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TOWARDS A FRAMEWORK FOR A CONTINUOUS IT INVESTMENT VALUATION

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Abstract

The goal of this article is to contribute to the decision of how to analyse and evaluate the economic impact when deploying large IT solutions. For that purpose, we present a framework, which can be applied by carrying out the following steps: At first, important preconditions and assumptions concerning the IT solution have to be collected. Then, key factors, derived from the results of the previous step, can be identified. Finally, these factors have to be evaluated and, if possible, quantified and measured. Consequently, these steps have to be embedded in the development process of the IT solution. We describe a procedure model, based on the stages plan, do, check, act, which can be used to carry out a structured analysis taking into account the whole life cycle of the deployed IT solution, including an ex-post analysis. As foundation of the framework, we provide a classification of key factors of IT benefits and risks based on literature and case study review.

Keywords: economic valuation, IT investment, PDCA, valuation process.

1 INTRODUCTION

The adoption of IS/IT is considered to be one of the most expensive, complex and time-consuming tasks that a firm can undertake. As a result, the level of investment and high degree of uncertainty associated with its implementation is leading to an increasing attention in the valuation and justification of IT investments (Patel und Irani 1999). Organisational managers as well as IT professionals recognise IT valuation to be one of the most important unresolved concerns in information management (Farbey, Land und Targett 1993).

Remenyi and Sherwood-Smith (1999) divide the need of valuation of IT investments up into two main categories: first, the assessment, how well the organisation's funds or financial resources are being used and second, the assistance in a better management of IT investments. The valuation may take place at several stages of the system's development life cycle: the proposal / feasibility stage, the development stage, the post-implementation stage and the stage of routine operation (Willcocks 1996; Swinkels 1997) realizing a continuous tracking of the investment project success and assuring that the predicted benefits are achieved (Farbey, Land und Targett 1993). These valuations may vary in formality and extent to which they are implemented (Hirschheim und Smithson 1999).

The valuation of IT investments is problematic, not only because of the inherent difficulties of valuation, such as making estimates for future situations or the identification and valuation of these qualitative factors, i.e. customer satisfaction etc., but also due to typical characteristics of such investments in comparison to other investments (Ballantine, Galliers und Powell 1995), such as the scope of investment and the high degree of investment project complexity. One major problem seems to be that each type of IT investment requires a specific and individual approach to evaluate the economic impact. With regard to the use of procedures and methods there is still uncertainty which methods are suitable, at which stage of the implementation process they have to be used, how they have to be adapted and customized and which preconditions have to be set in order to assess the economic impact of IT solutions.

The goal of this paper is to propose a framework that defines a standardised procedure model in order to enable both ex ante and ex post valuation of IT investments throughout the whole project lifecycle. The procedure model should operate on a framework that can easily be adapted to different IT investment projects such as ERP, SCM or portal projects. The additional support by appropriate methods and tools should enable the user to build up valuation routine in order to be stronger focused on the valuation process itself.

2 ISSUES IN IT INVESTMENT VALUATIONS

Typical problems related to the economic valuation are the difficulties in quantifying future benefits. According to Tam (1992), there are vast problems to identify the cash flow of IT investments. Hochstrasser (1994) states that the standard valuation methods can only be applied with restrictions to the domain of IT. Even though many benefits can easily be recognized, they are hard to be captured in numeric values. Instead, benefits are typically described by examples e.g. increased customer satisfaction, faster time to market, improved corporate identity etc., all of which can hardly ever be fully considered within a cost-benefit analysis.

Often, many organizations decide on investments more on a rule of thumb basis than on the basis of widely accepted economic decision models. In addition, the difficulties in quantifying the benefits of IT can lead to an asymmetric consideration of costs and benefits in economic valuations. Thus, economic calculations are rarely well balanced and create negative results, because costs outweigh the benefits due to their relatively unproblematic measurement (Renkema und Berghout 1997; Borchers 2004). Often this is associated with the rejection of strategically important investments by

organizations pursuing a more precautious valuation and thus systematically underestimating the benefits of IT (Silvius 2004).

Also, many organizations tend to overestimate those benefits that can be quantified, in order to justify the investments, with regard to their short-term goals - the achievement of a positive cash flow early in the investment process. Management however often does not agree to the results, as there is only little credibility (Tallon, Kraemer und Burbaxani 2000).

In the past two decades, a lot of valuation methods have been proposed, many of which with a strict focus on cost or benefit estimation, complicating the balanced consideration of both quantitative and qualitative costs and benefits of IS/IT investments (see e.g. (Renkema und Berghout 1997)). After reviewing the literature it can be seen that these methods and procedures cannot be easily adapted for complex IT investment projects. The need to consider different types of systems, i.e., intranet, ERP systems or legacy systems, inter- and intra-organizational processes as well as the identification and measurement of the soft but nevertheless important subjective qualitative factors are complicating the detailed evaluation of benefits and costs.

On top, there are no reliable universal frameworks or procedures, which can guide the selection, adaptation and use of the appropriate valuation method according to the needs of a specific IT investment project, often resulting in an asymmetric consideration of benefits, costs and risks – altogether no reliable starting point to come to reasonable IT investment decisions..

3 PDCA - A PROCEDURE MODEL TO MEASURE THE ECONOMICAL IMPACT OF IT INVESTMENTS

The origins of the PDCA approach are lying in the concepts of quality management. In this context it is used to systematically implement changes and improvements. The PDCA approach is based on the common practice of identifying and testing hypotheses, resulting in measures to correct the initial assumptions. The procedure can be carried out in multiple cycles, ensuring a continuous improvement of the economical analysis (Imai 1993). In contrast to other approaches (see e.g. (Swinkels 1997)) we use PDCA phases to structure the valuation process itself. The benefits of this approach are the clarity of the valuation process and independence of the approach from different types of investment projects (Okujava 2006).

In the following we outline the PDCA-approach and discuss all main steps (see figure 1).

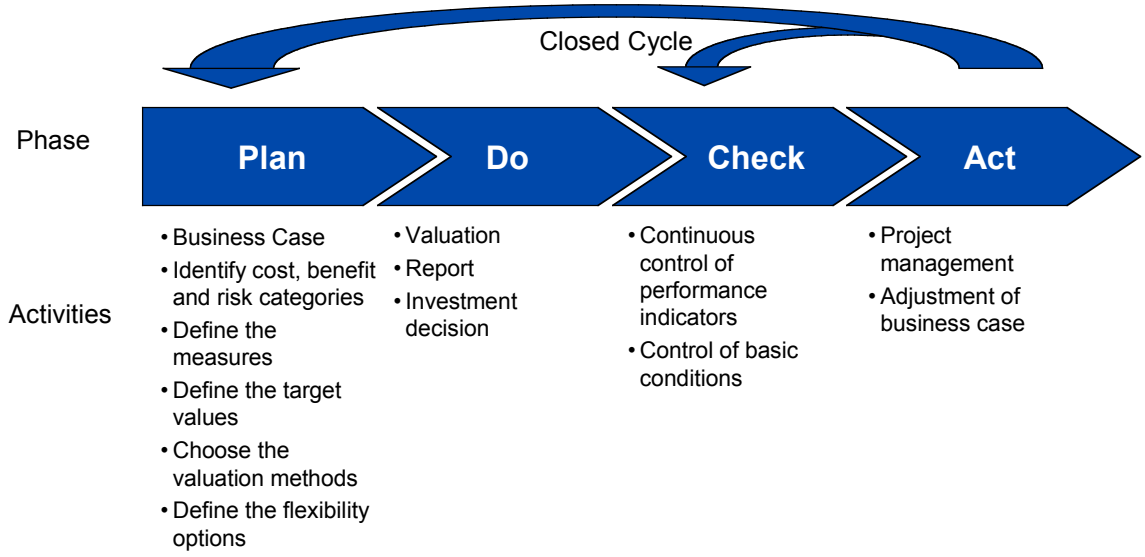

Figure 1: PDCA-approach

3.1 Plan-Phase

The first step in the PDCA approach contains the Business Case, the identification of categories with regard to benefits, costs and risks and the identification of performance indicators and target values. In addition, methods to evaluate the identified benefits, costs and risks as well as options for flexibility are determined, which can play an important role for project management later on.

Business Case

The Business Case intends to set requirements and detail the coming investment, taking into account a rough analysis of effects on the value adding and the technical description of the planned investment (Kütz 2000; Collins 2001; Collins 2003).

Identification of benefit, cost and risk categories

In order to make a final decision on the investment project start, costs, benefits and risks have to be identified and transferred into measurable performance indicators. Similar to the analysis of costs of IT investments using the well-known method of Total Cost of Ownership (TCO), cost, benefit and risk categories have to be split up into more detailed categories, finally defining atomic items, where concrete values can be assigned. The resulting framework can be used as a checklist to support the identification of appropriate categories and to assign specific analysis methods.

Benefits of IT investments: In order to compile a general list of benefits we reviewed literature about IT investments (Mirani und Lederer 1998; Amadi 2000; Tallon, Kraemer und Burbaxani 2000; Gunasekaran, Love et al. 2001; Benaroch 2002; McCaulay, Doherty und Keval 2002; DeLone und McLean 2003; Fichman, Keil und Tiwana 2005), resulting in the following 10 categories:

Benefit category	Description	Case example: Enterprise Portal Project
Strategy	Common benefits related to the strategy of an organisation or organisation department. These are commonly long term benefits.	Increase customer retention
Finance	All the benefit effects, that have direct financial impacts, e. g. cost reduction and directly quantifiable improvement of financial figures.	Cost and time reductions by providing access to digitalized documents
Processes	Impacts on processes that generate business value.	Improved quality by avoiding media breakes
Organisation	Benefits based on the improvement of the organisational structure or the organisation itself, e. g. basis for faster reaction on environmental changes.	Increased rate of employee involvement
Technology	Benefits resulted from improvement of the technological basis of an organisation.	Improvement of techno-logical basis; Experience in IT project management
Relationships with environment	Benefits related to the improved interaction with organisational environment, e. g. customers, suppliers, governmental structures.	Improved communication of objectives to customers and suppliers
Information supply	Benefits based on improved information supply in the whole organisation or for individuals.	Improved information access for key personnel
Flexibility	Benefits resulted from increased flexibility in an organisation, e. g. real options or capability of a faster reaction on environmental changes.	Faster information delivery; Basis for future portal applications
Products and services	Benefits resulted from direct improvement of products and services based on IT, e. g. mass customizing.	Broader range of products and services; Up-selling and cross-selling;
Human resources	Benefits resulted from improved working conditions for employees and management.	Automation of routine tasks

Table 1: Benefit categories based on literature review

Risks of IT investments: As already mentioned, the consideration of risks is an important part of every economical analysis. According to Bamberg and Cronenberg (2000) „a risk situation characterized by the fact that the decision maker is aware of (subjective and objective) probabilities according to the occurrence of possible situations", thus defining risk as uncertainty (measurable by variance or standard deviation). However, with regard to project management, we can note a different interpretation, describing rather the risk of not achieving the intended investment project goals. Cooper and Gray et al. (2005) are detailing risks into the following risk categories:

Risk category	Description	Case example: Enterprise Portal Project
External environment	The external environment can affect the project success. This category contains risks associated to political, social and other environments.	Legislative changes could affect the volume and variety of the provided information.
Responsible and persons in charge	Risks originated from activities of management and key personnel, such as resource misuse, unrealistic time frames and so on.	The management could change the priorities or modify the objectives.
Management of relationships	Risks emerging from deficits in relationship management with stakeholders.	Deployment of customer portals could (partially) fail due to ignorance of customer requirements.
Project management	Risks from erroneous project management – weak leadership, errors during planning etc.	Project success could suffer from weak project management, due to the lack of experience
Requirements	Risks of false requirement definition or vague specification. This category is especially important when dealing with large projects.	The requirements catalogue could be inconsistent or incomplete.
Project budgeting	Risks of premature aborting a project due to budgeting issues.	The project success could suffer from the lack of required resources.
Personnel	Risks associated with personnel involved in the project.	The project success could suffer from personal conflicts in the project team.
Technology	Risks resulted from the usage of different technologies, including feasibility challenges.	The current technology could be insufficient to realise the planned objectives.

Table 2: Risk categories

Identification of indicators and target values

The next step is to define indicators and target values as basis for analysing progress and deviations. Often, hierarchies of indicators and systematics are proposed (Hierholzer 2000; Kütz 2003). Indicators can play the role as target values, using economical performance indicators. These can be common indicators or indicators that are individually developed (e.g. ROI, EVA)

Selection of methods

The selection of methods is directly related to the selection of benefit, cost and risk categories and the corresponding performance indicators. As soon as all indicators are determined appropriate valuation methods have to be selected. The choice of the valuation methods and the scope of the valuation are also dependent on the stage of the system's development life cycle.

Definition of flexibility options

The analysis of flexibility options in IT investment projects can outline possible options for action. Possibilities to manage the IT project can be identified as well as effects assessed. With these guidance companies get the opportunity to react upon internal and external influences and adapt the project procedure accordingly.

Figure 2 shows a sample for an imaginary enterprise portal project with benefit items in selected categories, sample indicators with target values, methods and sample flexibility options.

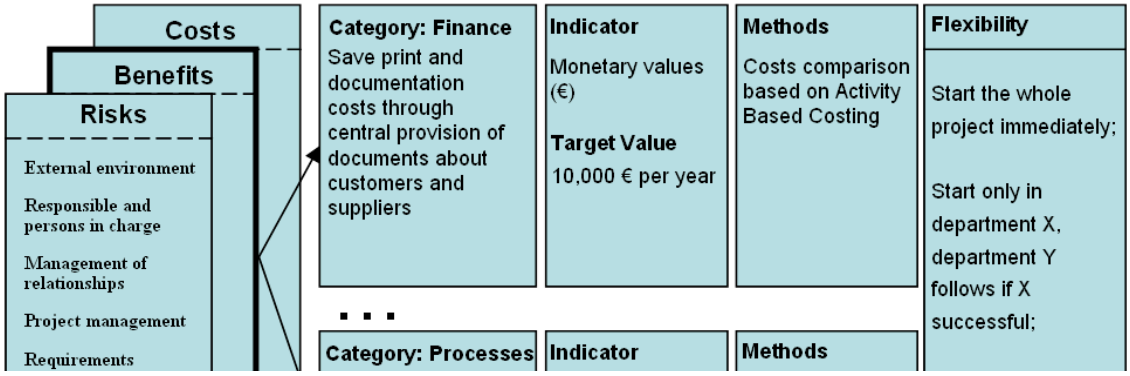

Figure 2: A sample flow for an imaginary enterprise portal project.

3.2 Do-Phase

The Do-Phase is the core phase of the economic valuation. All results are collected in a report, which is an important part of the business case and serve as basis for the investment decision.

The report is seen as a reference to evaluate upcoming IT investments, building the starting point for the valuation and the systematic management of IT investments. It contains the business case and categories of benefits, costs and risks, together with their corresponding valuation methods. Furthermore, the report supports an investment project controlling, by collecting performance indicators together with their target values in a transparent way. In addition, it contains possible scenarios and flexibility options. The report is accomplished by an executive summary containing a description for the best solution, its economic impact together with the main pros and cons for this solution. Based on these documents a decision about the investment project start can be made.

3.3 Check-Phase

The goal of the check phase is to control the progress of the investment project, the achievement and control of goals and if necessary, modifications of the Business Case.

Continuous control of performance indicators: In order to identify differences already in early stages many authors demand for a continuous monitoring of performance indicators (Deming 2000; Agrawal, Arjona und Lemmens 2001; Kütz 2003). There are different comparison methods: As typically, savings need a certain amount of time until they become effective, the comparison over time is providing a suitable basis to monitor the project process. The comparison of objects is focussing on projects neglecting other organizational-wide influencing factors (e.g., market changes) whereas a comparison using target figures from the economical analysis is useful to control the level of goal achievement of the IT investment project. In addition, benchmarking using external data from other organisations is useful to assess the impact and finally manage the investment.

Continuous control of basic conditions: Corrections with regard to the basic options defined in the Business Case align both, the economical analysis and the project management to real life expectations. In case corrections regarding project management are not sufficient, business goals have to be aligned (e.g. (Collins 2001; Collins 2003). Possible reasons for errors concerning the planning procedure include missing information, wrong description of situations and wrong methods for planning.

3.4 Act-Phase

The act-phase is responsible for actively managing the project taking into account identified deviations from the check-phase. These deviations can particularly result from modifications in the environment

of an organisation. Corresponding corrections are normally carried out by project management. In case these measurements seem not to be sufficient, the business case has to be corrected. Possible deviations may result from planning, execution or controlling errors. In order to solve typical planning problems budget and resources can be reallocated or, even the project can be stopped.

4 CONCLUSION AND OUTLOOK

Even though many benefits may lay at hand when implementing complex IT solutions, a systematic valuation of all economic influencing factors considering both, quantitative as well as qualitative benefits, costs and risks is important, not only in advance but dynamically throughout the whole investment project life cycle.

In order to fulfil these requirements, we presented a procedure model based on the phases plan, do, check, act, which can be used to carry out a structured analysis taking into account the whole life cycle of the IT investment. One of its key features is its adaptability to different IT investment projects by providing a classification where measurable key factors of IT costs, benefits and risks are collected and structured. Based on this classification, existing methods to measure the economic impact can be assigned to the corresponding items of the classification (see (Okujava 2006)).

What are the next steps in the development of the PDCA approach? First, the applicability of the approach has to be proved for different IT investment projects. Here we are already detailing the approach to measure the economic impact for the implementation of large enterprise portals, providing a categorization framework of benefits, costs and risks with regard to the main portal types (B2E, B2C and B2B) together with its appropriate performance indicators and valuation methods. Second, we are working on the development of easy to use software tools to support all stages of the PDCA approach, e.g., integrating templates for different IT investment project types, such as templates with already preconfigured values for typical benefits, costs and risks of employee portal projects.

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