business, and only by the business. This requires education, communication, understanding, training and resources. But having understood the role of IT in corporations, managers no longer expect impossibilities from IT, and are able to start successful business development projects in which IT is only one part, a sub-project, which is managed and steered along with other complementary changes.

13.2 Managerial implications

Top-performing enterprises generate return on their IT investments up to 40 percent greater than their competitors. These top performing enterprises proactively seek value from their IT in a variety of ways (Weill & Ross, 2004):

- They clarify business strategies and the role of IT in achieving them
- They measure and manage the amount spent on and the value received from IT
- They assign accountability for the organisational changes required to benefit from new IT capabilities
- They learn from each implementation, becoming more adept to sharing and reusing IT assets

Weill and Ross (2004) argue that top-performing enterprises succeed where others fail by implementing effective IT governance to support their strategies. This thesis gives tools to address the challenging requirements of the bullets above. The problems in effective IT management are largely due to old concepts and perceptions about the role and value of IT.

Understanding the linkages between strategy, processes, intangible assets and information technology gives managers better ability to manage IT and launch IT investments that best serve the mission of the corporation. IT can no longer be managed as a separate entity; instead, it must be considered a value-creating activity, which includes many more aspects than just technological issues.

13.3 Limitations of the study

Primarily due to the problem of scope with IT evaluation problem, some parts of this study remain quite superficial. Including such vast topics as corporate strategy, IT management and change management into one thesis proved to be challenging. Consequently, for a reader not familiar with the themes in this thesis, the comprehension may be difficult.

13.3.1 Reliability

The proposed processes (IT value cycle in part I and Benefit analysis process in part II) are quite generic and the logic behind them is supported by wealth of research and thought. However, neither of the proposed models has been actually implemented in full scope, which means that the applicability of the methods is not comprehensively field-tested.

Also, the concept of IT value and evaluation of it seems to be confusing for academics and research. This fact is highlighted by the versatile opinions on proper metrics for IT. This means that nobody has still created a silver-bullet for IT evaluation and management and also the conclusions made in this thesis are likely to be partially wrong. However, the background for the assumptions and claims in this thesis basis on a quite comprehensive investigation of the topic and the references give a wealth of additional information to those who need more evidence and fact to support their thinking.

13.3.2 Generality

This thesis considered information technology on general basis, although it may have been affected by author's background in retail industry. However, the results of this thesis apply

to all industries and the benefit analysis model suggested in part II could be applied to all technology projects. However, as most studies this study basis itself on the American and European knowledge and can be applied on developed economies only. The developing economies are behind the developed ones in many aspects of technology, so their capabilities and maturity may not allow direct application of these methods.

13.3.3 Limitations

Although this thesis attempted to describe the big picture on IT value creation and IT evaluation, various parts would require further investigation. Especially change management is a topic, which looks to be crucial in investment projects to realise the benefits. However, in this thesis I only scratched the surface of the interesting topic. Another topic that I did not investigate is knowledge management, which is a topic that might add understanding to the benefit realisation problems in IT projects.

13.4 Further development suggestions

Although, the description of IT value cycle seems reasonable and compelling, the realisation in practise requires actions in every part of the process. Careful planning is an issue itself, but maybe the hardest, and also most rewarding, part is still the actual change management during and after the technology implementation.

The concept of change management is a hot topic in the market and still no one seems to have found a silver bullet that would solve the inherent problems in change. How do we get things done? Who should/is willing to take responsibility on different changes? How do we get people involved and committed to project outcomes, not only implementation? These questions had some light during the thesis, but putting this vision into action still requires further investigation.

In evaluation of IT value the concept of real options is interesting due to its ability to take uncertainty and flexibility into account as positive opportunities. Because IT industry is dynamic and situations and circumstances change rapidly, an evaluation method, which is capable to evaluate the effect of these factors sounds very promising. However, due to complexity of real-life problems, the theoretically sound concepts do not always provide the best result and in fact common sense, experience and careful planning are still the key factors to success, no matter what methods are used.

Finally, there is a limit to what can be achieved by formal rational evaluation methods. This limit becomes evident when decision makers fall back on `gut feel' and other non-formal/rigorous ways of making decisions. Thus it is clear that instinct (and intuition) is a central part of all decision-making processes and, in particular, the management decision-making process. Without an understanding of instinct we would have a very incomplete understanding of management. In order to influence and improve IT investment decisions,

it would be very useful to have a deeper understanding of this interior practice or functioning of the managerial mind (Bannister & Remenyi, 2000).

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APPENDICES

Appendix 1. Balanced Scorecard Strategy Map (Source: Kaplan & Norton, 2004)