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# Adaptable Techniques for Making IT-Related Investment Decisions

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**Abstract**— *The author investigated the main methods used for making IT-related investment decisions. In the view of these methods it can be said that no method was found that would help to make investment decisions 'routinelike'. The use of traditional financial indicators – which would be suitable for so-called regular investments - has a lot of obstructions and it would be dangerous to base decisions only on them. Return on Investment (ROI) methods are used in the case of classical investments (buildings, machineries) to analyze capital investments. Their simplest explanation is that net profit is expressed in percentage of invested capital. If it is a planned investment, a quotient is used for comparing variations. Cost-Benefit Analysis (CBA) has gained upon from the 60's (in case of several IT-related investments as well), as it made possible to consider certain not quantifiable factors and uncertain elements too, so it meant a great help for choosing between different alternatives. Total Cost of Ownership (TCO)-model was created by GartnerGroup in the beginning of the 90's, which is an excellent method for monitoring IT infrastructure and for analysing direct and indirect costs of possessed and used softwares and hardwares. An another method for making investment decisions, Rapid Economic Justification (REJ) is an attempt made by Microsoft and Intellectual Arbitrage to develop a better-balanced approach for examining and developing IT projects as it had been before. REJ offers the possibility of assessment balance against the cost-models dealing with only the cost side of a project.*

**Keywords**— Return on Investment, Cost-Benefit Analysis, IT investment, Rapid Economic Justification

## I. INTRODUCTION

IT became an inseparable part in the life of enterprises, so this kind of integration is going to be more tense in the future and to operate it is necessary to consider several aspects:

- IT is becoming more and more important, actually its services have become indispensable,
- Costs of IT are higher and higher,
- As the expansion of IT knowledge is very fast, the demands of users became more sophisticated as well,
- The connection between information providers and users turns into a seller-buyer relationship, in which the most important thing is quality.

There can be several solutions for everyday problems, which are the following, based on the summary written by [1]:

- Buying more equipment, in this way problems can be solved by extensive growth. However, it is wasteful and it is not sure whether it leads to success,
- Revising troubles precipitately (fire-fighting) - although in the long run it does not bring adequate results,
- Observing what is happening and hammer out a formal solution as soon as possible, it means to work out an organized management approach. Of course it is

crucial to build a new IT system or to change and update the one that has already been installed.

The above-mentioned approaches show clearly that investments in IT became an indispensable part of business life. It doesn't matter if it is a system for supporting a company's business processes or an operation system of a non-profit company because every organization needs information.

As all investments, it is also for a long run and has a deep impact for the present activities of an enterprise and for its future possibilities as well. An integrated corporate management system sets the confine of a company's business processes for even 8 to 10 years. But a simple investment seems to be as simple as buying new computers or office system also raise several questions to think of. [3]

The way of creating an information system and the system-planning/organizing itself are qualified as an investment in financial sense. It means that examining the possible impacts of the system, considering all concerned, planning processes are needed to be done in the same way as in the case of any other investment. Accordingly, it is so frequent to appraise IT investments with the method used in case of other investments. In this case significant difficulties might be rising: to measure the „outgoing side” of an IT system is methodologically pending and also to estimate costs is not as easy as it seems at first sight. [2]

## II. CALCULATION OF RETURN OF INVESTMENT (ROI)

ROI methods are used in case of classical investments (buildings, machineries) to analyze capital investments. [6] The simplest explanation is that net profit is expressed in percent of invested capital. If it is a planned investment, quotient is used for comparing variations. In the case of a more complex investment, various similar schemes can be made, where every part appearing in the system as a surplus capacity should be taken into consideration.

Not only costs but benefits need to be indicated: plus incomes and decrease of operational costs as well. Based on these, yearly net cash flow can be counted and to correlate it with investment costs we get ROI.

This relatively simple method of correlating costs and profits is good for expressing aims, relation of budget and business efficiency in numbers and show to the owners what is happening with their money.

The biggest disadvantage of this method is not to consider the directly or indirectly facts turn out in IT investing in force. Besides this, it can be hardly used in the case of projects, where impact of investing primarily effects the whole or some part of the organization not only the certain division.

## III. COST-BENEFITS ANALYSIS

All paragraphs must be indented. All paragraphs must be justified, i.e. both left-justified and right-justified.

By means of it more detailed cost analysis can be made, as it makes possible to consider certain elements that cannot be quantified. These elements can be: rate of speed, accuracy, safety, solidity, better information supply.

CBA's has gained upon from the 60's (in case of several IT investments as well), as it made possible to consider certain not quantifiable factors and uncertain elements too, so meant great help for choosing among different alternatives. Discounted cash flow calculation has to be made regarding life-span of the proposed system, considering expected inflation and rate of interest. We can consider several indexes in financial calculations: net present value, internal rate of return, refund period.

At the same time regular CBA cannot be used efficiently in several cases:

- there is not „investment” made, but there are a lot of small „acquisitions”,
- impacts of established systems cannot be realized in an observable division or specific activity but in the operation of enterprise,
- operated parts of the system are integrated in a process, so impacts can't be isolated from each other,
- Increasing range of factors cannot be quantified (advantages and disadvantages).

To evaluate IT investments we have to consider that CBA's has a very important restriction: they are not able to process/consider those complex changes take place in the enterprise and influenced by the information system. Though demonstrable profit-increasing comes off for the corporation under the system, but appreciated possibilities can be the

followings as well: enterprise renews its supply by the system, enters into new markets, discovers strategic chances have not used before.

## IV. TOTAL COST OF OWNERSHIP

TCO-model was created by GartnerGroup in the beginning of the 90's, which is an excellent method for monitoring IT infrastructure and for analysing direct and indirect costs of possessed and used softwares and hardwares. TCO considers all the emerging costs during the lifetime of the system, so the enterprise can define easier all the costs of the investment. [8], [9], [10], [11]

Of course GartnerGroup did not create a model that can be used for every case, but it made a scheme that can be used for analysing certain IT fields by the enterprise.

A research – made by several of hundreds of financial and IT managers – showed that one of twenty-five financial decision-makers considers that the bigger part of IT investment's costs arise after initiation. Against this most of them focus on controlling IT investment's costs instead of costs arisen after initiation.

According to researches of GartnerGroup distribution of emerging costs during the lifetime of a system was basically changed by growing networks, intranet and extranet systems. Acquisition costs of hardware for data centers or single desktops make about 50% of the total cost, service costs are only 28% of them. The service costs of client-server systems reach 77% of the total costs. In the case of network workstations, acquisition of hardwares and servers make only 20% of the emerging costs during appliance's lifetime. To define and follow up exactly the costs of IT is a challenge because it means that a lot of costs can be different in several TCO-models, different divisions can pay the same cost and presence of some of the costs is not really obvious. Furthermore, accounting-mechanisms used by enterprises usually are able to record identifiable and hidden costs. Any of these make difficult for enterprises thinking of introducing TCO to choose the applicable model and define costs to be followed as well. [7] Actually every TCO-model has references worthy of considering and developing such model practically to meet requirements of IT environment and supported processes. Introducing and using TCO consistently, we can achieve such basic information as the following:

- present and future costs and resources need to establish, maintain and support computer environment (to meet users and business requirements by this),
- to make established decisions on behalf of maximal operational efficiency in the field of labour policy, network supporting and training,
- to appraise alternatives for purchasing, maintaining and supporting these fields,
- to make achievable plans and calculations which help to introduce chosen alternative.

Regular updating of basic information means a help for the management to measure continuously the efficiency of computer environment. TCO-model by GartnerGroup makes possible to compartmentalize costs that becomes able to

simulate and analyse in a reliable and particular way. It is not possible to compare and make conclusions without consistent cost-categories in the course of compartmentalizing costs in different groups. Cost calculation of IT includes analysis of regular costs (e.g. investment, labour, expenses of consultancy, activities, subcontractors) and hardly definable and measureable indirect costs (supporting collaborator and themselves, downtime) as well.

TCO model uses two main categories for systematizing costs:

- Direct costs: investment costs, fees and labour payments spend by computer division or those business unit provide information services or solutions for the enterprise and users. Costs include costs of the hardwares and softwares and costs of information financing and labours and also management and supporting fees arisen by subcontractors.
- Indirect costs: it measures the efficiency as information provider provide expected services for end users. If information services solutions are efficient, user does not need to be supported by fellow worker or itself and downtime decreases. But if it is not, of course it increases. At most of enterprises these costs remain hidden, they are not measured and followed. Because of it, if the enterprise starts to cut their direct costs, end users would be charged unconsciously by it.

The following main categories can be separated in the TCO model by GartnerGroup:

- Direct costs: measures direct payments of IT (capital, labour, fees)
  - Hardware and software: hardware and software investments and renting fees of hardwares, if they connect to the shared computer assets of enterprise (including servers, client machines – mobile and desktops – periphery and network)
  - Actuation: direct labour expenses, costs of activities, subcontractor's fees used by information provider at the level of division, business unit or enterprise to give technical support and make infrastructural procedure for user.
  - Administration: direct labour costs, costs of activities, subcontractor's fees arisen by supporting informational service operations (supervising management, financing, purchasing and training)
- Indirect cost: rating the efficiency of informational service's capital and labour payments through having effect on the users. Measuring it happens through efficiency loss of users' activities and downtimes.
  - Users' activities: it is a cost of users' supporting each other and themselves instead of letting official information support them. It includes support the collaborator and themselves, official training of users, non-official training, self-development and

modification of applications, local file maintenance and the use of the computer in a non-officially way (e.g. to play, use internet) .

- Downtime: lost productivity comes from the planned or not planned unavailability of a network, system and application. Its measurement happens by the wage for the lost time.

GartnerGroup defined the method to be followed needs for cutting TCO costs. Necessary elements were compartmentalized in three groups: innovation of technology, process and qualification. [12] Enterprises using it can decrease costs arisen during the lifetime of information services efficiently if they make investments complement each other: train their workers, update processes and introduce technology, which can be managed, amended and supported easily. Based on some studies using this skill costs can be increased with 30-40%, let alone greater operability and satisfaction of users.

In the practise of TCO all the innovations can be realized at three wider level (basic, intermediate and advanced) and defines those cost-categories are influenced by innovations.

So we can state about TCO-models, that they mean a very important step forward compared to regular investment-return analyses, as all of those elements are considered during making decisions can cause payment in the lifetime of certain application. Within the confines of it, costs of several factors (especially indirect costs) can be used as a decision criteria has been described with a sort of quality category so far.

This method is exceedingly suitable for finding those hidden costs by comparing alternatives or analysing operating system, which presence is not necessary, so to abolish them the result of the enterprise can be increased.

At the same time it needs to be noted that this method has a lot of disadvantages. The first and the most important that it counts only with costs but not the result made by the application. It means difficulty that most of the cases it is very hard to find out who made the certain cost, so this way it is not perfectly suitable for managing the enterprise.

It is a very important viewpoint that TCO has several explanations, because after GartnerGroup a lot of enterprises made their own TCO-models and connected analysis application. The point all of these that it examines emerging costs during lifetime of investment (or in some cases the profit of it). After this, the manager should be almost omniscient if he is going to be able to choose the most suitable model.

Furthermore, I would like to draw your attention to another limitation of this method. The method itself is not capable of being the one and only base for a decision in case of an investment or innovation. The cause of it is that it does not really care for the strategy of the enterprise and its business procedure and demands, thus it does not define a potential or operating application to be accepted or denied. It's worth mentioning that before setting up IT (especially if the motivation for investing is not the result of an elemental development but it is ad hoc connected to a tender or a

financial subsidy), most of the customers do not know exactly what kind of operational costs they should calculate with.

To analyse IT investment alternatives, a complex method need to be used by all, which includes examination of costs as well of course.

#### V. RAPID ECONOMIC JUSTIFICATION (REJ) AND THE BUSINESS ENVIRONMENTAL/ECONOMIC IMPACT STATEMENT (BEIS)

REJ is an attempt made by Microsoft and Intellectual Arbitrage to develop a better balanced approach for examining and developing IT projects as it was before. REJ offers the possibility of assessment's balance against those cost-models (eg. TCO) dealing with only the cost side of a project. Opposing to only cost-oriented models, REJ examines costs and profits at the same time in context of the whole enterprise. REJ focuses the datas and procedures of economic analyses in a chain of steps considerably executable quickly and offers a well-defined output and recommended implementation technique for or to each of them. [4] [5]

BEIS and REJ developed side by side. This method contains more detailed methodological datas and techniques. BEIS includes several ways of solutions, methods and techniques regarding the methodology and against it; REJ is a potential solution itself. BEIS makes possible to analyse in a more radical way and to analyze the connection between statistical correlations and business strategies. To use different application but REJ needs more time and effort and not recommended for enterprises has no expert in working out IT feasibility studies.

##### A. Basic parts of REJ

The aim of the REJ framework is to help the quantification and the evaluation of planned IT investments. With the help of this method, evaluating IT investments can be assured in the scope of limits defined by very important business exercises for the enterprise. REJ refers to these business exercises as Critical Success Factor (CSF).

The method is suitable for evaluating investments one by one, including specific technologies and products as well. The framework can be used with other analysing methods, eg. IT-portfolio management, Balanced Scorecard and with different methods analyzing emerging costs during lifetimes.

To make a REJ study has three steps:

- To define the roles and responsibilities in a team: the most important part of making a team is having a group of stakeholders from several different specialties to make the best IT investment decision. This approach gathers economic, IT and financial specialists, so investment decision can be examined from different point of views.
- Preparations for making the business study. (to define a policy to follow and based on it study can be demonstrated for IT and financial management) The aim of REJ is making a study helps for the management to understand better the value of investment in dispute. It is specially important as investments are competitors of other projects of the

enterprise. The final aim of the study is to assign observations of the team and to show how the sketched solution meets the business requirements and to determine the expected financing profit of the solution.

- The process of making the study (techniques and aids for examination): REJ helps IT managers to connect information regarding technological decisions with the business procedures important for the enterprise. The method combines parts of strategies used for evaluating popular IT investments with the parts of Microsoft Solution Framework (MSF) to make a quick and efficient process for evaluating IT and investment decisions.

##### B. Model of a REJ project

The process consists of 5 well separated steps:

- Assessment of the business situation: the REJ team starts work with defining the fields important for stakeholders. Like this the team is going to be able to harmonize decisions with the critical fields of the enterprise. This harmonizing activity ensures to work out REJ study quickly as the team focuses only on those factors that are really significant to reach their appointed aims.
- To define the solution: having finished the examination of the business situation the team defines those activities connecting the most to the CSF of the enterprise. It makes possible for the team to define the solution based on how it helps to develop critical business activities.
- Estimation of p&l: having defined solution to be made, the next step is to estimate potential profits such as emerging costs during the procedure of realizing it. These factors are defined based on the regular cash-flow planning.
- To define risks: as all the factors cannot be realized in the beginning of the project, so none of the investments can avoid risk. In this period the team tries to identify and quantify the obscure fields of the project.
- Calculation of financing key performance indicators: based on cash-flow calculations were modified by risks and timefactor results is going to be expressed with the financial indicators as well used by the enterprise. After collecting and analysing all the information the team is making the study, which features the technological investment that meets business demands.

###### 1) The first step: to define business situation

The first step of REJ is to explore the important fields of the business. The aim is that the IT investment decision has to be in line with the general aim of the enterprise. In the course of it the team reviews business plans, strategic plans, supply-chain calculations and makes interview with the stakeholders.

- The team identifies:
- CSF of the enterprise,
- Strategies of the enterprise to reach CSF hopefully,

- Those key performance indicators (KPI) with the enterprise measures success.

Conclusion are fixed in a so called „alignment-chart“. In this chart it is shown that what kind of critical success factors are elemental for stakeholders and for achieving it what kind of strategy they follow and what kind of indicators are used for examining its fulfilment.

### 2) *Second step: define an IT solution*

The team determines how every single activity assessed in the first period can be developed by IT. Then required enable (RE) is going to be defined for every activity can make profit of IT support. RE is a technological possibility or capability ensures the execution of expected activity. If it meets the capability of the solution, the solution gives value to the activity. The team makes a „value-report“ in every single case like this. The team can use cause and effect analysis to determine factors can be connected to certain activities.

Summing up the results an activity chart comes off, in which every single activity is defined. These are the followings: present status and status to reach, necessary technological conditions and connected value report and the actual technological capability of planned solution.

The end of this period value-reports can be conciliated with stakeholders if these are acceptable for them. They can choose the most important values for the enterprise.

### 3) *Third step: estimation of profit and costs*

The investment decision bases on how the solution meets the needs of the enterprise. In case of a profit-oriented enterprise the base of the decision is how much cash or asset will be earned by the solution and they usually examine how much money will be saved by introducing the new solution. In this period the team calculate profit and loss reached by introduction and make a cash-flow report for the top management to define relative value of investment by it.

The easier task for IT managers how to follow and measure costs (eg. with the help of models like TCO). Against it to measure IT profit can cause serious problems. Traditionally it means labour cost savings by introducing the solution. This way of approach does not give exact picture in case of certain group of users e.g. knowledge workers, so severe further indicators are worthy to consider:

- the time knowledge workers can use for production is increasing,
- cycle time is decreasing,
- used active capital is decreasing,
- supporting and infrastructural costs are decreasing,
- uncertainty and risk is decreasing regarding the final aim.

The team reviews all of the value-reports and examines how can it be modified for measurable profit for the enterprise. There are a lot of possibility to estimate IT and CT costs. Eg. PCM-model of MetaGroup or TCO Analyst or TCO Manager Systems of GartnerGroup. This step of the analysis ensures the calculation of the investment and continuous operating cash flows (expenses) in useful lifetime of the solution. The

advantage of these applications is also that makes possible to compare the cost of the enterprise with the cost rate of certain industries.

After the team identified costs and profits, they make a previous cash-flow report of the project, which is going to be the base of investment analysis. In the end of the procedure they finalize the alignment-chart of the planned solution (from the first step), value-reports and cash-flow reports.

### 4) *Fourth step: identification of the risks*

Risk-management is the part of the life, as in the beginning of the project we are not able to realize every factors. In this period the team identifies those important fields where we can count uncertainty with.

The following risk categories can be separated:

- Risk of alignment: the better is the alignment, the lower is the risk. However in case of certain developments it is hard to measure conformity (eg. development of infrastructure), but it is necessary, because without it future conformity is not possible.
- Risk of realization: the chance of the costs of realization are diverging from the planned cost.
- Operating risk: the chance of the operating costs are diverging from the planned ones.
- Risk of solution: the more we learn about the solution and its impacts, the lower is the risk. At the same time low-risk projects do not always give the chance for great profit. Risks connect to the technology can be handled as a part of the risk of the solution.
- Risk of the profit: the chance of not estimating appropriately prospective profits or an unexpected financial situation happens/comes. E.g. If the enterprise has to pay bigger capital cost as it was planned or any other fields need for more attention by the enterprise, planned incomes can not be achieved.

The risk-management of REJ was developed to focus on those fields, where the risk seems to be high. The team uses risk-management chart to identify potential risks. It describes all of the categories with points 1-5, besides the team makes risk report for every high-risk factors, estimates its chances and the impacts of its having effect on the solution.

After measuring risks, it is necessary to decide how to report them: one of the possible solution is modifying cash-flow report or putting risk factors and its estimated importance in a chart.

### 5) *Fifth step: composing financial indicators*

The closing step of REJ is compiling the study. The study has to contain all the information that helps management to make an investment decision. After calculating all indicators, the study is going to be appear in two forms (demonstration and text document).

The capability of profitability and return (ROI) can be described with useful indicators used by the enterprise. These popular indicators are NPV, IRR and beside them, a lot of other indicators can be used (Economic Value Add – EVA, payback period, Earnings Per Share – EPS). Before the study

is made, the indicators we want to use has to be in compliance with the management. As risks can cut revenues and increases costs, the actual NPS and IRR-values can be lowered accordingly. Many of the enterprises count with costs that raise threshold value has to be reached by IRR.

## VI. CONCLUSIONS

In the view of these methods it can be said that no method was found that would help to make investment decisions 'routinelike'. The use of traditional financial indicators – which would be suitable for so called regular investments – has a lot of obstruction and it would be dangerous to base decisions only on them.

TCO-model provided a lot better view for managers of impacts, IT appealed to the enterprise. With these, the method has severe failures: eg. profits made by IT cannot be defined; it has a lot of contradictory interpretation in severe meanings and does not reflect the appropriation of the enterprise's processes.

The framework of REJ by Microsoft tries to quantify the impacts of IT investments in the way that examines its effects on the enterprise's critical factors. After disclosing the factors leading to business success, a prospective IT solution needs to be examined in order to see if it is sufficient for the purpose, then estimates costs and profits were made by this. Then risks are going to be quantified and finally the value of a potential solution is going to be expressed in the system of financial indicators used by the enterprise.

This kind of REJ analysis gives proper picture of the relation between the enterprise and the potential IT solution definitely, but the success of the solution depends on the knowledge of experts taking part in the analyst group. The method (and all similar methods) provides only the support with the help of hopefully all potential factors can be realized, but only in that case if they learnt newly and specific way of thinking can be found in the methods and they are really looking for the best solution for the enterprise and do not represent some external interest.

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