



TAMPERE UNIVERSITY OF TECHNOLOGY

ALEKSANDR BUIANOV

**TOWARDS EVALUATION OF ALTERNATIVES IN INFORMATION
SYSTEMS INVESTMENTS**

Master of Science Thesis

Prof. Samuli Pekkola has been appointed as the examiner at the Council Meeting of the Faculty of Business and Built Environment on 6th May, 2015.

ABSTRACT

TAMPERE UNIVERSITY OF TECHNOLOGY

Master's Degree Programme in Business and Technology

Buianov, Aleksandr: Towards evaluation of alternatives in information systems investments

Master of Science Thesis, 62 pages, 0 appendices

May 2015

Major: Managing Technology-Driven Businesses in Global B2B Markets

Examiner(s): Professor Samuli Pekkola

Keywords: Information systems, investments, investment evaluation.

Modern highly competitive markets make companies to adapt to the ever-changing environment. Therefore, it is vital for the organizations to be flexible and provide maximum value to their customers. However, in modern firms almost every type of change touches the internal IS adjustment, as only utilizing them it is possible to achieve maximum efficiency, quality, and reliability of their services.

Nevertheless, every change requires an investment of time, money, or some other highly valuable resource, and in order to maintain healthy run in a long term, every single investment needs to be evaluated. However, evaluation process is highly demanding and time consuming as well, and it is not always easy to identify what exactly needs to be evaluated in regards to the investment decision. Current research tries to address the problem of evaluating the investment proposal or investment alternative on the very incipient stages, without gathering extensive information about the potential investment. The research methodology included literature research of other studies that were conducted on the topic. Found studies were analyzed in order to identify which problems modern companies face while evaluating their investment decisions.

After the analysis of the issues, it was found that most of the companies face the issues of skipping intangible benefits of an investment during the evaluation stage, which often represent the greater value than traditional qualitative tangible ones. In addition to that, companies need to establish a strong communication flow, as information gets scattered, leading to creation of a wrong picture over the project. Thirdly, each investment proposal should be reviewed in regards to company's environment and assessed on its fit to it. On the basis of these researched, current study suggests a framework for addressing these issues and avoiding pitfalls of investment alternatives evaluations for companies.

PREFACE

The thesis writing process has been a challenging experience. I have learned many things during the research, and especially how theoretical material from different researches can be actually applied in practice. This writing process has also been very educational for me in terms of time management. I would like to thank my supervisor Samuli Pekkola who his support and patience during the writing of this thesis.

I am very grateful to my family who supported me and all the closest people, without who this paper would have never been possible.

Helsinki, May 2015

Aleksandr Buianov.

TABLE OF CONTENTS

ABSTRACT	i
PREFACE	ii
TABLE OF CONTENTS	iii
ABBREVIATIONS AND NOTATION	vi
1. INTRODUCTION	1
1.1. Background.....	1
1.2. Research objectives.....	2
1.3. Scope of the study	3
1.4. Structure of the study.....	3
2. THEORETICAL BACKGROUND	4
2.1. Information systems.....	4
2.1.1. Types of information systems.....	5
2.1.2. Lifecycle of information systems.....	7
2.2. Investments in information systems.....	10
2.2.1. Evaluation of information systems investments.....	11
2.2.2. Information systems and business alignment.....	12
2.2.3. Requirements gathering	16
2.2.4. Problems of traditional investment evaluation	19
2.2.5. Intangible benefits evaluation for information system investments.....	22
2.2.6. Risks of investments in information systems.....	26
2.2.7. Investment decision-making process	28

2.2.8. Investment action options	29
3. RESEARCH METHODOLOGY	31
3.1. Research purpose and research framework	31
3.2. Methods of data collection	32
3.3. Obstacles and possible errors of the research	33
4. PRIOR RESEARCH REVIEW.....	35
4.1. The need for framework	35
4.2. Investment frameworks used	36
4.2.1. Design decision-making framework.....	36
4.2.2. Project Appraisal Method	38
4.2.3. Framework for evaluating investments by Counihan et al....	41
5. RESULTS OF THE RESEARCH	43
5.1. Results of frameworks' application in real-case scenarios	43
5.1.1. Results of design decision making framework	43
5.1.2. Results of Project Appraisal Framework	46
5.1.3. Results of the framework for evaluating investments by Counihan et al. (2002).....	48
5.2. Evaluating the results.....	52
5.2.1. Evaluation of research discoveries	52
5.2.2. Framework for investment alternatives evaluation	54
6. CONCLUSION	58
6.1. Research overview	58
6.2. Results of the research	59
6.3. Contributions for future research	61

BIBLIOGRAPHY62

ABBREVIATIONS AND NOTATION

B2B	Business to business
IS	Information System
IT	Information Technology
PAM	Project Appraisal Method

1. INTRODUCTION

1.1. Background

In today's highly competitive world companies need to react quickly and adapt to ever-changing environment. It is highly critical that companies try to be flexible and provide the maximum possible value to their existing and potential customers. Therefore, firms need to streamline their resource distribution in more intelligent way, and in addition to that, they need to maximize efficiency of how they do it.

Every change and adjustment requires a certain type of investment, which can be of time, human, or financial type, and very often all these types of investment do come combined. As a result, in most cases even the smallest adjustment of company's course to better fit its dynamic and changing vision and goals, leads to considerable investment that impacts a whole business unit or a whole organization.

Information systems were a hot topic for all companies over the last several decades. As Ives (1994) said, IT has given a great improvement to quality of our lives in ways that only few would be ready to sacrifice. Nowadays, companies cannot properly function without some information system implemented within it, as IS offer a broad range of possibilities, which extend and improve companies' capabilities, since they offer much better services comparing to the same in the past, and, more importantly, with a greater quality, reliability, convenience, safety, and flexibility (National Research Council, 1994).

Companies that operate in information-sensitive industries like financial services, healthcare services, communication, government, and so on have been admitting the importance of using information technology in their business (Kumar, 2004). However, a rapid pace of IT development puts certain challenges before companies that invest in IT in order to enhance the quality of their goods and services, because such dramatic declines in a cost for IT result in lower cost of entering the market for firms that embark on it later (Demirhan et al, 2006). Therefore, nowadays it is very important for companies not only to make a decision to invest or not to invest, but also to align on the IT portfolio and understand which investments are more important than the others, as they directly affect IS business value, which was defined by Schryen (2011) as "the impact of investments in particular IS assets on the multidimensional performance and capabilities of economic entities at various levels, complemented by the ultimate meaning of performance in the economic environment".

Having this said, it becomes clear that investments project a direct change on the business which they are implemented in. Even further, as discussed by Sircar et al (1998) in a modern competitive environment investments have a direct impact not only on company's performance, such as hard measures of return on investment or assets, market share and so on, but also on company's productivity, which is essentially an efficiency with which "outputs are produced for a given level of inputs". They also have found that there is a strong linkage between investments and company's operability in a long run, and that the non-computer capital, labor, and employee training should be taken into account when investments are being considered. Therefore it is clear that all investments should be evaluated with a special set of tools, techniques, and frameworks in order to ensure the most efficient distribution of company's resources.

1.2. Research objectives

In recent decades companies realized, that investments in information systems do not stand separately on their own. Almost any investment made by firms in processes, supply chains, products, support, and so on require a complementary IS investment (Peffer & Santos, 2013). This only intensifies the importance of proper evaluation techniques which firms would be able to employ in order to understand which investments would be more beneficial to the company in regards to its performance and productivity. Main research questions for this paper are:

- What are most common mistakes that companies do while assessing investments in information technology systems?
- How can these mistakes be addresses and avoided?

By answering these posed research questions it will be possible to develop a theoretical body that aims at addressing such issues. Therefore, the objective of the current study is...

...to develop a framework for evaluation of potential alternatives in information technology investments.

In other words, the current study aims at (1) discovering other researches that have been carried out on the topic of evaluations of IS investments. After that, (2) found research studies are evaluated on matter of discoveries and main issues that companies face, which they studied. Finally, (3) this study develops a framework that aggregates and takes into account major issues that were discovered in previous researches, and addresses them by suggesting a way of investment options evaluation, that can be potentially applied in companies.

1.3. Scope of the study

The study focuses on the review of the companies that are operating in mostly information-sensitive areas, as they experience the biggest need for proper handling of information technology investments. Therefore, the firms that do not possess the strong need in information technology investments, or whose investments do not include large information system contributions were not included into the study. The reason behind this is due to the nature of the research and the potential applicability of results, as review of companies who do not commit to considerable investments in information technology cannot provide strong meaningful results, and does not always reflect the true issues related to such investments.

It is crucial to state, that current thesis looks at the investment process starting from a moment when a decision about the need of the investment, or investment proposal, is made. Current study looks at this proposal and suggests a framework that allows to evaluate this proposal or series of proposals, and compare them between each other. However, it is important to notice that the research, as well as the suggested framework, focus on the prompt evaluation of the proposals, and therefore do not go beyond this point. As a result, the investment requirements gathering, as well as its implementation are not covered.

1.4. Structure of the study

Current study consists of five chapters. First chapter is introduction, which presents the background of the situation together with the objectives put for this study, as well as it defines scope of the research. After that, chapter that follows introduction focuses on introducing brief information on information systems as well as how they are related to this research. Furthermore, it explains the main concepts in regards to said systems, which are essential to understand in order to comprehend frameworks that will be discussed later. Chapter three introduces the research methodology together with an explanation how it is applied in current research.

Chapter four concentrates on the review of the studies made by other researchers, which were identified during the research. It collects the case studies and analyses them in order to extract the main results and findings. Furthermore, the chapter analyses the outcomes, which are used to build a framework for investment alternative evaluation, which is also presented in this chapter. Finally, the last chapter ponders over the sums up the paper and gives a free thought on the limitations of the thesis and how the current research can be improved and extended in future.

2. THEORETICAL BACKGROUND

2.1. Information systems

It is impossible to imagine current world without use of information systems. They power various applications that, while remaining in the background, power almost all services and goods people consume.

Supporting this, Córdoba (2009) states that organizations are currently using information systems as a necessity for survival. Moreover, information systems are not of a voluntary use, giving advantage over competitors on a market. He claims, that the times when IT and information systems associated were considered rare, as a luxury or even as an advantage are past. Having this said, it becomes obvious that almost each and every organization absolutely has to address certain amount of attention to information systems' planning and adopting.

It is important to understand how do information systems enable companies to perform better. Castells (1996) suggests, that with increasing collaboration and new forms of networking, the use of IS can open new opportunities for communication and interaction for organizations. Stair and Reynolds (2010) state that an organization is a formal collection of people and other resources established to accomplish a set of goals, and it is naturally a system, which has its own inputs, processing mechanisms, outputs, and feedback, all of which constantly use money, people, materials, machines and other equipment, data, information, and decisions, as shown on Figure 2.1.

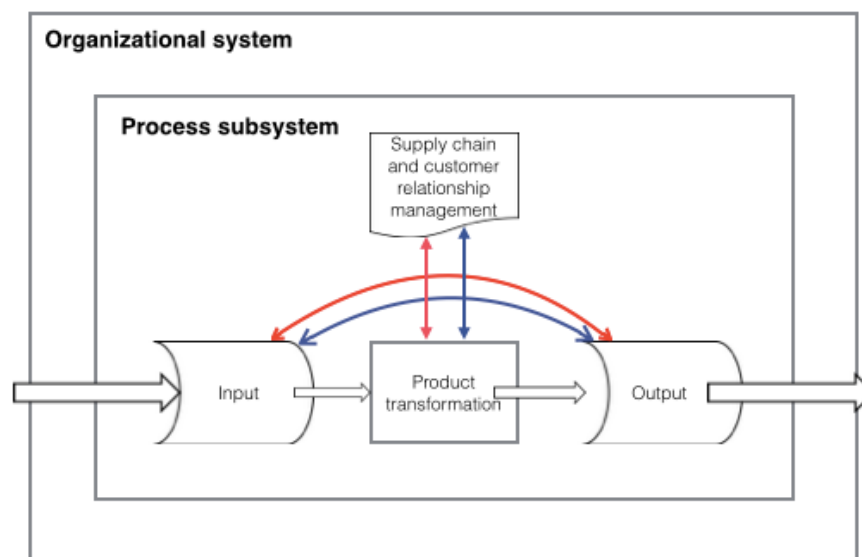


Figure 2.1. Organizational model (adapted from Stair and Reynolds, 2010).

Considering money and materials as inputs, outputs usually represent manufactured goods or services, minding that for a firm to be profitable it is necessary for inputs to be off a lesser value than outputs. All the processes that happen within organization are aimed to increase efficiency and to enhance the transformation process from input to output thus extending the discrepancy in the value. Information systems implemented in an organization help to achieve this. Information systems in organizations can be compared to the Internet for communication between companies, because information flows seamlessly between different functions, business units, and geographic boundaries. Therefore, it can be seen that such information systems do the same for organizations, as internet for various companies.

Therefore, information systems offer broad range of possibilities for firm performance enhancement, such as payroll processing, sale tracking, decision support, increasing transparency over various processes, gathering statistics, and many more. Typically, different information systems are developed for each of these examples, which will be reviewed further.

2.1.1. Types of information systems

Different organizations or departments have dissimilar goals, methods, processes, interests, and structure. Because of that, different types of information systems exist, and by providing different functionality they serve different purposes.

Nevertheless, looking at the big picture, the goals and methods share similarities among various firms on the market. Hence information systems share similarities as well, what allows, according to Stair and Reynolds, 2010, to classify them in three layers, as shown on Figure 2.2.

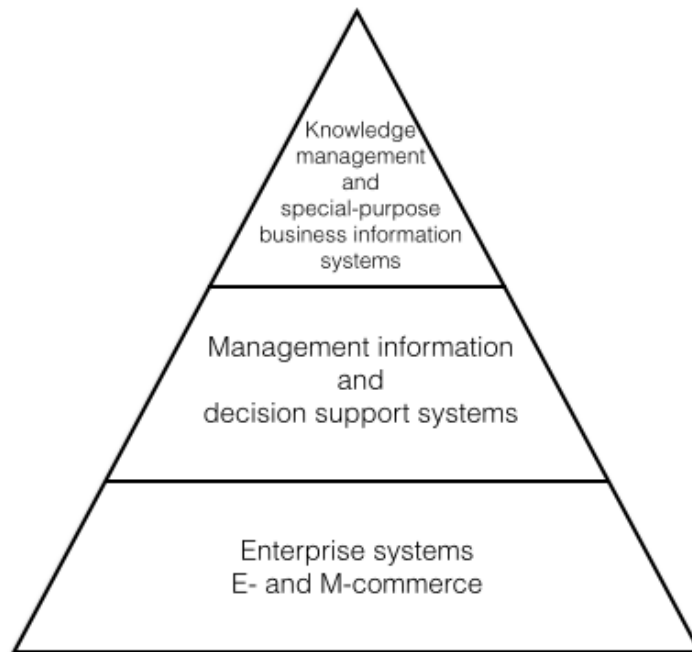


Figure 2.2. Three layers of information systems (adapted from Stair and Reynolds, 2010).

Each of these layers represents the basic functionality and purpose of the information system. However, it is crucial to understand that the boundaries are not strict and may be blurred in these systems. Because of the complexity and difference in firms' needs, sometimes information systems come in a package that integrates several systems in one product, or simply includes separate functionalities from each layer.

According to Markus and Tanis (2010) enterprise information systems take origin back to 1970s, when companies started thinking about automating certain tasks by using computer power. Such "islands of automation" represented certain automated functionality that was not integrated with other similar "islands", therefore complete information system as such was still a far reach, which nevertheless gave a start for the idea of information systems. However, nowadays, according to Castellina (2012) research, in 2012 84% of mid- and large-scale companies have already implemented information system solution. Such systems enable organizations to integrate all the primary business processes in order to enhance efficiency and maintain a competitive position (Addo-Tenkorang & Helo, 2011). Markus and Tanis (2010) classify the reasons for adopting enterprise systems into two categories - business and technical. Among technical reasons they name integrating applications cross-functionally, elimination of redundant data entry and concomitant errors with analyzing data, easing technology capacity constraints, and decreasing computing costs. In addition to that, more importantly, business reasons range over accommodating business growth, improving informal and or inefficient business processes, and reducing business operating and

administrative expenses. Therefore, it seems obvious, that the potential consequences and benefits of implementing these systems are significant.

However, while enterprise information systems are useful, they do not cover the whole range of companies' requirements. It is important to realize, that while such systems do process and store massive range of data, it would be beneficial to provide stakeholders assistance in decision-making process. Clearly, the quality of decision-making depends on the type of information available and the manner it is obtained and utilized, state Singh and Bhattacharya, 1995. Therefore, they define management information system as a system, which provides the required information, and only the required information, to each level of management at the right time, in the right form, to form the basis of decision-making and control. In other words, it would be a system for obtaining, abstracting, storing and analyzing data in order to present organized information to aid manager in carrying out his functions of planning, decision making, etc. However, while management information system helps organization to "do things right", decision-support system helps a manager to "do right things" (Stair and Reynolds, 2010). Therefore, the main focus of decision-support system is to go beyond simply storing and presenting data, but also to suggesting the possible courses of actions in certain situation. As a result, such systems help managers and decision-makers better understand processes and performance issues, as well as suggest options for various situations in a convenient and accessible format what enhances organization performance in a long-term.

However, in current fast-paced environment it is utterly challenging for companies to catch up with the latest developments and changes in the ever-changing markets. Thierauf (1999) states that knowledge-management systems provide competitive advantage by giving decision makers (from the highest level to the lowest level) the necessary insight into patterns and trends that affect their domain. This, in turn, allows managers to tailor their information and related knowledge requirements by discriminating according to defined criteria. Thus, it allows companies to utilize their aggregated knowledge to find emerging trends on the changing markets, and adjust their actions to better fit them.

As it can be seen, information systems have advanced in a great way since their commencement in 1970s and with the advance of modern technologies, nowadays they provide a broad range of functionalities to assist companies in their day-to-day business, as well as in helping to shape their strategy and enhance their run in a long term.

2.1.2. Lifecycle of information systems

Despite the need of information systems in current world and success in their implementation in different companies, it is crucial to understand that constantly changing environment should always be taken into account. For any company it is vital to keep in mind that systems employed within an organization cannot stay unchanged forever. The state of processes, goals, interests, structure, and other parameters of the

company change over time, and considering that systems must reflect current state of things – they must change over time as well.

There are several theories on the topic of lifecycle of an information system, but most of them agree that over its lifetime, IS goes through several stages, beginning with the conception, or idea generation of a system in the beginning to the decommissioning or abandoning the system in the very end. For example, one of the most popular theories is a waterfall model of a system's lifecycle, introduced by Royce (1970), as portrayed on Figure 2.2.1.

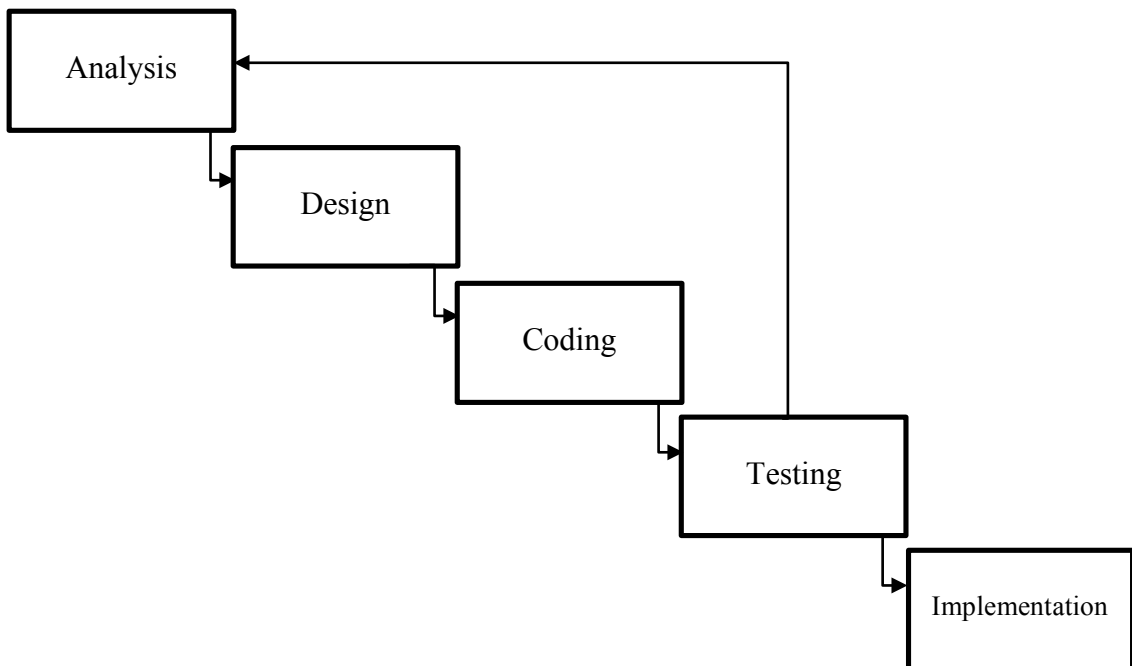


Figure 2.2.1. Waterfall model (adapted from Royce, 1970).

Five main stages of the model are:

- Analysis;
- Design;
- Coding;
- Testing;
- Implementation.

First of all, all it is needed to know the requirements of the system in order to be able to identify what is needed from the system. Once the requirements are understood and requirements document is ready, the system can be designed. Software and hardware architectures should be thought of at this stage, meaning that all the previous requirements has to be taken into account at this point. Next, the system needs to be coded and programmed, and can be tested after. Once development efforts are complete and organizations is certain that the system is capable of delivering all require functionality requested earlier at the first stage, IS can be implemented and maintained.

In similarity to this model, Blanchard and Fabrycky (2006) identify several stages that information system goes through over a period of a lifetime:

- Conception;
- Design;
- Development and production;
- Distribution and implementation;
- Operation
- Maintenance and support;
- Phase out and disposal.

First of all, the yet nonexistent information system takes its start at a conception stage. At this point it is the most important for a company to understand the need and purpose of the information system, what involves reviewing of a target environment. Information Resources Management Association (2001) defines target environment as the area of interest into which a company wishes to intervene. Furthermore, target environment has subjects of interest whose implications the management of the target functions would strive to achieve or avoid in order for the enterprise to thrive in a wider environment. In other words, company identifies possible areas of improvement in the target environment, which, in turn, give birth to the need of the information system. On the design stage generally the needs for a potential systems are gathered, requirements are aligned, possible solutions are proposed and the overall validity of the system is evaluated. Rajaraman (2004) suggests following steps for the information system design stage: requirements determination, requirements specification, and feasibility analysis. Having system's design aligned and feasibility justified a firm gains the possibility to develop a detailed design and outline needed specifications for the system, as well as produce and test system.

Once a system is developed, it needs to be distributed and implemented within a target organization. At this point it is important to note that system is not necessarily being developed for internal use only. Quite common scenario for firms is to buy already produced information system and to make it tailored for their custom needs. Therefore, evaluation of required changes and actual customization happens on this stage, before implementation. Once deployed, a system is simply being used for the needs of the organization. At the same time it is being constantly monitored in case it needs to be modified or adjusted to better fit in the production environment. Moreover, system is constantly assessed if it is delivered required quality and functionality to the company, as well as being checked against the original design.

According to Blanchard and Fabrycky (2006), effectiveness and efficiency of the system must be continuously evaluated to determine when the product has met its maximum effective lifecycle. If a system no longer meets required criteria of operability and efficiency, it must be evaluated for retirement. In addition to that, it might happen that

external or internal environments of a company change, making a system ineffectual despite system's normal functioning.

To address this issue, Munassar and Govardhan (2010) suggest incremental model of IS lifecycle that partially addresses the issue of aging. They suggest, that development and production, distribution and implementation, operation, and maintenance and support can be united in one stage. Thus, after each of the phases of this stage, there should be received a feedback from a client in order to adjust the system in a way it is needed, as shown on Figure 2.2.1.2.

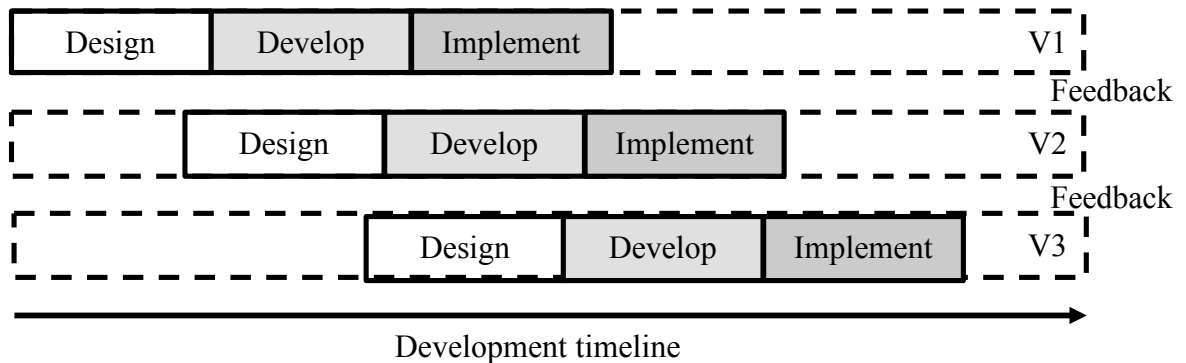


Figure 2.2.1.2. Incremental stage of IS development (adapted from Menassar and Govardhan, 2010).

This way, when IS is deployed, it is ready for use, but it can be continuously developed in order to satisfy changing design and requirements.

However, in any case at some point of time an IS system would not be able to cope with the changes and would have to be phased out and disposed. At the same time, the lookout for alternative systems should be happening.

Considering that companies operate in utterly complex environment it is crucial to distribute resources efficiently. As can be seen, information system lifecycle follows this approach, allowing firms to evaluate their needs and requirements, and to make the most of a system employed.

2.2. Investments in information systems

Strategic decisions made by managers are crucial because they commit resources, set precedents, and direct actions (Mitchell et al, 2011), which in turn make a significant impact on company's strategy and operability in a long run. Therefore, it is essential to obtain correct and complete data in order to be able to make rational and justified decisions. Furthermore, despite organizations engaging in all kinds of strategic decisions, those related to IT investments have become increasingly important and they illustrate the involved challenges well (Boonstra, 2003). Moreover, within the past several decades

it has become clear that most major investments by firms, whether for processes, products, supply chains, or support, require complementary IT investments (Peffer and Dos Santos, 2013). In other words, in almost any business environment information systems play such a vital role and are integrated so deeply in company structure and operability, that it becomes impossible to separate them from other parts or processes. Companies have become utterly dependent on the operability of information systems that even a several minute outage can serve as a basis for some firms to lose millions of dollars of profit. Hence, it becomes apparent how important the investments in information systems in companies are.

Peffer and Dos Santos (2013) agrees and but warns that although firms have made very large IT investments in recent decades, these investment decisions have never been easy. Many of the biggest challenges have been in identifying and estimating the benefits and costs for new IT applications. Furthermore, according to the research by Brynjolfsson (1993) it is apparent that managers rarely justified their investment decisions, mostly relying on the gut feeling, knowledge of the topic, and experience. This is extremely surprising to find out, as it is usually expected for companies to have various techniques for estimating investments. However, Avgerou (2000) justifies such approach, claiming that early IT applications were aimed to replace manual labor rather than enhance current programmed solution. As a result of this, in the best-case scenario, in most companies discovery and evaluation of IT investment alternatives were traditionally focused on financial issues, and therefore have been supported by readily available instruments that measure tangible impacts, such as financial indicators and KPI. Nevertheless, now we have more comprehensive tools for estimating the possible effects of the implementation of an IT solution. These tools help to get an insight not only on the possible benefits of choosing certain information system, but also assist on choosing one solution over another.

Overall, it can be seen that investments in IT and information systems are essential for a contemporary company to succeed. Even more, Grant (2003) supports this by saying that the contribution of large-scale IS deployment to superior business performance is predicated on the dynamic alignment of business and information technology (IT) strategies and the underlying architectures and systems that support the strategy execution. However, considering that firms do not have unlimited resources it is extremely important to choose and invest only in those ventures that promise to yield the maximum outcome.

2.2.1. Evaluation of information systems investments

Evaluating the possible outcomes of investments is a very difficult and demanding task, which does not necessarily provide a certain result. Moreover, while assessing the investments there is no guarantee that the result will be trustworthy, as many uncertainties and factors affect the outcome. Nevertheless, the company struggling to allocate money

or other resources to development of its information systems may find itself in an extremely challenging and dangerous situation, which may lead to loss of market. Because of that, the biggest importance of an information system evaluation relies in the jeopardy of making an uninformed decision.

Evaluation of information systems can be of many criteria. It can be either formal or informal, based on calculations or guess “feelings”, accounting different parameters, such as social, financial, technical, and many more.

2.2.2. Information systems and business alignment

As it has been found out, information systems contribute to achievement of company goals, enhancing its profitability, and general performance. However, Worthen (2002) states, that usually information systems are being deployed primarily for solving pressing functional and technical problems without regard for overall strategic considerations. As a result, companies fail to perceive the broader implications for organizational change that implementing these systems leads to.

It has been researched by Chan et al (1997) that for firms to yield the best value of its investments, it must create an explicit understanding of the connection between IS strategies and business aims. Therefore, companies that possessed better understanding and implementation of these connections, demonstrated not only better return on investment, but also higher performance after the implementation of investments into information systems.

Parker (1996) introduced a model for shaping interconnection between information systems vision and strategy, overall business strategy, IT execution models, and the supporting business (Figure 2.2.2).

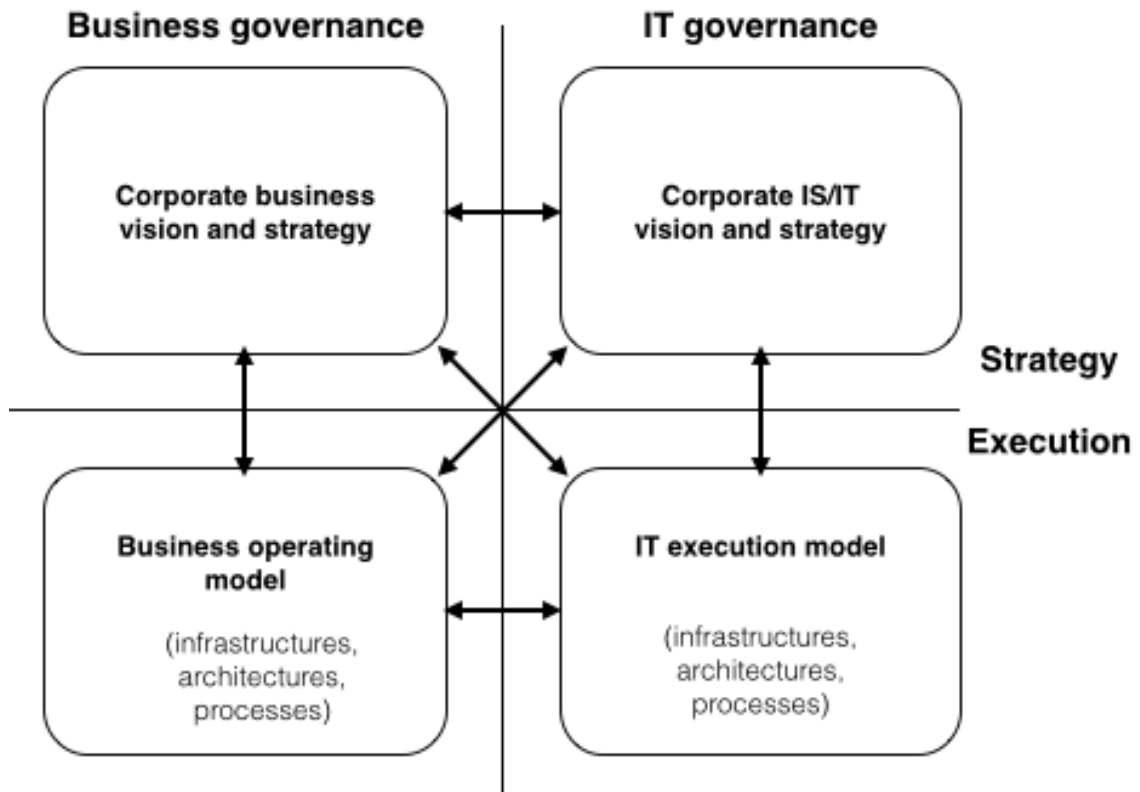


Figure 2.2.2. Business goals and IS alignment (adapted from Parker, 1996)

This model states, that information system strategies have to comply and assist in forming business vision and strategies. Therefore, the model explains that IT can supply achievement of existing company's aims and goals, while at the same time IT can contribute to forming and adjusting current and future business objectives and vision. Most importantly, it enables managers to see what possibilities information systems offer to business to produce and create goods and services. According to Hirschheim and Sabherwal (2001), although strategic IS alignment is a conceptually simple notion, the process of attaining and maintaining alignment is not always straightforward and can be quite difficult and fraught with false starts, and especially in dynamic environments, which are very common in modern world.

Nevertheless, Ali (2000) claims that despite all difficulties, in case of proper and successful implementation of information system alignment to business vision of the organization, information systems can provide a plethora of opportunities for the firm on several levels, as portrayed in Table 2.2.2.

Table 2.2.2. Opportunities provided by IS systems aligned to business objectives (Adapted from Ali, 2000).

Type of impact	Opportunities
Strategic	Support globalization, strategic alliances, mergers and acquisitions Improve responsiveness to competitive pressures and market opportunities Support the supply chain, selling chain and electronic business processes Support consolidation of the IT infrastructures across business units
Organizational	Create a platform for business process re-engineering Support the introduction of best practices in business processes Improve communication and coordination between and across business units Support the rationalization and coordination between and across business units
Operational	Improve the transaction-processing ability Improve operational efficiency by integrating operational and transactional data across operating units Improve the quality and visibility of organizational information Improve the decision support capabilities
Technological	Improve the processing power across organizational network Introduce more cost-effective IT architectures Standardize IS/IT operations for developing focused IT competencies Overcome systems challenges such as year 2000 and Euro compliance

Despite offered benefits, failure to implement information system, or to align it to business vision can lead to massive organizational risks and damaging business operability. As a result, it is vital for the company to commit to organizational level involvement into implementation and managing information system. To support this though, Rockart et al (1996) states that organizations need to clearly identify the capabilities required for delivering the IT solutions and commit to those, as effective implementation of those is associated with companies that have dedication to managing the deployment process during all stages from identification of needs to use and support of the system. Otherwise, failure to commit to set goals will lead to a failure of system implementation and irrational waste of company resources, what essentially in a long term leads to harm of a company's operability.

In order to find out how companies align their information systems to business strategies Grant (2003) carries out a research during implementation of new IT governance model at Metalco, a multinational leading producer of metal products with offices in over 30 countries. This research was aimed towards answering two main question in regards to aligning IT to business values:

- What is the experience of organizations in practice in aligning their IT strategies with their business strategies?
- What is the impact of global ES deployments on strategic IS alignment?

During this research it has been found out that in real life scenarios firms have difficulties with aligning IT strategies to business because it is more difficult than originally thought. While it is not unexpected, it portrays that developers do not completely understand anchors serving as connecting points between business and IT.

More precisely, several main factors were found during this study that lead to misalignment and less successful implementation of the project. First of all, top management of the company lacked a clear corporate vision for the role of information systems. Secondly, lack of clearly shaped vision for IT in Metalco led to fragmented information systems investment strategy, as investment initiatives were pushed at different organizational levels with different levels of interpretation among them. Furthermore, at some levels of the company implementation of information systems was perceived as a purely technical issue. Thirdly, again, “there must be a clear fit between the information requirements of the business and the information architecture and infrastructure put in place for delivering the IS in order for organizations to derive significant value from IS investments”. In the case company the main focus was put on information requirements on the enterprise level of the company, while other levels failed to receive a proper share of requirement review. Moreover, managers hesitate to commit to considerable investments needed for successful project implementation due to absence of immediate benefits. Finally, case company showed lack internal information system management resource. As a result, it brought certain limitations to the implementation of the project, as well as the ability to support internal customers.

As a result, learning from this research report that companies need to invest to communicate the clear vision of the role that information systems will play for the company, as well as to make sure that this vision is perfectly understood. In addition to that, managers must show greater dedication towards business-driven planning at all levels of the organization. Management has to ensure to come up with mechanisms to review long-term benefits of project implementation and stick to them without trying to pursue short-term goals, as it hampers successful implementation of the project. Furthermore, to boost efficiency it is necessary to ensure an information system evaluation is not entirely focused on prevailing IT costs, but rather that it delivers considerable returns over the lifecycle of the system. At the same time, such behavior

should also be understood at top management level and encouraged through all levels of organization. Finally, companies should “consider the development of a multidisciplinary global IS competence center for enlarging and enhancing its IT program development, management and delivery capabilities”.

Guillemette & Paré (2012) carried out a research among 24 Canadian companies, in which he gathers the results of how the contribution of the IT functions helps to align with business goals in companies, as well as to identify how it mesa with top management’s expectations towards IS implementation. In this research he agrees with Grant, but expands his thought by insisting on the importance of understanding the senior management’s perception of the importance of the IT to the organization. Also, Guillemetter & Paré claim that for the top management of the organization it is very important to align on the understanding of which level a particular information system belongs to, let it be operational, tactical, or strategic.

Having this said, it can be seen that aligning internal IT strategies towards business vision and objectives is crucial for successful implementation of information systems. Companies should take into account the suggested list of improvements, based on the studies by Grant and Pare in order to achieve best return on their investment, as well as to understand their actual needs before starting the information system requirements planning.

2.2.3. Requirements gathering

Investments in information systems tend to require a substantial approach, as they usually demand a significant share of money, as well as may bring company to the risk of bankruptcy if implemented poorly. Therefore, companies need to invest resources into researching their actual needs for the system and the ways they can implement the information system properly. The whole reason for requirements gathering is to comprehend and understand the customer’s needs and reflect them within the system implementation. Holmström and Sawyer (2011) claim that requirements are often formulated according to particular specifications, which may include detailed specifications regarding the IS’s functions, appearance, and performance. Therefore, the specifications act in a role of a guide towards the development of an information system, and serve as a basis on top of which a system will be built. As a result of this, requirements that were selected inappropriately or wrongly may lay a foundation for an investment to bring less return than planned, as well as act as a failure to a whole project or a company.

Thayer & Dorfman (1990) continue this though, saying that prior to the implementation of information system it is vital for the companies to discover, prioritize, document, represent, and maintain a set of requirements. Furthermore, requirements analysis and requirements specification should not be forgotten. In addition to that, the requirements collection has certain caveats. Such, Truex et al (1999) provides more practical

knowledge on the topic saying that in most of organizations during requirements realization stage it is assumed that an organization remains unchanged sufficiently long for a complete list of required specifications to be gathered and a system developed. Secondly, it is assumed that users are both capable and expected to understand and communicate their wishes and desires towards the needs of a system in a clear and structured way, what is not true for the most of organizations. Third requirements collection caveat, expanded in a study of Bergman et al (2002), states that the main management of an organization not always has a coherent and shared understanding of the aims of the information system to be invested in.

Therefore, it is important to take these limitations into consideration and try to adopt company practices to fit them the best way possible. Thus, Truex et al (1999) states that “contemporary organizations must be flexible and adjust rapidly to dynamic situations, hence their IS must be similarly flexible”. In addition to that, the process of identifying requirements and needs to the information system must be flexible and adjustable as well. This way, requirements must be re-accessed and re-validated on a regular basis. Furthermore, Hansen et al. (2009) agrees by stating that dynamic model of organizing, identifying, understanding and representing a organizations’ problems and needs should be seen as evolutionary, ongoing and constantly changing. Therefore, it can be easily seen that is critically important for the actors for IS implementation to think about system implementation not only within a system, but also within a larger socio-economic context in which information system will find its use.

To support this though, Holmström and Sawyer (2011) carried out a research in which they explored the ways in which information system developers engage in requirements gathering and how said developers devise its value. They conducted 26 qualitative interviews with developers and applied qualitative analysis to interpret the requirements gathering practices. In addition to these interviews, more than 200 relevant documents were gathered. After that, they applied SCOT approach to collect, analyze, and report data. The SCOT framework upholds the principle of symmetry between social and technological elements, avoiding any reference to material characteristics of a technology in its analyses. Technological change is related to social parties, and especially to the processes of interpretation, negotiation, and closure by different actors (Pinch & Bijker, 1984). This approach was used to understand why information system developers “often choose to ignore, and thus effectively black-box, the complexities of gathering requirements in order to simplify both the difficulties of their work and their relations with customers”.

During this study, Holmström and Sawyer found that requirements gathering reflects:

1. The changing needs of the organization;
2. The way in which structured IS methods are enacted via experience and social competency;

3. The formation of project groups;
4. The resolution of conflicts and negotiations.

First of all, during the interviews it was found out that developers of information systems generally assume that IS development projects will necessarily lead to a finished and complete system. This means that developers do possess unrealistic worldview of requirements to be unchangeable. Furthermore, they assume that users do not have a definite view of the requirements in the organizations, as they are constantly being changed during the development process, which was viewed as a common characteristic, but nevertheless quite problematic. However, sometimes it might have happened not only because users regularly change the requirements, but also because developers misunderstood the environment or requirements, or due to communication errors when customers assumed some functionality would be included while in fact developers thought otherwise. Also, there was identified a possibility for requirements to be not prioritized or be forgotten during development.

It was found that IS methods are enacted via experience and social competency. Interviews stated, that the requirements were gathered from customers by using some form of the existing method. However, while these methods differ among companies, most of developers admitted that they use them not as rules, but more as guidelines for requirements gathering, as they mostly rely on experience, working knowledge, and social competency. As a result, it is possible to say that methods were not being followed.

It was found out that during requirements gathering it was common practice for developers to work in project groups, and, very importantly, group members had little to no involvement in deciding who is part of the group or not, as this was mainly task of the commissioning organization. It was also noted that due to unwillingness to start a new project with problems, project as group members were chosen mostly those who demonstrated positive attitude, enthusiasm, and ability to work with others. Therefore, combination of these three factors was viewed as more important factor than technical competence, organizational relevance, or domain knowledge. Considering the fact that members were chosen using non-relevant factors, it was observed that sometimes members representing some departments were forgotten or given lower priority. Also, members who were less interested in the process were not allowed to express views regarding requirements for the system.

Lastly, in regards to conflicts it was observed that sometimes it was healthy for them to arise during the development process, as they had impact on the project immediately, what is incomparably better than when the project had ended. Regardless of their position on the conflict, developers emphasized that discussion between the parties was the most important factor for creating mutual understanding. As an example, it is beneficial to discuss requirements thoroughly to avoid their different interpretation, what can the best to be achieved by arguing. In addition to that, interviewees noted as well more general

observations, such as observation that conflicts, which happen during the process of requirements gathering, often reflect other ongoing issues within the organization. Moreover, developers noted that there is only a certain limit to which you can argue and discuss a certain issue or requirement. Also, it was found that while compromise is critical, it is not necessary to find compromises for all conflicts. On the other hand, several respondents noted that avoiding conflicts could be beneficial from time-saving perspective of view.

As a result of this work, Holmström and Sawyer outline two changes that need to happen in organizations to streamline the requirement realization process. Firstly, developers need to have better analytical approaches to help them evaluate and prioritize domain and systems challenges. Secondly, all participants in requirements gathering process, including developers, need to develop social skills for successfully engaging in negotiation, conflict management and the other social competencies through which requirements (and methods to gain them) are developed.

Therefore, it is important to notice that for successful realization of the needs and requirements of the information system, developers should not only possess technical awareness and domain knowledge, but also social competence and awareness. At the same time, it must be understood that requirements gathering should not solely rely on social nature, as this can be extremely time-consuming. As the result, there is a clear need to shift towards adopting a more complex, negotiated, approach to developing requirements for requirements evaluation.

2.2.4. Problems of traditional investment evaluation

As investments lead to a considerable change within an organization, it is vital for organization to carefully evaluate it before implementation takes place. Although it is important for investments to align with company's business values, traditional investments evaluation techniques and tools do not always find the best fit for information technology investments. This way, Irani & Love (2001) claim that as these techniques concentrate on the operational implications of the investment decision and fail to evaluate the strategic implications of the investment decision, many strategically important projects are not evaluated adequately. However, this cannot mean that evaluation of investments for information systems should be left aside.

In regards to the same though and considering traditional investments assessment, Ballantine & Stray (1998) stated that capital budgeting techniques are regarded as the primary accepted approach to evaluating IT investments. Furthermore, it has been researched that in many companies investment assessment mechanisms are used to validate investment decisions that have been already made, rather than as an evaluation technique to estimate value of investment options. Arapoglou et al (1997) agrees and gives practical overview stating that there have been attempts to adapt capital budgeting

tools to suit IT investments better by taking technologies' business and strategic values into account, but were of little help due to difficulties in estimating and applying those values. It is important to note that even with having problems of traditional evaluation outlined, top management still tends to rely on financial evaluation. Therefore, in his study Counihan et al (2002) tried to outline main problems of traditional approaches for evaluating information system investments. His findings are represented in Table 2.2.4.

Table 2.2.4. Problems with using traditional approaches for evaluating information system investments (adapted from Counihan et al, 2002)

Problem	Explanation
Evaluating intangible benefits	The identification or incorporation of intangible benefits does not form part of any capital budgeting technique (Chapman, 1988). Traditional appraisal techniques are not suitable for evaluating projects with major intangible strategic benefits (Irani & Love, 2001).
Making the relationship between IT and profitability explicit	There is no clear relationship between IT investment and profitability (Strassman, 1990; Lee 2001) as the implications of the IT investment decision often extend outside the context for which it was actually intended (Hopwood, 1983; Wilcocks, 1994). However, the traditional investment appraisal techniques assume that such an explicit and measurable relationship exists.
Dealing with the vanishing status quo	The traditional investment appraisal techniques assume that the market place and environment will remain static regardless of the investment decision. Continuation of the status quo, as an alternative to a proposed IT programme may lead to rapid deterioration of the company's present position (Clemons & Weber, 1990). Reliance on traditional appraisal techniques may lead to projects of long-term strategic importance being excluded, which could jeopardize the future survival of the organization (Fitzgerald, 1998).
Dealing with the extended investment time frame	Expected life span of the project is longer than that assumed with the use of the traditional financial appraisal techniques. (Kelly, 1997).
Evaluating infrastructural investments	The traditional capital budgeting techniques are suitable for standalone investment decisions and application evaluations. It is difficult to associate infrastructure-type investments with the subsequent benefits of using applications (Fitzgerald, 1998) even where sophisticated investment appraisal techniques are used (Ward, 1994).

However, in his study Counihan et al. suggested techniques to overcome each of these problems, as shown in table 2.2.4.1.

Table. 2.2.4.1. Summary of the difficulties associated with the traditional capital budgeting techniques and overcoming these difficulties (Adapted from Counihan et al, 2002)

Problem	Problem as evident in organizations	Overcoming the problem
Evaluating intangible benefits	The chief driver was that the companies required information relating to customer behavior. As a result, the business value of intangibles was paramount.	The criticality of the intangible benefits determined that high-level commitment and sponsorship was received
Making the relationship between IT and profitability explicit	The companies had the opportunity to exploit customer information and react proactively to competitive pressures. However, it is extremely difficult to measure potential benefits of this nature	The organizations leveraged commitment and sponsorship at appropriate levels to emphasize the impact of exploiting the intense relationship between the organization and the customer.
Dealing with the vanishing status quo	The market place in the financial services sector was changing so rapidly that existence without data warehouse technology was in doubt.	The level of commitment and sponsorship demonstrated the criticality of the data warehouse and the need for such technology to allow the organizations to respond more proactively to an aggressive market place.
Dealing with the extended investment time frame	The problem was one of achieving a balance between realizing the longer term business benefits of a data warehouse with the need for short-term deliverables	<ol style="list-style-type: none"> 1. Two-tiered evaluation process to ensure quick deliverables. 2. Enterprise-wide data warehouse broken into discrete data marts

Evaluating infrastructural investments	The proposals required extensive investment in a technological infrastructure that would not deliver business benefits by itself.	<p>3. An informal, incremental approach to evaluation.</p> <p>1. Two-tiered evaluation process.</p> <p>2. Data marts chosen such that these marts would recover the base infrastructural investment and return a payback in the short term.</p> <p>3. An application basis with no formal financial appraisal.</p>
---	---	--

As it can be seen, evaluation of information system investments using traditional tools brings certain difficulties, as they are not able to capture the broad picture and reflect the real value of implementing a solution. Highlighted problems represent the main points of difficulty, as well as show the most common challenges in modern organizations. Nevertheless, suggested ways of overcoming said problems could be of a use for companies during investment assessment stage.

2.2.5. Intangible benefits evaluation for information system investments

As it has been mentioned in the previous chapter, one of main problems of traditional investment evaluation is the inability to capture the value and relevance of intangible benefits of the investment. Therefore, due to the lack of skill to capture the qualitative and intangible benefits management mostly uses available techniques for estimating quantitative factors. As a result of that, for the dominating number of cases the project success is estimated by the financial measures, such as return on investment (Farbey et al., 1992).

However, Sircar et al (2000) discovered that despite investments in information systems have tight connection to sales, assets, and equity growth, they are loosely related to net income. Moreover, they found out that investing in information system staff as well as staff training is beneficial to company's performance, which, however, is difficult to measure. As a result, it is claimed that many of the possible benefits from investments in information systems are not taken into account during the evaluation stage for assessing their effect on an organization. Taking into account the usual size and impact of

investments, it is crucial to take a closer look at them and include them into possible investment benefits evaluation.

Throughout the history goods have been generally material and associated with wealth. Therefore, logic has developed in a way to consider that investments must be tangible, therefore possible to estimate asset value, profit, savings, and so on. However, in modern environment it often happens that intangible assets and investments in those bring higher revenues and returns, as found out by Murphy & Simon, (2002). Intangible asset is “an identifiable non-monetary asset without physical substance held for use in the production or supply of goods or services, for rental to others or for administrative purposes” (Bradbury, 2001). Definitely, for information systems the characteristics of intangible assets can go beyond this definition, as they can represent copyrights, patents, processes as well as improvement ideas for those. In other words, tangible benefit has characteristics that can be measured and assigned a certain value, while intangible benefit is something that cannot be easily measured.

In line of this thought, Irani & Love (2001) suggested that benefits could be categorized in relation to the level of their belonging to the company layer, as showed on Figure 2.2.5. Basically, their suggestion claims that while moving from strategically oriented projects to operational ones, derived benefits from the investment shift from generally intangible and non-quantitative nature towards tangible and quantitative.

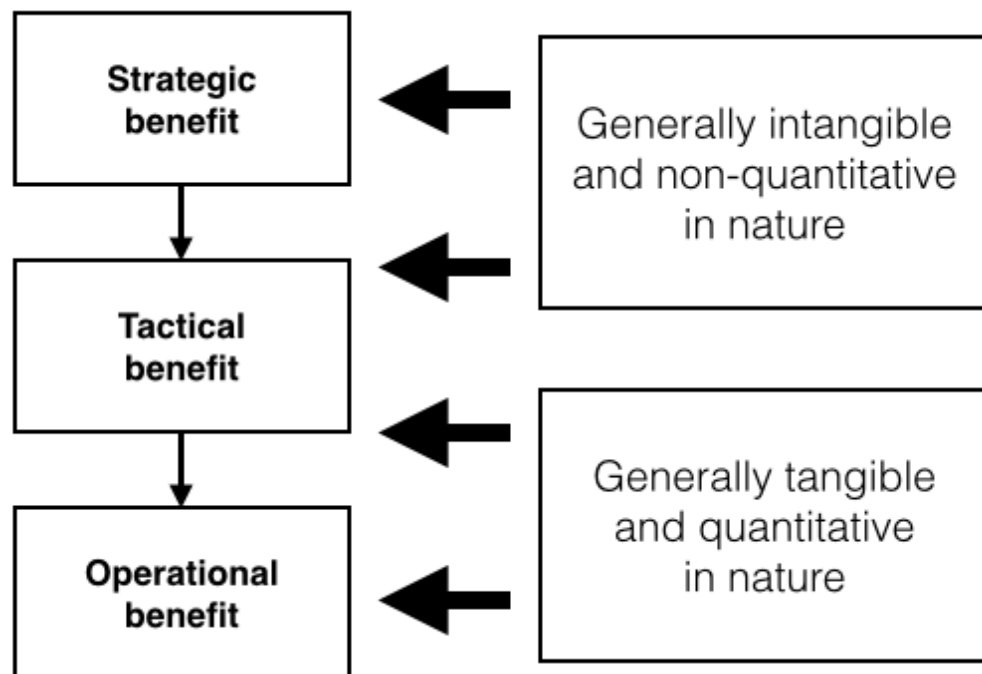


Figure 2.2.5. Nature of benefits in an organization (adapted from Irani & Love, 2001)

Considering that investments in information systems generally are of strategic nature, it is difficult to correctly estimate the received benefits of the investment.

Furthermore, Accampo (1989) expands the idea, saying that quantitative techniques are challenging to apply to those areas of company operations, where information is the key commodity. Considering that most of key performance indicators for information systems investment evaluation are intangible, usual techniques of evaluation fail to estimate, if they cannot be quantified in financial bounds. In support to that, Hares & Royle (1994) outlined four intangible categories of IT investment benefits, as portrayed on Figure 2.2.5.1.

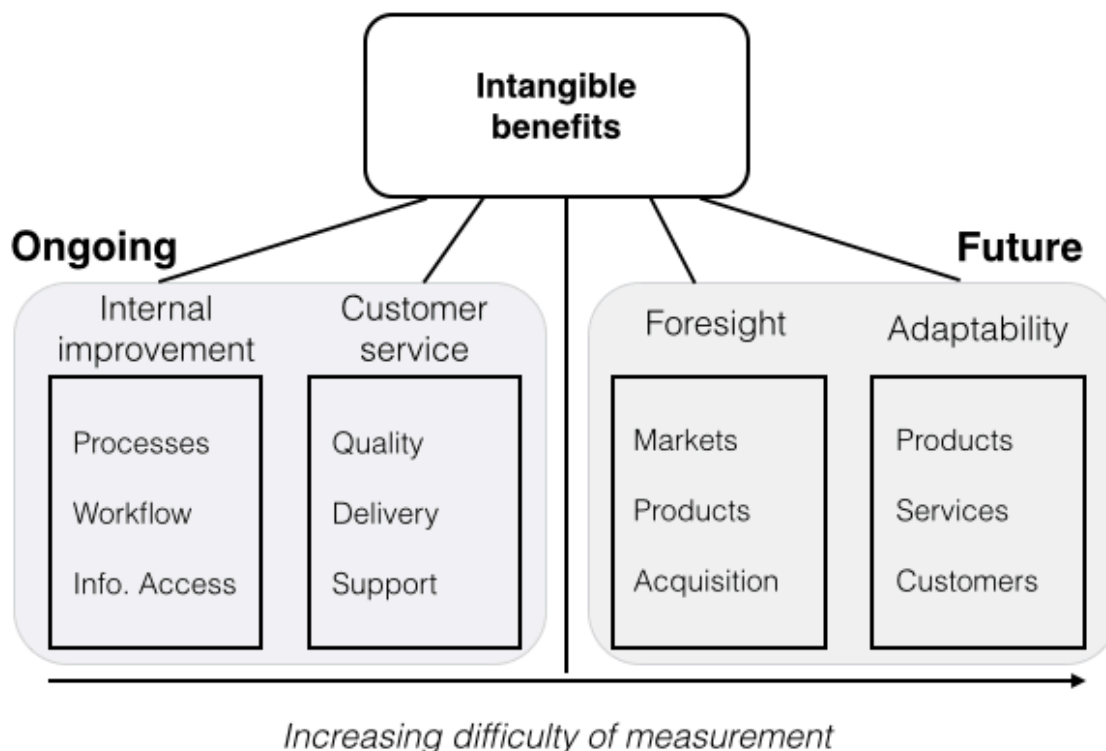


Figure 2.2.5.1. Categories of intangible benefits adapted from Hares & Royle, 1994)

The first intangible benefit is internal improvement, which is mostly related to company operations and performance. It goes over management of operations, improvements in production processes, process chains, and changes in production value to enhance output and decrease production cost. Second group are customer-oriented intangible benefits, which represent a higher difficulty to measure, as their effectiveness is measured by factors that reside outside of company's area of power. For example, as a positive side of improving customer service and support would be increased customer retention and satisfaction by company's actions. Third group covers foresight, what essentially means discovering emerging trends in constantly changing environment that company operates in. If company succeeds to identify trends in markets or products, the technology may be adapted to create a new product or process and boost sales or gain higher market share. Finally, the group of benefits represents adaptability. Similar to the previous group, company can adjust its products or services to address emerging trends, what is especially

essential for many companies operating in dynamically changing environment and rapidly changing industries. Therefore, it can be noticed that the intangible benefits are more difficult to estimate as we move further down the forecast horizon. In addition to that, external factors are more difficult to estimate than factors residing within company.

However, if for a company it is absolutely necessary to evaluate intangible benefits, it is not impossible to do so, even though it might involve quite a complicated process. Hares & Royle suggested a framework for converting intangible benefit into cash flow, which in turn can already be accounted by cost-benefit analysis. This framework includes four steps:

1. Identify benefits;
2. Make benefits measurable;
3. Predict the results in physical terms;
4. Evaluate the cash flow resulting from this intangible benefit.

First of all, the intangible benefit can be quantified and taken into account through critical success factors list and checklist of intangibles. Next, benefits should be measurable in order to be represented in monetary terms. For example, the customer satisfaction can be identified as a reference benefit. In order for it to be quantified, as an example, customer satisfaction survey can be conducted which will ultimately help to estimate potential value of customer happiness and convert intangible benefit into a tangible one. Thirdly, the benefit should be predicted in physical terms. Such, three methods, suggested by Reilly (1998) for achieving this are the market approach (referencing to benefits and costs of similar projects in other companies), the cost approach (evaluating the cost and benefits of implementing similar functionality using alternative technologies or human resources), and the income approach (estimating all costs and benefits because of the technology as much as attainable by the management). The final step is evaluating the cash flow, which is a straightforward estimation of factors gathered through previous steps in monetary terms.

Furthermore, Murphy & Simon (2002) provide more input on this, saying that evidently “successful justification of large-scale systems implementation projects often requires financial valuation, which in turn calls for monetary estimates of the benefits and costs that the project will entail”. As it has been proved in this chapter, some of the potential benefits are more difficult to quantify and estimate within a company than others. However, it is possible quantify and measure such kind of benefits by using framework presented earlier. Nevertheless, the ultimate potential of realizing intangible benefits must be understood by management while processing the decision of information system investment. The failure to understand and take into account intangible benefits might result in poor performance of a firm in a long run despite stable and healthy financial indicators. Moreover, it is important to realize the potential indirect value of the intangible benefits that as they enhance firm’s performance consequentially. All in all, ignoring

intangible benefits represents is one of the biggest risks for the company during investment evaluation.

2.2.6. Risks of investments in information systems

Every investment decision is naturally related to risk. If bad choice is made and company invests money into a failure project it would put a firm's existence in danger. Because of that it is vital for the company to carefully assess possible risks for each investment option.

Benaroch (2002) identifies three types of information system investment risks:

- Firm-specific risks;
- Competition risks;
- Market risks.

First type of risks is *firm-specific risks*, which are related to uncertain endogenous factors. They may arise because of doubts that a organization can maintain stability and finance a long-term capital investment, match of firm's available resources for an investment maintenance, as well as fit of the investment to the company's units, vision, and goals. All these characteristics are directly related to the ability of a company to fully take advantage of an investment opportunity.

Second type is *competition risks*. Competition risks are an outcome of uncertainty if other player on the market succeeds to make a move in the same direction faster, or take an opportunity to copy the investment and succeed with it, with the possibility to even improve it. As a result, this may mean that the organization making investment may lose some share of expected returns on investment, or even completely lose them.

Finally, market risks may occur because of the possibility that every competitor is considering or implementing the same investment. Therefore, this type of risk spans over the doubts that demand for the investment will be smaller than originally expected, possible governmental or regulatory changes, lack of functionality from the technology investment is being made to, or appearance of the similar, but cheaper or more functional substitute. Hence these risks arise from the uncertainty of company's ability to take maximum advantage of expected yield of an investment opportunity. Benaroch summarizes the risk types and areas as showed in Table 2.2.6.

Table 2.2.6. Risk types and respective areas (adapted from Benaroch, 2007).

Risk category	Risk area
Firm-specific risks	<p>Monetary - the firm cannot afford the risks investment; the financial exposure may not be acceptable or the projected investment costs may not remain in line with the projected investment benefits.</p> <p>Project - the target application is too large or too complex, the IS staff's technical skills may be inadequate or it may lack experience with a target IT, or the firm's existing IT infrastructure may be inadequate.</p> <p>Functionality - the firm may build the application right according to the required specifications, but still fail to realize the anticipated benefits because the requirements are wrong to begin with.</p> <p>Organizational (political) - the IT application can be undermined by vested interests of people in the firm, or it may be adopted too slowly by people in the firm.</p>
Competition risks	<p>Competition - competitors could take an risks unanticipated preemptive action or simply respond by developing a better application.</p>
Market risks	<p>Environmental - unanticipated favorable or risks unfavorable reaction of bodies that can affect, or be affected by, the application; these reactions could come from regulatory bodies, customers, vendors, and business partners.</p> <p>Systemic - the IT application may so dramatically change the environment (that is, market or industry) that the expected benefits vanish.</p> <p>Technological - the technology used to develop the application may be immature (such as no experience exists with it), or the application could become obsolete with the introduction of a new superior technology.</p>

It is important to note, that nowadays investments in information systems are mostly aimed to developing or deploying innovative product or service, and generating a payoff is mostly tied to the degree to which it is accepted by customers or market in general. In addition to that, *firm-specific risks* are considered as the most dangerous ones, as they “increase the possibility of failure to deliver promised capabilities on a target date, and such failure could erode the first-mover advantage or lead to market rejection, even if the

capabilities are reintroduced later in an improved form". However, this statement applies with a lesser degree for investments in information systems aimed to the internal use.

As it can be observed, during investment period it is very important for a firm to realize potential risks it is facing and react to them appropriately. In order to identify risks and be more ready to proactively avoid them, a firm can take a look at several types of risks and therefore foresee them more easily. By looking at a company and its environment in relation to mentioned factors and levels, it becomes possible to evaluate which risks are actually applicable to the situation. Moreover, it is important to do so not only during the investment evaluation and options review stage, but as well during the follow up and implementation process.

2.2.7. Investment decision-making process

Decision processes are crucial because they shape the course of an organization (Dean & Sharfman, 1996). Even more, Eisenhardt & Zbaracki (1992) support the thought by claiming that companies that are capable of taking initiatives and making important decisions represent enduring sources of competitive advantage. Therefore, it is important to understand how management tends to make choices.

There are three main theories of choosing among alternatives that are dominating in the literature. First of all, Anderson (1983) says, that decision makers typically enter situations when they are already familiar with objectives, which therefore define the consequential value of a decision. After that, taking into account the available information sources, decision makers come up with a number of possible alternatives, out of which they select the optimal one later on. As a result of this, the decision making process is very rational, as it takes into account evaluation of possible alternatives based on the evaluation of their characteristics, and looking at them at different angles and through various perspectives.

Secondly, March (1962) provides a slightly different approach. In his opinion the perspective of power and politics plays major role, as it is related to the assumption that companies are mostly driven into development to achieve their ultimate goal. March states that people are not usually rational in their decisions, and therefore this perspective suggests a model that during decision-making process conflicts are resolved between individuals possessing competing interests. As a result, it is claimed that people with the most amount of power in their hands shape the decision making process for the whole organization.

Finally, another approach, presented by Eisenhardt & Zbaracki (1992), implies focus on the fact that during decision making process decision makers still mostly rely on incomplete assumptions. Therefore, in place of argues organizational goals, vision, and investment place among them, it is crucial to pay attention and concentrate on attaining more realistic outlook on the assumptions and decision-making process. Therefore, in

order to better understand how decision process happens within the organization it is needed to look at and evaluate assumptions from different perspectives, what will eventually help organizations to make decision-making process more reliable and flexible.

As it can be seen, making a choice among alternatives is a comprehensive process that involves evaluation and comparison of many criteria, and theorists have not agreed on one certain approach that they commonly believe is absolutely valid. As a result, the same approach cannot be applied for different situations. However, as it was said for the first approach mentioned above, alternatives are not always clear and well-known beforehand.

Romme (2003) in his research described how alternatives emerge by standard approach. However, Boland and Collopy (2004) disagreed with him and presented the concept of design approach. The main difference between these two mentioned theories is that the choice theory “assumes it is easy to come up with alternatives to consider, but difficult to choose among them. The design attitude toward decision making, in contrast, assumes that it is difficult to design a good alternative, but once you have developed truly a great one, the decision about which alternative to select becomes trivial”. Therefore, design theory dictates that alternatives, instead of being available, should be discovered by the decision maker. By following the design approach a company should adopt iterative continuous process of discovering alternatives, limited by available resources such as time and money. However, as design represents just an idea without being implemented in real life, alternatives that emerged during alternative-seeking process should be related and bound to a company’s realities and current situation. Therefore, design approach towards alternatives selection seem superior to the standard approach and should be adopted by an organization making an investment decision, only unless external circumstances dictate otherwise.

2.2.8. Investment action options

However, during investment assessment period it is very important for a firm to understand actual investment is not an atomic operation, and therefore there are some other options apart from explicit invest – not invest. Benaroch (2007) says, that in fact, there are four types of handling an investment:

- Defer investment;
- Partial investment;
- Full investment;
- Disinvestment or reinvestment.

First of all, *deferring investments* enables organizations to learn about the risks of making an investment decision on the very early stage of a project. If the uncertainty about the impact and seriousness of the risk is unknown, there are two ways of handling such

situation. First option implies passive learning about the risk by observing competitors and their actions, following governmental or regulatory actions, reviewing emerging trends on the market in regards to an investment, and so on. Another option is about active methods for learning about the investment such as conducting surveys, lobbying changes for the regulatory bodies. Studying about the potential risks enables companies to resolve market, competition, and organizational risks.

Second way of handling the investment is a *partial investment*, which means exploring potential risk on incipient stages. Thus, if company is uncertain about the scale of a risk, it can perform investment on a smaller scale in order to explore and essentially learn from it. It helps a company to learn about an investment by doing it, and hence gather information about its social, organizational, and technological ability to implement and benefit from an investment. In addition to that, company can observe how customers, other market players, regulatory bodies, and internal parties react to an investment and adapt to it while carrying out the full-scale one. This way, it is possible to shift dangers of market, development, and organizational risks to earlier stages of a big investment; as a result risk is distributed across stages of the investment more evenly, eliminating stages with extremely high or extremely low risk. Also, it is worth noting that implementing the riskiest parts of an investment as early as possible enables a firm to realize the potential on an investment and, more importantly, the evaluate the required effort for implementation and assess if it can be completed successfully.

Third way is carrying out a *full investment*, but with decreased expected financial effect of risk. As a result of enables a company to decrease the value consequences of risk and the probability of its occurrence. Examples for this method represent leasing and outsourcing the development process. This allows company to cancel the investment on the mid-road and save the cost of investment implementation, or allows transferring the development to external party, which has better capability or resources, respectively. All in all, both examples represent risk transferring to third party what is important for reducing risk that can emerge within a company.

Final option is *disinvestment or reinvestment* with risk avoidance. If company admits that it cannot control a certain risk, it has two ways out of the situation. The first way is to abandon investment will allow firm to redirect resources in case competition, market, or organizational risks emerge, while second option implies monitoring emerging uncertainties and adjusting scale of an investment to a smaller (partially disinvesting), or bigger (reinvest) investment, compared to the original plan.

3. RESEARCH METHODOLOGY

3.1. Research purpose and research framework

Research in general sense means searching for the body of knowledge, therefore it is a scientific and systematic search for pertinent information on a specific topic (Kothari, 2004). However, this search for information can be classified to two main types, as stated by Soni & Kodali (2012). They argue, that empirical research can do towards the way of creating its own theory and observing the results, or it can be based on applying and measuring the outcomes of another theory.

Theory creation implies research of the current available literature on the topic, as well as current established practice, trying to find different interdependencies and relationships between these areas, including both practice and theory (Flynn et al, 1990). However, theory verification covers only the use of empirical data for theoretical hypothesis testing (Soni & Kodali, 2012). It can be noted, that current study covers mostly the first type of empirical research, as portrayed on Figure 3.1.

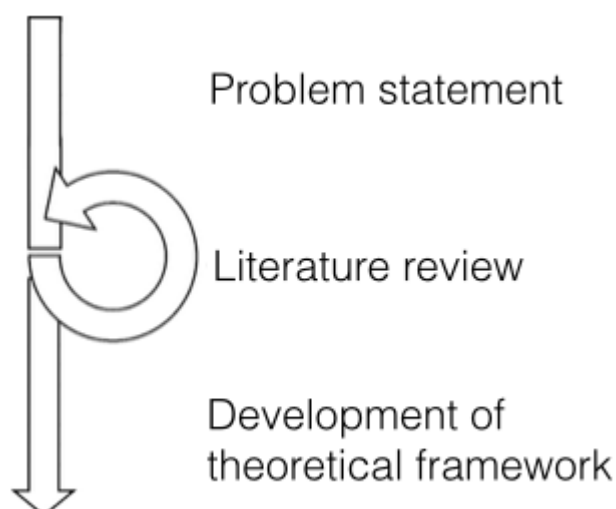


Figure 3.1. Research framework of this study

As a result, this study represents a systematic literature review, as it depicts the time frame within which the sources were selected, and also methods that are used to evaluate and converge findings on the current topic (Parahoo, 2006). Therefore, the process of systematic literature review was as follows:

- Identifying the research question;
- Setting the scope and exclusion criteria;
- Accessing the literature;

- Analyzing, converging, and making synthesis of discovered findings.

As the research questions were formulated in the beginning of the current paper, the research for relevant literature has started. Considering that the topic of information systems and information system investments was a trending topic over the last decades, it has been decided to select IS-related journals as a main source of researches on the topic. The scope has been identified as all issues of 8 journals over 15 years (from 2000 to 2015) have been researched with the exclusion of studies, which are not related to IS. However, all previous researches that were related to IS performance, IS to business alignment, IS investments, and IS business value were carefully explored and considered in order to build a theoretical background for the current study.

However, current research was limited to the systematic literature review. After all previous researches were analyzed and synthesized, current study has built a framework for investment evaluation, using findings and synthesis of previous researches as a basis for creating a new theoretical body.

Therefore, it can be seen that this study originates from the understanding current issues with investment alternatives evaluation in modern companies. Hence, it tries to address this by formulating the problem and looking at current established practices through previous researches on this topic. After identifying the main issues with alternatives evaluations, this study suggests a framework that can be applied in companies in order to avoid discovered pitfalls.

3.2. Methods of data collection

Gummerson (1993) state, that for empirical research purposes, usually qualitative methods of data collections are used. He presents five key methods for collecting data for the research:

- Using existing material;
- Questionnaire surveys;
- Qualitative interviews;
- Observation;
- Action science.

First method implies using the existing material available on the topic. It can be done through documents, books, research papers, magazines, articles, letters, organizational charts, and any other source of relevant information. Once such data is gathered, it can be organized in order to be easily processes and analyzed to discover important information required for the research. After that, second method is questionnaire surveys, which are usually related to quantitative and qualitative approach, as even though the implementation of said surveys are quantitative, the quality of them is also utterly

important for the research. Third is the method of qualitative interviews, which, to the contrary to the questionnaires, is more informal. Fourthly, observation includes two sub-methods: direct and indirect (or participant) observation. While the first one is traditionally conducted in the environment of observed study area and represents qualitative analysis of study area, the second one is referred to the application in the scope of field research. Lastly, action science method is traditionally considered to be the most challenging from the implementation point of view, but it potentially is possible to yield the best results for the research. This method ranges over all other methods mentioned previously, but in this case it should be conducted by a researcher who acts in a role of an internal actor for the area observed. As an example, it can be that researcher is an employee of a company where research takes place in.

As a result, during this study mostly method of using existing material was used. The data was gathered from various researches that were carried out by different researchers. After that, it was consolidated and analyzed to create a new body of knowledge, as it is displayed on Figure 3.2.

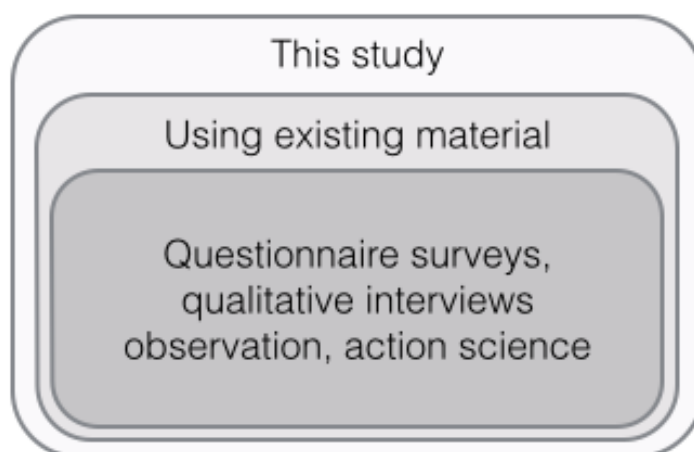


Figure 3.2. Methods of data collection in this study

However, it is important to notice that different researches that were carefully explored during this research cover all other methods of data collection.

3.3. Obstacles and possible errors of the research

Current study aims at discovering potential issues related to investment decision-making in modern companies, and analyzing these issues. In addition to that, it reviews three different frameworks that were applied through three different researches in order to understand the strong and weak points of each of these methods. Having these points considered, this study furthermore suggests its own framework that attempts to take into account all these issues and streamline the decision-making process more easy and transparent.

However, during the research process the researcher faced following obstacles. First of all, considering that study was carried out by thorough analysis of different researches, it was challenging to find relevant studies that took into account all factors that are important to the research. Secondly, not all reviewed sources managed to come up with the suggestions or points of improvement after identifying the main issues, what hindered carrying out a proper analysis. Next, many reviewed researches that came up with improvement points together with a framework, they did not measure the negative or positive effect of said framework to the company neither in a short, nor a long run. Therefore, it was impossible to evaluate the quality of the suggested framework, as well as its reliability, as according to Howell et al (2012) it is impossible to make any outcome analysis or claims without the research results, tools, and procedures replicability.

Even though relevant studies for analysis were found, it is important to understand that they do not represent or cover all possible scenarios that may occur in real life. Therefore, the suggestions and frameworks which worked well or not well for some particular companies may be inapplicable or inadequate for others. Hence, considering that this study is built on their work, it must be understood that it cannot represent everything possible as well. Nevertheless, it should not be confused that all most general cases were found and analyzed, and therefore the validity of this thesis stays strong.

In addition to that, framework that was suggested in current study was not applied in practice in any real firm. Still, while being a theoretically-based only, it comprises of findings that were discovered through practice, and therefore it should be considered as a reliable source of information, as reliability is defined by Howell et al (2012) as a grade to which experiment, test, or some other process which involves measuring, provides the similar result as during prepared trials.

4. PRIOR RESEARCH REVIEW

4.1. The need for framework

Companies with extensive use of information systems are very dependent on the quality and functionality of said systems. Therefore, it is crucially important to maintain and improve them in any possible way. However, the replacement of information system always involves extensive planning, development, implementation, and support, and as a result it is challenging for companies to replace existing systems. In addition to that, usually this involves significant spend of financial resources; therefore it is vital for firms to take the process of improvement or replacement seriously. However, not always companies have chances to implement these systems on their own. In some cases firms have to ask for assistance from external organizations that can help doing this activity, what is particularly important in, for example, companies related to the governmental service. As a result, companies that are responsible for information system implementation have to choose which projects are in fact the most needed, as well as which will yield the best benefits as a result of implementation. Moreover, in many companies the role of developing and implementing organization is devoted to the internal IT department, which role is to help businesses solve their problems from an IT perspective (White, 2012). However, they also need to see which internal needs (or which internal business unit's needs) are higher than the others. They need to manage IT project proposal portfolio and to be able to identify which alternatives are more beneficial for one of the proposals.

Nowadays in many companies information systems investment evaluation is seen as the best way to align project portfolio and select the best investment alternative, what can be done through risk analysis and benefits management, what is essentially the capability of the proposed investment to achieve desired levels of hard and soft benefits, as stated by Serafeimidis & Smithson (2003). However, there is a big issue with this approach, which is the complexity of calculation of returns. It is clear that traditional quantitative method of benefit analysis does not provide a realistic picture over the complex returns, as they are difficult to estimate, as well as not able to take into consideration the strategic value of information system investments. As a result, there is a clear need for a documented and well-established procedure that company can follow during decision-making process. It eases management, as well as provides an opportunity for an organizational learning by giving the possibility to easier track the state of the process, as well as gather and record attained knowledge.

4.2. Investment frameworks used

4.2.1. Design decision-making framework

The framework used for investment evaluation during the research carried out by Frisk, Lindgren, and Mathiassen (2014) was based on several theories:

- Design thinking for the selection of alternatives;
- Evaluation theory;
- IS evaluation theory.

Therefore, as discussed before, the framework looks at decision making as a creative and adaptive process, during which decision makers continuously gather information in order to collect as much data about the decision as possible. After that, various options and ideas are tested and assessed which gives birth to different possible alternatives. More importantly, the framework stimulates management responsible for decision making to evaluate alternatives considering both tangible and possible intangible benefits.

Frisk, Lindgren, and Mathiassen propose a five-stage design approach, which stimulates companies to make best possible decisions based on the available alternatives, as portrayed in Figure 4.2.1.

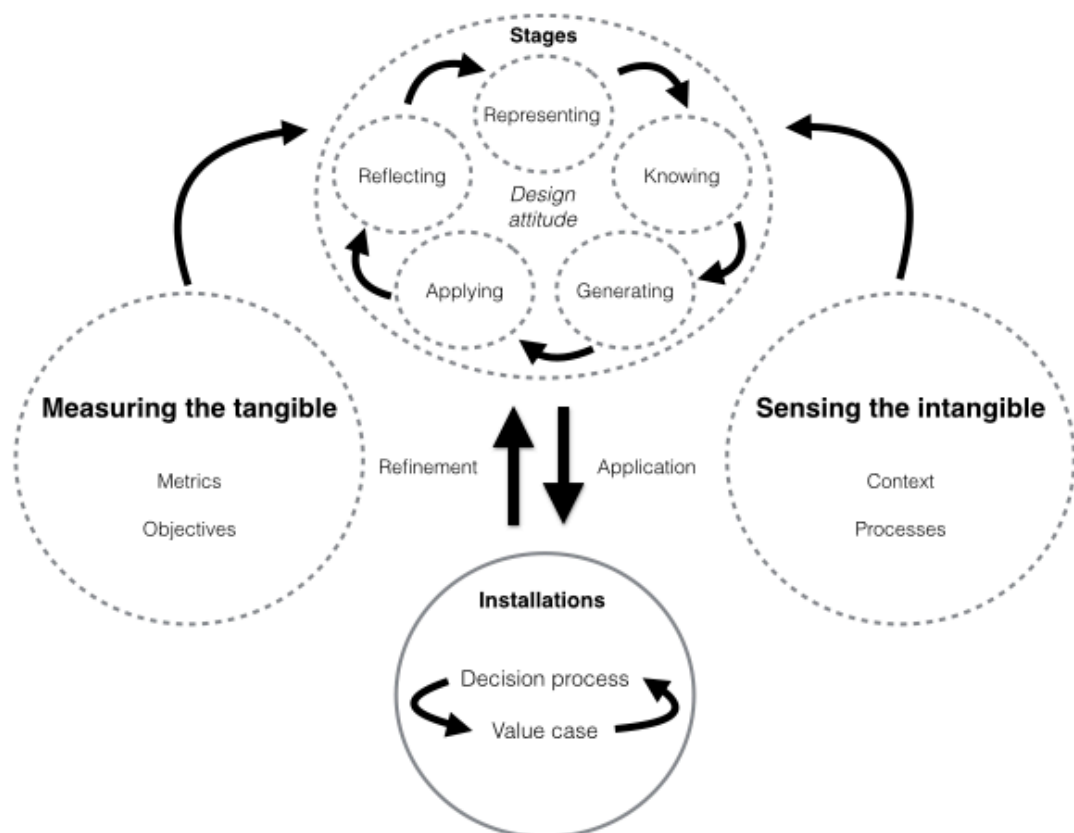


Figure 4.2.1. Framework for organizational design decision making (adapted from Frisk, Lindgren, and Mathiassen, 2014).

First stage is *Representing*. During this stage decision makers start approaching the problem of decision making by diagnosing and formulating the problem situation requiring investment decision. The problem can be approached from different ways, all of which essentially help to gather necessary information about the needs. First of all, the request for an investment can come directly from an interested business unit within or outside of an organization. Another way is to conduct interviews with various people at different roles in a company in order to understand how to better adapt decision-making process to get both tangible and intangible benefits into account. As Frisk et al. says, “the representation of the problem situation is questioned, adapted, and modified vis-à-vis different stakeholders’ improvement suggestions and future expectations”. During this stage it is crucial that decision makers identify and disclose assumptions that company was not aware of before.

After that, during *knowing* stage managers work on generating a knowledge base that will help to come up with, identify, and assess available alternatives. It is crucial to evaluate all available data about the investment decision that can be in a form of a research data, documentation, or literature. By utilizing this information, decision makers create evaluation techniques that, importantly, assess tangible and intangible benefits, which were discovered during previous stage. As a result, this facilitates the decision making process by enabling management see beyond simplistic evaluations, shape better alternatives, and come up with new better ones.

Next stage is *generating*, during which stakeholders communicate and discuss expectations of an investment decision. This is important in order to make clear the understanding of the problem situation, and make explicit how it can be improved with the investment. Suggesting various types of analyses that cover tangible and intangible characteristics of the investment, decision makers are coming up with potential new values of the investment. The main aim of this stage is to create a situation that enables management to understand the business value of an investment while “supporting stakeholders’ discovery and evaluation of specific IT investment alternatives”. This enables all stakeholders to agree on expectations what this investment should provide in financial and social terms.

At *applying* stage decision makers discuss, adjust, and develop an agreed value case by applying evaluation process. It is important that this particular case is tailored to an organization it is going to be implemented in and takes into account company’s values, goals, and other characteristics. To achieve this, all stakeholders and decision makers should continuously work on iterative stages for further development and adjusting it. Management examines the value case and it is ready to be implemented only when there are no more challenges on the way that change the vision of the case.

Finally, during *reflection* stage management evaluate the decision-making process by communicating and discussing it with all stakeholders. It is needed in order to maximize

personal learning and experience, as well as improve company's ability to make information system investment decisions. As a result, the stakeholders, and more importantly, decision makers become more aware of tangible and intangible indicators, as well as get better understanding on the processes of working with them. Considering that decision situations differ in complexity and scale, the quality and level of learning differs dramatically from case to case, and success of this stage is dependent on the ability of stakeholders to clearly communicate their position and negotiate different views on the problem.

4.2.2. Project Appraisal Method

Serafeimidis & Smithson (2003) carried out study how Project Appraisal Framework affects organization, which is trying to move from a state of an ad-hoc evaluation practice to a more business-driven one. Project Appraisal Method framework takes start back in 1990, when it was developed as a result of iterative process of learning from investment projects implementation, and pushed mainly from lower to higher levels of the company.

The use of this framework implies that company's vision towards its current and future situation is clearly understood by all stakeholders, and most importantly, that goals of the company are made explicit, as an investment evaluation process will be based on the success of achieving them by implementing the investment. A company should take a close look at the business goals of the company and business unit at which the investment is aimed at, measure current key performance indicators, and come up with the main evaluation criteria that will be used as a reference for the future assessment. Serafeimidis & Smithson suggest a subset of nine criteria:

- Customer base;
- Customer service;
- Sales effectiveness;
- Unit cost;
- Exploration of business opportunities;
- Company's brand;
- Product design;
- Management information;
- Staff attitude to IT.

However, it is important to note that these are only reference criteria identified during the study. In fact, they not necessarily must be relevant to a company the Project Appraisal Method is being applied to. Each of them should be carefully evaluated and thought on its applicability. Therefore, the main streams, deliverables, and methods of gathering of Project Appraisal Method are summed on Table 4.2.2.

Table 4.2.2. Main streams, deliverables, and methods of gathering.

Streams	Deliverables	Methods of gathering
Financial costs and benefits	Financial model of the costs and benefits	Modelled cash flows Project payback period Internal rate of return Net present value
Risks	Risk management plan	Computer-based questionnaires
Strategic and intangible benefits	Benefits profile	Criteria identified on previous stage (<i>customer base, customer service, sales effectiveness, unit cost, exploration of business opportunities, company's brand, product design, management information, staff attitude to IT</i>)

After evaluation of these streams and respective criteria, it becomes clearer which project aligns better with company's business goals. After careful comparison of those values, the project that offers the best value should be selected. It is important to notice that all types of business values should be considered, tangible and intangible.

Further, Serafeimidis and Smithson (2003) propose four orientations for IS evaluation which they use in their study. These orientations recognize the importance of the context in the perception and performance of evaluation. Furthermore, it considers the need for contingency approaches to evaluation because of the diversity of contexts and organizational changes attempted by IS, the clarity and uncertainty of the expected outcomes and the different needs along the time horizon. These orientations are control, social learning, sense-making, and exploratory (as portrayed on Figure 4.2.1.1.).

		Impact on organization of information systems	
		<i>Tactical</i>	<i>Strategic</i>
Perception of objectives	<i>Consensus/ Clarity</i>	Control	Social learning
	<i>Non-consensus/ Ambiguity</i>	Sense-making	Exploratory

Figure 4.2.1.1. Orientations of information systems evaluation (adopted from Serafemidis and Smithson, 2003)

This categorization presents two dimensions, which provide four criteria of information system evaluation. On one side it has impact on organization of information systems, which can be either tactical or strategic. The main difference between them is in scale. Bierman and Smidt (2003) state, that a tactical investment decision generally involves a relatively small amount of funds and does not constitute a major departure from what the firm has been doing in the past. On the other hand, strategic investment decisions involve large sums of money and may also result in a major departure from what the company has been doing in a past. Moreover, strategic investments normally involve committing to very substantial sums of money to selected investment project for long periods into the future, usually in the face of considerable risk and uncertainty (McMenamin, 2002). Therefore, adaptation of a strategic investment involves a noticeable change in the company's expected profits and in the risks to which these profits will be subject.

The other side takes into account lucidity and achievability of the objectives of an information system, as well as their evaluation. It extends between consensus and clarity of the perceived objectives of an information system to non-consensus and ambiguity, as depending understanding of a purpose of an information system provides a better overview over the investment decision.

The first orientation is called *control* and happens when a firm clearly understands the objectives of an information system and an impact occurs on a tactical level. In other words, the consequences of an investment are relatively certain and understood. This allows the company to possess a control over the process, minimizing risks and

uncertainties related to the investment. In addition to that, the previous experience in the similar field makes evaluation of the investment more predictable and easy to make.

However, sometimes it happens that objectives are not well understood or are not clear. In such cases, *sense-making* evaluation should be used. It suggests, that the impacts of the investment are relatively predictable, therefore they happen on a tactical level. Sense-making evaluation scheme takes into account not only pure data and figures, but also unofficial and hidden elements and information, up to personal and cultural values, beliefs, myths, and rituals. This allows revealing of different views and interests, thus providing “a platform for negotiation and compromise between the various individuals and groups involved in the evaluation exercise”. Therefore, it builds a basis for sharing both formal and informal views and objectives. This requires establishing strong communication flow among decision makers, but if this is not possible, informal sharing can be employed.

Social learning orientation relates to the situations when the objectives of the investment are utterly clear and present no uncertainty to the company. However, the ways they are achieved, as well as a perceived result, are not well understood. Therefore, this orientation makes focus on attempts to increase the experience and knowledge of companies in such areas during constant iterative learning over the lifecycle of an information system. This builds an expertise within a company that allows to mitigate the uncertainty of investments while the objectives are understood.

Despite said above, sometimes situations occur when company “faces a lack of consensus in terms of the objectives and/or the sense-making cannot deal with the strategic nature of the change and its uncertainty”. Therefore, on the contrary of the previous orientations, *exploratory* stage takes place, when learning or communication among decision makers is problematic. Exploratory stage attempts to bring out the experience, aims, and goals to develop a new paradigm. As they collide, participants provide arguments and over this establish mutual understanding. Because of this, the truthfulness, validity, and correctness of facts are important.

4.2.3. Framework for evaluating investments by Counihan et al.

Similar to previous frameworks, research conducted by Counihan et al (2002) showed that in many companies capital budgeting tools are looked at as a main approach for evaluation of investments in information systems. The result of this was that investment appraisal techniques were used as a method to justify the decision when it has been already taken, rather than using them to evaluate the potential investment alternatives first, and then choose the most suitable and beneficial of those (Grindley, 1991).

As a result Couhinah et al conducted a research that aimed to investigate how different companies evaluate investments in information systems. It was motivated by the assumption that various firms which have certain experience for investment evaluation

would be able to share their knowledge on the area, as well as explain the factors that they consider important during decision-making process. As a result of the data gathered across companies, researchers would be able to create a foundation for a framework that helps organizations to evaluate investment alternatives.

5. RESULTS OF THE RESEARCH

5.1. Results of frameworks' application in real-case scenarios

5.1.1. Results of design decision making framework

In order to test a framework Frisk et al. (2014) chose action research, as it combines theory generation with researcher's intervention to solve immediate organizational problems (Baskerville & Wood-Harper, 1998). The research had taken a start in 2005 as a Collaborative Practice Research study between the Swedish Fire Rescue Agency and the Viktoria Institute. The study involved active participation of managers from different levels of organizations, such as operational, functional, and strategic.

The problem being addressed was in that three partner organizations within Swedish Fire Rescue Agency had a history of repeating information system failures and malfunctions. Existing systems, despite broad functionality, did not meet expectations, and, surprisingly, underlying investment decisions were not doubted.

It has been discovered that the main reason for IS failures was inadequate information system investment decision making, as they employed quantitative approach of software and hardware cost evaluation as a tool for justifying and reasoning the decision making process. Essentially, that led to lack of understanding of available alternatives and importance of cultural, political, and social factors during the decision-making process.

The study was aimed on application of a suggested framework in practice and evaluating the results in Swedish Fire Rescue Agency. In addition to series of interviews with management of all levels of the organization, the framework was iterated through all suggested five stages of decision-making.

Frisk et al. (2014) identified a summary of representing, knowing, generating, applying, and reflecting stages of the framework, as shown in Table 4.3.1.

Table 4.3.1. A summary of stages for application of decision-making framework (adapted from Frisk et al. 2014).

Stage 1: Representing (January–June 2005)

There were conducted semi-structured interviews (each lasted about 2 h) and observational studies (each lasted for 3 days) to collect information about people's experiences with discovery and evaluation of IT alternatives. Two key problems with existing approaches to IT investment decision making were identified.

<p><i>Data sources</i></p> <p>9 interviews at Gothenburg FRS, 7 interviews at Stockholm FRS, 5 interviews at Lund FRS, 2 observational studies at Gothenburg FRS (complemented by unstructured field notes), 3 project meetings, 2 workshops, strategy documents, technology reviews, and e-mail conversations.</p>
<p><i>Data analysis</i></p> <p>The interview and field notes transcripts were analyzed using the open, axial, and selective coding techniques (Strauss & Corbin, 1990). The identified problems have been reviewed for accuracy by interviewees and other people in the three organizations.</p>
<p>Stage 2: Knowing (March–October 2005)</p> <p>On the basis of our understanding of the IT investment problems identified in the first stage, there was developed a multi-indicator model for discovery and evaluation of IT alternatives. It was anticipated that the model would help to resolve or ameliorate the problem situation.</p>
<p><i>Data sources</i></p> <p>European Journal of Information Systems, Information and Management, Journal of Enterprise Information Management, and Electronic Journal of Information Systems Evaluation.</p>
<p><i>Data analysis</i></p> <p>The selected research articles were analyzed using the open, axial, and selective coding techniques (Strauss & Corbin, 1990).</p>
<p>Stage 3: Generating (November 2005–November 2006)</p> <p>This stage was executed through nine workshops (three per organization). As an initial activity, the multi-indicator model was discussed and analyzed with representatives of the participating organizations. In collaboration, a value case and an associated decision process for each of the three organizations was developed. These instantiations were supposed to trigger new ways of thinking and we anticipated that they could help transform IT investment decision making. To follow-up on these activities, there were an e-mail and telephone conversations with managers in the three organizations. Regular informal meetings with these people provided additional complementary data.</p>
<p>Stage 4: Applying (November 2006–July 2007)</p> <p>The instantiations materialized in the previous stage were implemented to varying degrees in two of the organizations. A value case and an associated decision process were implemented and tested at the Lund FRS. As for the Gothenburg FRS, the value case developed was introduced and assessed. More specifically, it guided the execution</p>

<p>of two IT investment decision projects. Discussion workshops and telephone meetings were conducted to support these projects.</p>
<p>Stage 5: Reflecting (April 2009–July 2012)</p> <p>User site investigations were conducted to assess the effects of the interventions pursued. They were assessed to identify the consequences of the design approach to organizational decision making. In addition to the anticipated consequences, however, the assessment also revealed some unanticipated ones. To understand if any sustainable effects would occur, there were pursued complementary follow-up activities at the Gothenburg ERS over a 2-year period. In light of the lessons learned, there was developed practical and theoretical implications by reflecting on our research project in its entirety.</p>
<p><i>Data sources</i></p> <p>Four interviews at Gothenburg ERS, two interviews at Lund FRS, and e-mail and telephone conversations with managers in the two organizations.</p>
<p><i>Data analysis</i></p> <p>The transcribed material was analyzed using the open, axial, and selective techniques (Strauss & Corbin, 1990). In this analysis, practitioners offered comments on and corrections to our interpretations.</p>

During each of this stages there were found particular issues that prevented Swedish Fire Rescue Agency from implementing successful information system projects in the past.

Thus, on *representing* stage it has been identified, that current problems in existing decision making process mostly happen due to a significant knowledge gap among management within the organization. Frisk et al. anticipated, that the new design approach towards investment evaluation would facilitate efficiency of management and help evaluate investment in information systems by assessing tangible factors and taking into account intangible. However, it has been discovered that for it to take full effect it needs to be deeply embedded into the working culture on daily basis within each of reviewed organizations. During *knowing* stage has been developed a model that accounts essential indicators for realizing business value for discovery and evaluation of alternatives:

- Strategic match;
- External pressure;
- Organizational impact;
- Benefit and cost awareness;
- Risk sensitivity;
- IT capacity;
- Stakeholder understanding;

- Project competence.

As a result, in two out of three reviewed organizations, the suggested design approach towards investment alternatives evaluation was taken as an essential tool that shifted vision of management towards discovering and realizing better alternatives and grasping tangible and intangible values. Furthermore, it was found that by using this framework in one reviewed organization decision makers have discovered business value indicators that they were previously not aware of before. Moreover, the alternatives that were discovered with application of the suggested framework were considered as relevant and the company made a decision to invest in them.

All in all, during this research by Frisk et al., it has been found that in order to enhance and change approach towards discovery of information system alternatives, a complex system of actors on multiple organizational levels needs to be changed. Secondly, this process demands discovering and processing large amounts of structured and unstructured data. In addition to that, research proves that in certain contexts it is extremely difficult to shift from abstract thoughts of decision-making process to concrete business value indicators for investment evaluation. Finally, the process of discovery of information system investment alternatives requires taking use of the potential of advanced technology to influence decision making (Leidner & Elam, 1995).

5.1.2. Results of Project Appraisal Framework

The reviewed organization was founded in 1848 and is one of the largest insurance companies in the world, acting as the largest British insurance company. It has been observed that at the company the planning and managing of investments in information systems was done in, generally, an ad-hoc way. As a result, management of the company realized that evaluation of IT investment should be mostly based on the results that the implemented information system shows after the investment in regards to achieving business goals, not on the technical performance.

The main actor during application of Project Appraisal Method framework was a group, which role was coordinating changes to company's information systems, allocating resources to their implementation, and assessing their effect on business. Therefore, among this unit's responsibilities were conducting evaluations of project proposals and choosing the most suitable portfolio for implementation.

Unfortunately, the results of the framework application were not completely successful. Majority of stakeholders that were responsible for proposing projects for implementation felt that the use of Project Appraisal Method framework was "forced", as this remained as the only way to communicate requests and ideas to the business unit responsible for proposal evaluation. Most probably this was due to the lack of understanding of the process of project appraisal. Nevertheless, Project Appraisal Method was used over a timespan of 18 months, after which systems strategy management admitted that the it

was, in fact, successful: “We have saved at least £1.8 million over the last six months. The risks could now be clearly identified and managed by explicitly setting out accountabilities, metrics and milestones and benefits delivery has improved in general”. Nevertheless, it was admitted that PAM failed to optimize the whole portfolio, as it was only used in order to justify project on per-case basis. Unfortunately, this led to approval of some projects, even though they exceeded allocated resources. To prevent that additional step of cross-assessment had to be introduced. Eventually, the situation worsened due to lack of developers, as many project proposals were denied, even though some of them had potential value if assessed by PAM. However, it is important to mention that these issues were not related to PAM itself, but rather to the decision-making process that developed within a company.

As a result of mentioned outcomes, initiative to apply PAM for project evaluation decreased over time. This, in turn, led to return to evaluation of the projects based on quantitative financial criteria, and risk analysis as well as intangible values were no longer assessed. Despite the fact that PAM eventually was abandoned, it helped the firm to identify its main stakeholders for decision making. It made clear that taking into account various values and views is vital for the organization during decision-making process, as well as to invite business groups for shaping the evaluation methods.

Therefore, four orientations of information system investment evaluations were identified and applied in the case company. Main points that were identified during study of Serafeimidis and Smithson (2003) are related to the connection between information systems and organizational change:

- Elements of control evaluation are typically required in order to establish a continuity between information system and management functions;
- Communication and sense-making are vital for the key stakeholders. As a key enabler of the communication, the common evaluation language should be established;
- Exploration and experimentation can amplify firm’s abilities to learn and gather knowledge, as well as experience for evaluation of information system proposals;
- It is not necessary to conduct an evaluation of a proposal in all four orientations of IS evaluations simultaneously. As a result, it strengthens the need for clarity while realizing roles of stakeholders taking part in the evaluations;
- It is important to employ a proper change management approach in order to integrate IS evaluation process into organization;
- It is crucial to understand that different orientations for proposal evaluations demand different approaches.

All in all, during the study it was mostly observed the attempts to promote awareness of business affect on information systems, as well as encouraged various methods for project proposal evaluations with inevitable and inseparable risks. It has been observed that tools

and techniques for investment proposal evaluation not always have complete relevance to the case and should be adapted to each company separately. In addition to that, such tools and techniques should be compatible to other methods used in other management processes.

It is also vital to note that study revealed that IS evaluation methods and techniques necessary lead to certain organizational changes that are not always desired or expected. As a result of this it is not easy to forecast or predict them in advance, what can potentially lead to challenges in managing emerging difficult situations.

5.1.3. Results of the framework for evaluating investments by Counihan et al.

The research done by Counihan et al (2002) mainly based on two ways of data gathering: interviews with stakeholders within companies and internal documents review. By overviewing separate projects in each of the companies, researchers were able to identify the key decision makers within each of the firms and therefore conduct an interview about the process of alternatives evaluation and company's environment during the change, as well as other aspects of company's initiatives. After that, the main issues and points identified were analyzed on their correlation to the documents reviewed during the research.

During the research four companies were reviewed, each of which from different industry. The first company is the largest composite insurer in the UK, which had an experience of evaluating two large-scale project of information system implementation of 10 and 18 million pounds respectively. Second company is one of the biggest banks in the United Kingdom, which has experience of numerous projects implementations, most of which are based on value of their contribution to the business goals. Third firm was also a bank which had a negative experience of information system investment evaluation, which resulted in expanding the implementation budget thrice. Last company is an airline organization, which used financial metrics for most of their investment evaluations, which failed for one of their information systems implementations.

By studying how companies dealt with the difficulties related to traditional investment evaluation (as mentioned in Chapter 2.3), researchers were able to identify six critical factors that are related to the investment evaluation of information systems, as it is outlined in Table 4.3.3). It is important to state that in all reviewed companies evaluators must review a company on a high level and with regards to the operating environment.

Table 4.3.3. Relation of problems of traditional investment to critical factors that need to be managed for investment evaluation (Adapted from Counihan et al, 2003)

	Critical factors					
Problems	Economic environment analysis	Information intensity analysis	Commitment and sponsorship	Approach to evaluation	Time scale of benefits	Appraisal techniques
Evaluating intangible benefits	Determines criticality of intangibles	Separates customer requirements from internal intangibles	Shows high-level appreciation for importance of intangibles	Categorizes intangibles	Manage time scale to yield quick wins	Compliance
Making the relationship between IT and profitability explicit	Illustrates the role of IT in industry	Illustrates the role of IT in meeting customer requirements	Denotes need for making direct relationship explicit	Facilitates the adoption of IT at appropriate level	Managing time scale to yield profit at critical stages	Compliance
Dealing with the vanishing status quo	Determines rate of change in environment	Determines the degree to which preservation of status quo is possible	The level of required commitment is reflected by the rate of change	The approach is determined by the rate of change	The time scale of benefits is determined by the rate of change	Formal challenge process
Dealing with the extended investment time frame	Determines short- and long-term requirements	Determines short- and long-term customer requirements	Commitment and sponsorship reduces emphasis on time frame	Approach should be in line with expectations regarding time scales	Management of time scale critical for longer term time frames	Justification in terms of shorter time scales, check and balance facility

Evaluating infrastructure investments	Determines scale of infrastructure investment	Determines scale of infrastructure investment	Determines relationship between requirements and infrastructure	Approach should be in line with expectations regarding infrastructure investment	Management of time scales critical for justifying infrastructure investment	Two-tiered process, support application and infrastructure
	High-level analysis		Managing the process			

As a result, Counihan et al (2002) suggests a framework for evaluating investments in information systems, as portrayed on Figure 4.3.2.1.

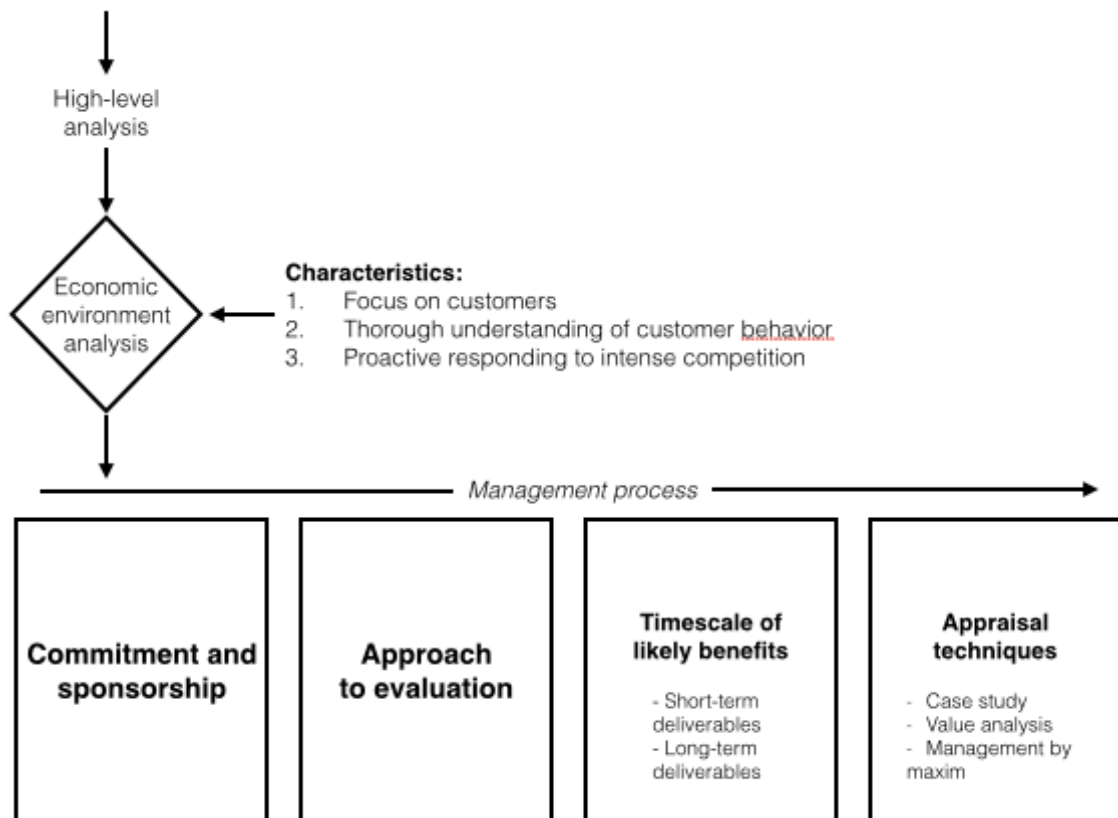


Figure 4.3.2.1. Framework for evaluating investments in information systems (adapted from Counihan et al., 2002)

First of all, information system investment should take off by analyzing economic environment, which the firm operates in. It is crucial to do in order to understand if the investment is the necessary activity or not. After that, it is necessary to assess the level of

commitment and sponsorship in order to steer and estimate the investment process. It is important, because the bigger investment project is, the higher level of commitment and coherence should exist in a company. After shared vision is achieved, main actors of investment process must communicate implications of the decision. Then, approach to evaluation of the decision is chosen, which can be either of application type, or enterprise-wide. Application approach dictates for evaluation to happen at business unit level, while enterprise-wide approach aims at evaluating the investment in terms of whole organization. Nevertheless, it is important to understand that even if the evaluation is happening at the business unit level, collaboration between various business units is required, as data for correct investment evaluation is gathered from many different departments, and most importantly, once decision is made it affect those business units as well. Moreover, the investment for business unit should meet that business units needs and satisfy the demand for it. However, enterprise-wise evaluation would require a slightly different approach. Two-level evaluation should take into account base infrastructural investment, which is made a group level, and at the same time each business unit takes care of assessing their own sub-investment.

On the next stage decision is evaluated in regards to the timeline. It is advisable for evaluation to take into account mostly constraints on the short-term scale, while planning and overview of long-term benefits should happen in the background.

Finally, the framework suggests the decision to be evaluated in terms of appraisal techniques. These techniques can be of different types, such as case study, value analysis, or management by maxim. This case study approach views the investment as a coherent unit rather than looking at the financial gains. Value analysis suggests building a prototype of the system, thus giving the possibility for potential users to trial intangible benefits of the invested system before devoting to the final investment. Finally, management by maxim approach gives guidelines for understanding that investments in infrastructure are in line with a company's business vision and could be tailored to it for potential future use.

All in all, it has been found that all mentioned enterprises overcame difficulties that they were facing by building prototypes. Keen (1981) suggested that investing on a small scale to build the prototype of the system to be invested may be of a great use, as it potentially allows decision makers to take a look and assess possible intangible benefits before opting in to the full-scale investment. It also can be seen that the framework suggested by Counihan et al. (2002) suggests that each investment evaluation is a two-stage process which firstly differentiates potential adopters, and after that looks at the possible tangible and intangible benefits of the investment in a context of an organizational environment. However, it is important to notice that even though this framework was based on the research carried out in several companies, it has not been tested on a real case evaluation.

5.2. Evaluating the results

5.2.1. Evaluation of research discoveries

All three studies conducted by researches mentioned in previous chapters provided reflection on the state of decision-making and investment evaluation approach in various real-life companies. All findings and outcomes were backed up by real data, and therefore provide a valuable realization on the most common issues identified in said firms. It is important to note, that taking into account that it is virtually impossible to cover all companies in the world, it is impossible to broadly cover all potential issues different organizations might face. Moreover, considering that different projects have their own peculiarities, it was hardly possible to review all potential problems even within these organizations.

Nevertheless, each of the researches brought its own value towards the understanding of the problem, which, once gathered together, portray a realistic picture.

In the first research, carried out by Frisk et al (2014), the main finding was that companies not only rarely possess the full understanding of the problems they are facing, but also rarely have a clear picture of alternatives available before them. The researchers insist on the importance of adopting design-driven approach for decision-making, which dictates that it is difficult to find a proper alternative, but once it is found the choice becomes apparent. Essentially it means, that in order to succeed during decision-making stage firms must adopt a continuous process of discovering alternatives that are reviewed in application to firm's environment, available resources, and business vision. Once this process is established, proper investment alternatives will be found relatively easily. In addition to that, Frisk et al have identified that the quantitative approach for decision-making does not act as a meaningful tool for investment evaluation. As a result, for each of the investment proposals companies should take intangible benefits into account, which span across several categories: strategic match, external pressure, organizational impact, benefit and cost awareness, risk sensitivity, IT capacity, stakeholder understanding, project competence. Also, companies should address the issue of potential knowledge gap among its key decision makers. If they do not possess necessary knowledge to evaluate and comprehend the tangible and intangible benefits of the investment, they are not able to make an informed decision.

Among key outcomes of the second reviewed research made by Serafeimidis & Smithson (2003) are findings that investments are inseparable from the organizational context, and therefore firms should always review their investment alternatives in terms of their relevance to the business goals and vision of company's future. Moreover, considering that each investment poses a big chance for a company to change, several key metrics or performance indicators should be established in order to be able to evaluate how a certain investment alternative fits a company. In addition to that, the researchers state that the

decision-makers must take into account hidden values of an investment option, i.e. intangible benefits, as well as personal values from key participants of the evaluation, as this boosts discussion and benefits the process in general. Moreover, it is crucial for companies to learn from their experience on the best practices for communication. By gathering such knowledge companies attain a higher convergence among its members, what is crucially important for the successful evaluation of investment decision. Finally, the researchers state that not all the tools for investment alternative evaluation fit each and every case of every company. Therefore, key stakeholders must think on which technique is the most applicable to the case being reviewed prior to the evaluation itself. As the aim of the study was to bring and observe the culture to organizations with rich awareness towards evaluation, it has been noted that such culture enhanced organizational learning, as well as made communication within stakeholders easier.

During the research made by Counihan et al (2002) authors identified several problems of investment evaluation, such as evaluating intangible benefits, making the relationship between IT and profitability explicit, and dealing with the extended investment time frame. The researchers developed a framework to address these issues. The framework suggests to take start evaluating an investment from looking at firm's environment and analyzing if a real need for investment exist or not. It is also important to estimate the level of commitment, which an organization responsible for implementation is ready to devote to it, as well as to evaluate the necessary assistance and interdependence among business units involved into the evaluation of information system investment. Finally, the researchers state that companies should look at the investments from the viewpoint of their relation to the timeline, and that benefits and constraints should be carefully reviewed for a short-term planning, but long-term ones should not be forgotten either. All in all, authors also put emphasis on considering intangible benefits of the investment alternatives, as they play a vital role for realizing the potential value of the investment.

As it can be seen, different researches discover different problems and ways of addressing them. However, on the other hand it is impossible not to notice that even different organizations in different projects mostly face the same issues for choosing alternatives during investment decision-making process. These issues must be carefully analyzed and tackled in order to find a useful method of solving them for upcoming projects.

First of all, it is clearly seen that the biggest and the most important issue for investment evaluation is assessment of intangible benefits, which was covered and highlighted as very important one by all three searches. Many organizations rely on using quantitative financial measures and tools as the only technique for evaluating investments. As it has been proven, this approach fails to take into account factors that are difficult or impossible to measure in traditional ways. However, through all researches that were made it was proven that these "hidden" benefits do impact the company's operability and performance in a long run a lot. Moreover, intangible factors of a certain option may provide higher

benefits of the investment than financial ones, leading to making a wrong or incorrect decision.

In addition to that, two of the researchers have found out the importance of reviewing the investment option in regards to the company's environment, business vision, and long-term goals of a business. Adopting an approach of continuous monitoring of company's internal and external environment would lead to a better understanding of the actual company's needs and understanding the importance of an investment to which company is about to commit, as well as pondering if the investment is actually needed at all. Furthermore, it would lead to discovery of better alternatives, what is important for a design-driven decision-making approach, as discussed in the research of Frisk et al.

Finally, all three researches find out the importance of smaller factors, which nevertheless contribute to the investment evaluation process. Two of the studies insist on the importance of establishing organizational learning and knowledge accumulation from investment projects and setting up strong communication flow between main stakeholders involved in the process, let it be individuals or business units of a company. In addition to that, companies in general need to promote learning for decision makers, as knowledge gap is a problem, which can also negatively affect evaluation process in cases when decision makers do not possess complete understanding of the investment proposals.

5.2.2. Framework for investment alternatives evaluation

Having three models analyzed and findings of the researches discovered, it is possible to build a new theoretical body of a framework for investment option evaluation, based on this new knowledge. Therefore, it is important to project points mentioned in previous chapter to a new framework that will comprise of the synthesis of the findings discovered in these researches as well as frameworks used, as portrayed on Figure 4.4.2.

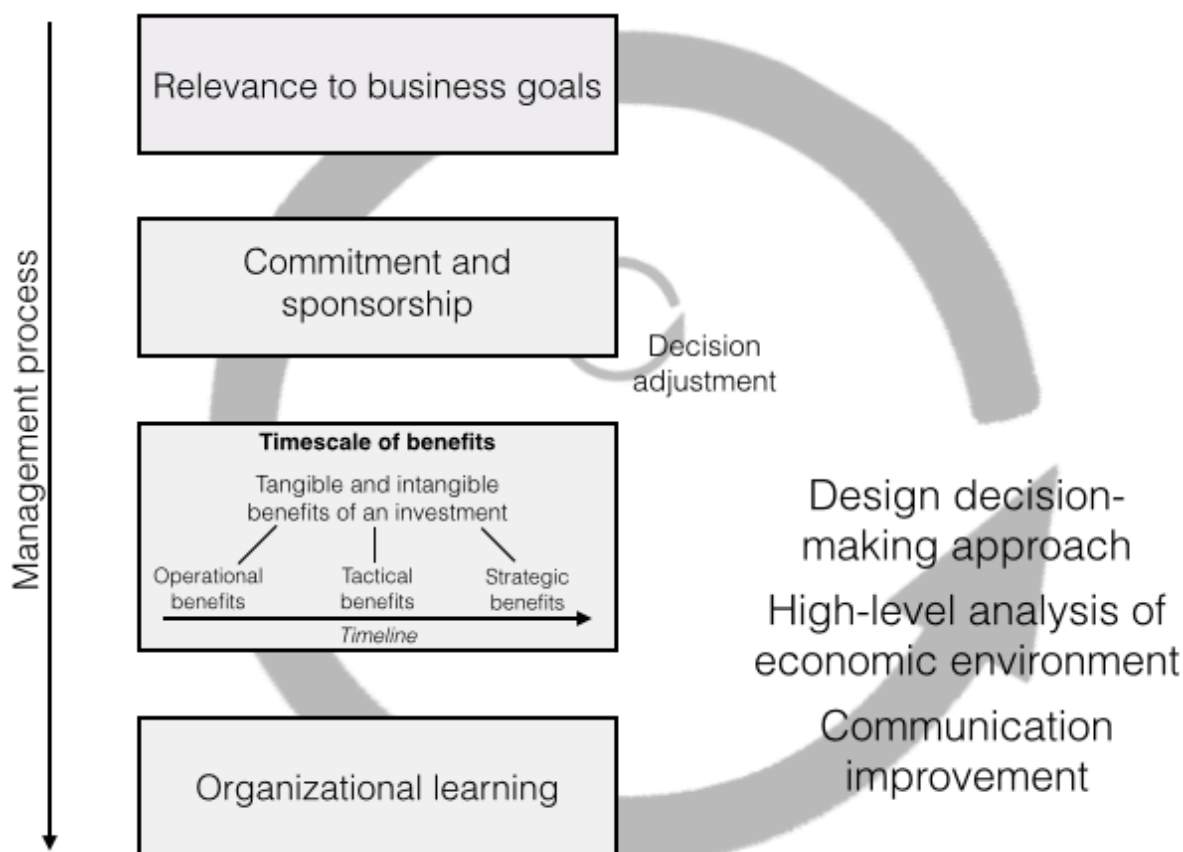


Figure 4.4.2. Framework for investment options evaluation.

First of all, the whole organization's investment options evaluation should be organized to incorporate a design approach. Organizations should be constantly critically evaluating the company's environment in order to identify emerging possibilities, as well as realizing possible options for an investment, and if the need to an investment actually exists. Having this process established, company should think about their realistic needs, what will eventually help to find good alternative options. In addition to that, the suggested framework cannot be properly used without strong and potent communication flow among all stakeholders involved into the evaluation process. A company should be able to achieve convergence in terms of its vision, its market performance and value, its business goals and aims. It is crucial that business units also understand their position, role, and needs within the company, as without this it would be impossible to achieve shared understanding of the process and implement it with maximum efficiency.

Once these processes are achieved and in place, company can proceed with evaluation of possible opportunities for investment, and their assessment. First of all, an investment option should be evaluated for its relevance to the company's business goals. Considering that every company should have certain metrics established in order to track and assess its market performance, each of the investment options should be thought over how it will help to enhance those values. If investment possibility does not seem to relate to those or enhance them in any meaningful way, such option should be either abandoned or re-

assessed from the beginning. Each of the investments or project proposals usually represents a high money distribution, and therefore may pose a company to financial or operational risk. Furthermore, it can lead to a considerable change within organization, which cannot always be predicted and foreseen. As a result, in order to mitigate these risks, careful evaluation of relevance of the option to company's business goals should be taken with a great responsibility and accuracy.

After that, a firm should define how much it is ready to commit to investment implementation. If information system, which is being proposed, will be developed internally, it is vital to investigate how much human and technical resources it would take to create and implement it properly. However, in case when the solution is developed externally, it is logical to evaluate the financial and technical resources that will be required in order to implement this solution. Such evaluation should be performed on both business unit-wise, and enterprise unit-wise to see if all parties are capable of supporting this solution. As a result, investment option should be adjusted in order to take into account limitations should there arise any. As no hard decision about information system investment is done at this point, adjusting solution can be achieved relatively easily. Nevertheless, it should not be forgotten that this can should be communicated properly among all parties involved in the decision-making process, what can be achieved only if proper communication flow established in a company.

Once the investment option is adjusted, it is possible to assess potential benefits that it will bring to a firm, and to align them towards the timeline of the potential information system implementation. Most companies still use the traditional tools for investment evaluation which mostly rely on measuring certain financial indicators, and therefore it is expectable it is exceptionally challenging for companies to make a change immediately and switch only to evaluation of intangible benefits. Therefore, company should take both approached towards evaluation and first of all, assess investment option in a traditional and established way. Also it is beneficial to project the yield of investment benefits to the timeline in order to understand how these benefits will take effect of certain investment alternatives against the other options. However, after that it is important to tackle the issue of intangible benefits evaluation. Suggested intangible benefits are of four groups: internal improvement, customer-oriented benefits, foresight, and adaptability. Intangible benefits of first group take a look at how the investment affects *production processes, management of operations, changes in production value and output*. Secondly, customer-oriented benefits measure the changes in customer satisfaction, customer retention, and so on. Thirdly, foresight benefits evaluate how the investment option will help company to better fir to the market, and how it will affect company's ability to enhance doing its core task, for example provide better health services, or gain higher market share, if an organization where the investment is going to take place will be a hospital, or a goods manufacturer, respectively. Also, it is important to relate intangible benefits to the timeline of investment as well. In this case, the two former groups of the intangible

benefits belong to ongoing benefits, while two latter groups – to future or potential benefits.

After investment's benefits evaluation, a company should possess quite clear understanding of positive sides of an investment option, as well as its caveats and limitations. At this stage it should be already able to compare various information system investment alternatives among each other, and therefore be able to choose the most beneficial and suitable ones, as well as to understand which ones are of higher importance, in case the investment proposals do *come from different business units or third companies*.

During each of these stages, and most importantly after the choice is done, company should try to promote organizational learning and knowledge gathering. Experience gathered from investment evaluation will be beneficial in future cases, and therefore should be shared among stakeholders. At the same time, firms should address potential knowledge gap, which may prevent certain parties from understanding all concepts and ideas required for understanding the investment completely.

It should be noted that the suggested framework is relatively flexible, as even if some stage of the evaluation process is not carried out properly, it will still provide a meaningful evaluation of an investment option, allowing to see the big picture with positive and negative points of each of proposals. However, it is important to understand that in order to get the best overview of each of the options, every stage should be performed thoroughly. Moreover, intangible benefits evaluation step should not be skipped at any cost, as it was identified during all the researched reviewed in previous chapters, that ignoring intangible benefits is one single biggest mistake most of companies can do.

However, this framework should not be blindly followed in every single case of every company. It should be understood that it is impossible to cover all possible cases that can occur in real life with one framework. Therefore, companies should be able to review what are their needs and situation they operate in. During the first stage (environment evaluation) firms may evaluate the applicability of this framework in order to assess, how much does it fit into their realities.

6. CONCLUSION

6.1. Research overview

On modern highly competitive and constantly changing markets it is vital for companies of all sizes to be able to adjust to emerging changes as well as to be able to satisfy altering customer desires and demands. However, every change and adjustment requires a certain type of investment, which can be of time, human, or financial type, and very often all these types of investment do come combined. Information systems enhance capabilities and empower companies, and as result of that organizations need to invest into them to be able to compete on the market. Moreover, almost any investment made by firms in processes, supply chains, products, support, and so on require a complementary IS investment.

However, it is not always clearly perceived which investment should be carried out, as none of the companies naturally possess enough resources to carry out every investment out of the broad range of virtually limitless options. Therefore, the objective of this research was to develop a framework for evaluation of potential alternatives in information technology investments. Moreover, as a basis for the presented framework, the intermediary goal of the research was to identify issues that companies face while evaluating potential alternatives, as this is necessary to be understood prior to tackling these issues for the framework building. As a result of this, the first research question was set to identify most common mistakes that companies do while assessing investments in information technology systems. Furthermore, second research question was aimed at understanding how can these mistakes be avoided to mitigated.

A literature review was carried out in order to identify what researches have been done on this topic. The aim of the literature research was to find cases of investment evaluation frameworks in different real-case scenarios, and to analyze how they affected companies' performance. Therefore, there were found three studies that applied three different frameworks and measured how these companies succeeded at selecting such alternatives. Combining together the provided theoretical background and current study's discoveries, findings from other researches, and results of the frameworks' performance it was possible to answer all set research questions, as well as to complete the objective of current research and develop a framework for evaluation of potential alternatives in information technology investments.

6.2. Results of the research

In order to be completely able to develop a framework for investment alternatives evaluation, it is important to understand caveats and limitations that are modern companies facing during the decision-making process. Therefore, two main intermediary goals were set as questions to the research.

First question was aimed towards understanding of the caveats themselves, and mistakes that companies do while assessing investments. After the conducted research, it can be clearly seen that one of the most crucial mistake that staggering amount of companies fails to pay attention to is neglecting the intangible benefits. Most of organizations rely on using quantitative financial measures and tools as the only technique for evaluating investments, and this approach does not take into account factors that are difficult or impossible to measure in traditional ways, even though they tend to have a massive effect on the company's operability, at times even more than the measurable quantitative one. Second mistake that organizations often do is inability to overview the investment proposal in regards to the company's environment or in relation to business goals or vision. Thirdly, many firms do not emphasize the importance of continuous learning and increasing IT literacy among its top management, what essentially leads to setting wrong priorities and relying on gut feeling or experience rather than scientific evaluation during the decision-making process. Final mistake that was found during the research was the failure to see all available options that companies see in front of them. It is apparent that inability to identify available alternatives naturally leads to incorrect evaluation of the existing ones, as well as potential selection of the option that was not the best for the company.

However, current research succeeded at finding the answers for mitigating or avoiding such mistakes, as synthesized in Table 5.2.

Table 5.2. Answers to first and second research questions.

Most common mistakes and caveats during investment assessment stage	Required actions to mitigate such mistakes
Failure to account for intangible benefits	Evaluate intangible benefits before making a decision.
Inability to overview investment in regards to the company's environment and vision	Adopt an approach of continuous monitoring of company's internal and external environment.
Not setting up continuous learning	Promote continuous learning for decision makers and top management.

Inability to identify all available options	Adopt design-driven approach for decision-making
---	--

During this study was developed a framework that enables companies to evaluate investment options and investment alternatives and see, which investment proposals are worth implementing and which are not. This was achieved through the extensive literature research that was conducted through gathering information from publications of scientific journals, books, magazines, and other scientific papers. In addition to that, it was important to gather information about main issues that these organizations faced, and cross-compare them between each other. It was vital to discover if such issues occur in different scenarios, what are the factors leading to their occurrence, and that were the ways that case companies approached them. Therefore, the contribution made by analysis of these issues helped to create a framework that encompasses the best ways of dealing with these problems from various researches. As a result of this, the research process had three main targets:

- Discover past researches on the topic of IS investment evaluation;
- Analyze found researches;
- Develop a framework for investment option evaluation based on the findings of the research.

During the research it has been found that in researches carried out during the past years it is not always easy to find a common ground, because the notion that investments in information systems clearly enhance company's performance has not always been easy to prove (Santhanam, 2003). Nevertheless it was still possible to find reliable sources of information with initial situation, issues identification, framework, and outcome evaluation documented.

After evaluation, main issues with investment option evaluation were discovered, and during their comparison it was found out that various companies faced similar issues while investment proposal evaluations.

As a result of this study, a framework was suggested, which is based on the findings and recommendations made by other researchers. It encompasses all mentioned points, as well as parts of the frameworks that were proved to be successfully working during their implementation in case companies. With the use of such framework, various companies take advantage of evaluating their investments and selecting the most beneficial one in terms of potential advantages and benefits.

6.3. Contributions for future research

Current thesis's topic ranges over a wide research area, but as it was stated in the scope chapter, current study is limited only to the process of investment option or investment proposal evaluation. Furthermore, the study aimed at the quick evaluation, and this essentially means that in order to conduct a thorough evaluation that encompasses assessment of hard measures such as return on investment and financial profits, the suggested framework would not be the best choice.

In addition to that, the research does not go beyond the point of actual investment implementation. After the investment is evaluated and is considered to be a decent option, it can be deferred, implemented partially, dis- or reinvested. Therefore, these areas represent points that would need to be studied more.

Furthermore, the framework is mostly aimed towards the companies working in information-sensitive areas with a high culture towards IT. Unfortunately, it fails at addressing the issue when the management of the company is not able to understand the importance of information system investments, and therefore cannot be applied there. It also represents a potential area for future research.

In addition to this, it needs to be noted that the suggested framework for investment option evaluation is not tested on a real-case company. Despite the fact that it was made as an outcome of the extensive research and combines best practices of many other firms that were conducting such researches, it cannot provide an absolute guarantee that it is applicable to evaluation of all possible scenarios of investments. Therefore, it would be interesting to see this area researched more. This framework needs to be applied in practice to observe the results it yields. Also, it would be interesting to see how it performs for companies working in different industries.

BIBLIOGRAPHY

- Accampo, P. (1989). Justifying network costs. *CIO*, No. 2, pp. 54–57.
- Addo Tenkorang R. & Helo P. (2011). Enterprise Resource Planning (ERP): A Review Literature Report. Proceedings of the World Congress on Engineering and Computer Science 2011 Vol II WCECS 2011, October 19-21, 2011, San Francisco, USA
- Ali, M.K. (2000). Issues in implementing enterprise resource planning (ERP): a management perspective. MMS research project, School of Business, Carleton University, Ottawa.
- Anderson P. A. (1983). Decision making by objection and the Cuban missile crisis. *Administrative Science Quarterly* No. 28(2), pp. 201–222.
- Arapoglou, A., Serafeimidis, V. & Doulidis, G. (1997). Rationale and management of IT investments in the case of Greece. Proceedings of the 5th International Conference on Information Systems, Ireland.
- Avgerou, C (2000). Information systems: what sort of science is it? *Omega*, No. 28, pp. 567–579.
- Ballantine, J. & Stray, S. (1998). Financial appraisal and the IS/IT investment decision making process. *Journal of Information Technology*, No. 13, pp. 3–14.
- Baskerville, R. L., & Wood-Harper, A.T. (1998), Diversity in information systems research methods. *European Journal of Information Systems*, No. 7(2), pp. 90–107.
- Benaroch, M (2002). Managing Information Technology Investment Risk: A Duopoly Perspective. *Journal of Management Information Systems*, Vol. 19 (Fall 2002), No. 2. pp. 43-84.
- Brgman, M., King, J., Lyytinen, K., (2002). Large-scale requirements analysis revisited: the need for understanding the political ecology of requirements engineering. *Requirements Engineering*, No. 7(3), pp.152–171.
- Bierman H., Smidt S (2003). *Financial Management for Decision Making*. Beard Books, 828p.
- Blanchard, B. S. & Fabrycky W. J., (2006). *Systems Engineering and Analysis*, Fourth Edition. Prentice Hall. 800p.
- Boland Jr. R. J., & Collopy, F. (2004). Design matters for management. In *Managing as Designing*. Stanford University Press, California.
- Boonstra, A. (2003). Structure and analysis of IS decision-making processes. *European Journal of Information Systems*, No. 12(3), pp. 195–209.
- Bradbury, M. (2001). Accounting for intangibles. *Chartered Accountants Journal of New Zealand*, No. 80, pp. 15–17.
- Brynjolfsson, E. (1993). The productivity paradox of information technology. *Communications of the ACM*, No. 36(12), pp. 66–77.
- Castellina, A., (2012). *A Guide for a Successful ERP Strategy in the Midmarket: Selection, Services, and Integration*. Aberdeen Group, USA
- Castells, M. (1996). *The Rise of the Network Society*. Blackwell Publishers, Cambridge, MA, USA.
- Chan, Y.E., Huff, S.L., Barclay, D.W. and Copeland, D.G. (1997). Business strategy orientation, information systems orientation and strategic alignment. *Information Systems Research*, No. 8(2), pp. 125–50.

- Córdoba, J.R. (2009). Critical reflection in planning information systems: a contribution from critical systems thinking. *Information Systems Journal*, No. 19, pp. 123–147.
- Counihan A., Finnegan P., Sammon D. (2002). Towards a framework for evaluating investments in data warehousing. *Information Systems Journal*, No. 12, pp. 321–338.
- Dean, Jr. J. W., & Sharfman, M. P. (1996). Does decision process matter? A study of strategic decision-making effectiveness. *Academy of Management Journal*, No. 39 (2), pp. 68–396.
- Demirhan, D., Jacob, V. S., and Raghunathan, S. (2002). Strategic IT investments: Impacts of switching costs and declining technology costs. *Proceedings of the Twenty-Third International Conference on Information Systems*. Atlanta, pp. 469-480.
- Eisenhardt, K. M. and Zbarachki, M. J., (1992), Strategic decision making. *Strategic Management Journal*, No. 13 (S2), pp. 17–37.
- Farbey, B., Land, F. & Targett, D. (1992). Evaluating IT investments. *Journal of Information Technology*, No. 7, pp. 109–122.
- Flynn, B. B., Kakibara, S. S., Schroeder, R. G., Bates, K. A., Flynn, E. J. (1990). Empirical research methods in operations management. *Journal of Operations Management*, No. 9 (2), pp. 250-284.
- Frisk J. E., Lindgren R., Mathiassen L. (2014). Design matters for decision makers: Discovering IT investment alternatives. *European Journal of Information Systems*, No. 23, pp. 442–461.
- Grant G. G. (2003). Strategic alignment and enterprise systems implementation: the case of Metalco. *Journal of Information Technology*, No. 18, pp. 159–175.
- Grindley, K. (1991). *Managing IT at Board Level*. Pitman Publishing, 280p.
- Guillemette, M. G., Paré G. (2012). Toward a new theory of the contribution of the IT function in organizations. *MIS Quarterly*, Vol. 36, No. 2, pp. 529-551.
- Gummesson, E. (1993). *Case study research in management: Method for generating qualitative data*. Stockholm University, Department of Business Administration, 61p.
- Hansen, S., Berente, N., and Lyytinen, K. (2009). Requirements in the 21st century: current practice and emerging trends. In *Design Requirements: A Ten-Year Perspective*, pp. 44–87, Springer, Berlin.
- Hares, J. & Royle, D. (1994). *Measuring the Value of Information Technology*. Wiley Publishing, Chichester.
- Hirschheim, R. and Sabherwal, R. (2001). Detours in the path to strategic information systems alignment. *California Management Review*, No. 44(1), pp. 87–108.
- Holmström J. & Sawyer S. (2011). Requirements engineering blinders: exploring information systems developers' black-boxing of the emergent character of requirements. *European Journal of Information Systems*, No. 20, pp. 34–47
- Information Resources Management Association (2001). *Managing Information Technology in a Global Economy*. Idea Group Publishing, 1202p.
- Irani, Z. & Love, P. E. D. (2001). The propagation of technology management taxonomies for evaluating investments in information systems. *Journal of Management Information Systems*, No. 17, pp. 161–177.
- Ives, B. (1994). Probing the productivity paradox. *MIS Quarterly*, No. 18 (2), pp. xxi—xxiv.
- Howell, J., Miller, P., Park, H. H., Sattler, D., Schack, T., Sperry, E., Widhalm, S., and Palmquist, M. (2012). *Reliability and Validity*. Colorado State University.

- Keen, P. (1981), Value analysis: justifying decision support systems. *MIS Quarterly*, No. 1, pp. 1–14.
- Kothari, C. R. (2004). *Research Methodology: Methods and Techniques*, Second Edition. New Age International, 401p.
- Kumar, R.L. (2004). A framework for assessing the business value of Information technology infrastructures. *Journal of Management Information Systems*, No. 21 (2), pp. 11-32
- Leidner, D. E., Elam, J. J. (1995). The impact of executive information systems on organizational design, intelligence, and decision making. *Organization Science*, No. 6 (6), pp. 645–664.
- March, J. G. (1962). The business firm as a political coalition. *The Journal of Politics*, No. 24 (4), pp. 662–678.
- Markus M. L. & Tanis C. (2010). *The Enterprise System Experience— From Adoption to Success*. Pp. 173-207.
- McMenamin, J. (2002). *Financial Management: An Introduction*. Routledge Publishing, 832p.
- Mitchell, R. J., Shepherd, D. A., and Sharfman, M. P. (2011). Erratic strategic decisions: when and why managers are inconsistent in strategic decision making. *Strategic Management Journal*, No. 32 (7), pp. 683–704.
- Munassar, N., & Govardhan, A. (2010). Comparison between five models of software engineering. *International Journal of Computer Science Issues*, No. 7 (5), pp. 94–101.
- Murphy K. E., Simon S. J. (2002). Intangible benefits valuation in ERP projects. *Information Systems Journal*, No. 12, pp. 301–320.
- National Research Council (1994), Committee to Study the Impact of Information Technology on the Performance of Service Activities. *Information Technology in the Service Sector*. National Academy Press, USA.
- Parahoo, K. (2006). *Nursing Research – principles, process and issues*. 2nd ed., Palgrave, Houndsmill
- Parker, M.M. (1996). *Strategic Transformation and Information Technology*. Prentice-Hall Publishing, USA.
- Peppers, K. & Santos, B. L. (2013). Research opportunities in information technology funding and system justification. *European Journal of Information Systems*, No. 22, pp. 131–138.
- Pinch, T. J., and Bijker, W. E. (1984). The social construction of facts and artefacts: or how the sociology of science and the sociology of technology might benefit each other. *Social Studies of Science*, No. 14, pp. 399–441.
- Rajaraman V. (2004). *Analysis and Design of Information Systems*. Prentice-Hall of India, 304p.
- Reilly, R.F. (1998). The valuation of proprietary technology. *Management Accounting*, No. 79, pp. 45–49.
- Rockart, J.F., Earl, M.J. and Ross, J.W. (1996). Eight imperatives for the new IT organization. *Sloan Management Review*, No. 38 (1), pp. 43–55.
- Romme, A. G. L. (2003). Making a difference: organization as design. *Organization Science*, No. 14(5), pp. 559–573
- Royce, W. W. (1970). *Managing the Development of Large Software Systems*. Technical Papers of Western Electronic Show and Convention (WesCon). Los Angeles, USA.
- Santhanam, R. (2003). Issues in linking information technology capability to firm performance. *MIS Quarterly*, Vol. 27 No. 1, pp. 125-153.

- Schryen, G. (2011). Seeking the value in IS business value Research – an agenda for investigating synergies between socio-organizational change, IS capabilities change, and IS innovation. In Proceedings of the 19th European Conference on Information Systems (ECIS 2011), Helsinki, Finland.
- Serafeimidis V., Smithson S. (2003). Information systems evaluation as an organizational institution – experience from a case study. *Information Systems Journal*, No. 13, pp. 251–274.
- Singh M. K. & Bhattacharya A. (1995). *Management Information System*, First edition. Discovery Publishing House, New Delhi, India, 355p.
- Sircar, S., Turnbow, J.L. & Bordoloi, B. (2000) A framework for assessing the relationship between information technology investments and firm performance. *Journal of Management Information Systems*, No. 16, pp. 69–97.
- Sircar, S., Tumbow, J.L., and Bordoloi, B. (1998). The impact of information technology investments on firm performance: a review of the literature. *Engineering Valuation and Cost Analysis*. No. 7, pp. 171-181.
- Soni, G., Kodali, R. (2012). A critical review of empirical research methodology in supply chain management. *Journal of Manufacturing Technology Management*, No. 23 (6), pp. 753-779.
- Stair R.M. & Reynolds G. W. (2010). *Principles of Information Systems - A Managerial Approach Ninth Edition*. Course Technology, Cengage Learning, Boston, USA.
- Strauss, A., and Corbin, J. (1990). *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. Sage Publications, USA.
- Thayer, R. H., and Dorfman, M. (1990). *System and Software Requirements Engineering*. IEEE Computer Society Press, Los Alamitos, USA.
- Thierauf R. J. (1999). *Knowledge Management Systems for Business*. Greenwood Publishing Group, USA, 360p
- Truex, D. P., Baskerville, R., and Klein, H. (1999). Growing systems in emergent organizations. *Communications of the ACM*, No. 42, pp. 117–123.
- White T. (2012). *Reinventing the IT Department*. Routledge Publishing, 368p.
- Worthen, B. (2002) Nestlé's ERP odyssey. *CIO Magazine*, accessed <http://www.cio.com/archive/051502/nestle.html> on August, 2014.