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MULTI-CRITERIA EVALUATION METHODS IN EFFECTIVE ICT PROJECTS IMPLEMENTATION

Summary: The main aim of the article is to outline the nature of ICT projects and provide the methodology to evaluate such projects. There are also multi-criteria methods, which should take into consideration such aspects as whether or not a project supports strategic aims of an organization, the influence of a project on the market share and clients satisfaction, the cost of the capital involved in the venture together with the calculations of lost profits resulting from the capital being tied up and the costs and profits of risks taken during the project realization. In the article, the authors also suggested the use of the Balanced Scorecard, which is used more and more often to evaluate company management. It is one of the most modern tools of results evaluation, because its construction takes into consideration the vision or strategy of companies, joining various perspectives of functioning evaluation of a company.

Keywords: evaluation method, ICT projects, projects criteria, organization effectiveness.

1. Introduction

Today companies operate in more and more sophisticated circumstances, so they need to adjust to the changing requirements of customers and workers in a quick and flexible way. This is possible only on the condition of efficient information flow between an organization and its customers.

To get customers involved into the process of organization management, it is necessary to create platforms of communication. Such platforms usually require thorough computerization of an organization so that computers segregate data, collect information and help in a decision-making process.

To achieve this, some steps must be taken. They are called ICT projects, which allow the company to gradually implement the computerization process. Such projects need to be evaluated, monitored and adjusted when needed. To make that process efficient, many multi-criteria measures must be used. But, there appears a problem: how to measure effectively projects is one of the most important questions.

In the article there is an attempt to find out a solution that can be helpful in ICT projects implementation. Namely, the authors decided to show available methods and try to customize the Balanced Scorecard so that it can be used as a measure tool. The main aim of the article is to analyze more thoroughly the aforementioned issues and list the possibilities to go through ICT projects with an appropriate set of measures, which also have been analyzed and described in the text.

2. ICT ventures as a conventional example of a project

The functioning of companies in the contemporary market conditions makes it necessary for companies to build a competitive advantage. The problems with keeping the advantage arise because of technological and technical development, shortening of product life cycles, globalization, growing unemployment, economic integration, more important issues connected with environment protection or growing consumers awareness and expectations [Wrzosek 2007, pp. 11–13].

Thus, companies taking care of keeping their market position make effort in order to re-organize and innovate their processes or whole systems. Making steps in that direction to reach the above goal is called projects. According to the generally accepted definition given by Project Management Institute (PMI), the project is a temporary activity taken in order to create a unique product, deliver unique service or reach a unique result [*Kompendium...* 2006, p. 5]. This means that the basic trait of such projects is delivering new solutions in conducted processes: in both production and management areas.

Because contemporary companies must be open to the technological development and to the new solutions in ICT area (Information and Communication Technology), the biggest part of projects is connected with mastering the used technologies or implementing new solutions which are to make an organization more efficient.

Taking up projects in ICT area is defined as the venture of informatics nature whose aim is to create, deliver and implement informatics product with the accompanying services [Szyjewski 2004, pp. 14–15]. Informatics product is understood here very widely and may mean the informatics system as well as a bunch of applications, informatics infrastructure holding the whole net or even whole ICT architecture [Duncan 2004, p. 4].

Taken projects (informatics as well) must be characterized by some parameters to treat them as real projects. The most important are the following:

1. given time of realization – one should determine a time period for finishing particular stages and the deadline for ending the whole project;
2. estimated finished product or a clearly stated aim – the project should be oriented on a give aim;
3. inclusion of coordinated activities – every activity and task should result from the decomposition of main project activities;

4. activity of an unusual and rare nature – even in the process of implementation of projects taken before, they are usually reconstructed in order to meet the requirements of a given organization [Karbownik 2004, p. 2];

5. the implementation of all the activities should be controlled and monitored;

6. realization costs – in various dimensions and time spans.

The methods and the way of conducting informatics projects is a topic of frequent discussions in the literature [Bolles 2007 pp. 17–25]. However, on the whole, we can say that the implementation of ICT projects in companies takes place in two perspectives. The first is to implement solutions based on Internet technologies, which allows for the development of e-commerce – it is to this form that usually microcompanies limit their activities because of relatively low costs of implementation. The other perspective is implementing complex solutions of ERP/MRP II nature which support most of the functional areas of companies which use also informatics technologies [Chomiak-Orsa 2011, pp. 133–142].

No matter with which area of the project we deal, each of the projects implemented in an organization should be realized:

- in the way which is individual for a given company;
- according to projects implemented before;
- with the use of mixed approach [Chomiak-Orsa 2007, pp. 110–117].

According to the above distinction, as an individual project we understand the creation and delivery of a totally new solution in the area of using informatics technologies. It may be a project of a website advertising a given company, an interactive form allowing a company to fill and order or a dedicated informatics solution made especially for a company to solve a specific problem. This kind of solutions (including system, technology and application infrastructure) concerning implementation of complex systems requires usually the preparation tasks of a consultant, analytic and project nature. This results in a huge cost, long time of realization; thus, especially in the case of microcompanies, this is very risky and very often impossible to conduct.

The second way of conducting an informatics venture is to implement copied solutions. This is done by choosing and implementing existing standard informatics solutions supporting, for example, the financial area and accounting for internal purposes, evidence of machines or stocks or simple clients base. This kind of solutions is implemented in many microcompanies because of the minimum costs of searching and implementing them. The entrepreneurs often use free licenses of software including basic functions of evidence. The only costs that they pay is buying technical infrastructure.

It is not often that we find in the group of small and medium companies changed standard informatics systems of ERP class. Such systems are usually for middle-sized companies, well and clearly organized with not complicated functional requirements.

The third most often found solution used especially in fast developing companies of small size is the informatics venture of mixed nature, which delivers a com-

pany a little changed standard informatics system. This kind of informatics venture is connected with integrated ERP systems delivered to the companies which have to take into consideration the branch characteristics. It is because of the characteristic processes for every branch. They also have to take into consideration the tradition and methods of company functioning worked out for years (for example, specific market, company image). Such projects are also projects connected with niche activities – they usually fill ERP systems, very dedicated to the specific of a company organization and functioning (for example, ASRS systems, mobile systems, numeric machinery systems, weighing systems and so on).

Thus, in the article we discuss only one approach in a more detailed way. Particular attention is given to describe the criteria which should be taken into consideration while taking the decision connected with informatics ventures.

3. Project evaluation methods

Taking the decision connected with the realization of a project is always accompanied by deciding what rules will be applied to evaluate the effects of a project. In management accounting, there are many tools to evaluate investments projects which are also used in evaluation of informatics ventures.

The main criteria which are taken into consideration while evaluating the effectiveness of projects are:

- the period of realization,
- investment costs,
- investment profits,
- discount rate [Nowak 2004, pp. 266–268].

The above criteria let us make a preliminary analysis connected with the effectiveness of taken projects in IT area.

Taking up projects, also in improving those existing in organization informatics technologies, is connected with incurring huge investments costs. Because each organization tends to control the costs of its activities, it is crucial to control and estimate future effects although in the case of IT projects profits rise often very late.

In the classic economy approach, one usually measures such factors as the value of investment and the value of expected revenues. However, in the contemporary managerial accounting, the accent is on the non-financial methods of projects evaluation. Thus, many companies tend to use multicriteria methods, which should take into consideration such aspects as:

- whether or not a given project supports the strategic aims of an organization,
- the influence of the project on the market share and clients satisfaction,
- the cost of capital involved in the venture together with the calculations of lost profits resulting from capital being tied up,
- the costs and profits of a risks taken during the project realization [Sudoł 2007, pp. 192–193].

In the analysis of the effectiveness of informatics projects as investments, what is important is not only the specification of all the costs and revenues but also the right method to evaluate the investment.

In the literature on this subject, numerous methods of projects evaluation are usually mentioned (see Lech [2005]; Nowakowski, Tretyakova, Kieruzel [2005]; Pańskowska [2001]; Cypryański [2004]; Dudycz, Dyczkowski [2003]). However, in the article we will study only one of them – the one proposed by T. Renkem, in which four different approaches to the economic evaluation of information projects are listed [Dyczkowski, Dudycz 2007; Jędrzejewicz 2006].

The first group is the measures of financial analysis taking into consideration only the financial results of an investment and realized cash flows. Such methods of effectiveness evaluation are to give *ex ante* the profitability of an investment. For example, one uses such measures as the period of investment return, profitability index, netto worth index or IRR. This group of measures is used the most often by companies. However, the biggest disadvantage of such measures is evaluating projects only from the financial point of view – by comparing costs and revenues.

The other group of the measures is the tools of multicriteria analysis, which allows evaluating the informatic ventures on the basis of many criteria. The most often evaluated platforms are:

- financial aspects – using the measures mentioned in the previous group with the cash flow, expected revenues resulting from the innovative technologies used, etc.;
- business aspects – the connection with realization of a company strategy, the influence on getting and keeping the competitive advantage, improving the quality of management system, improving and creating image of a company;
- technological aspects – if it is according to the strategy of informatics system development, the level of the integration of all the areas of company activities, improvement of the processes of information transformation, the level of meeting the information requirements by all information users [Chomiak-Orsa 2010a, pp. 257–266].

In this group one uses such tools as the Balanced Scorecard – BSC and Information Economics – IE.

Another group of measures is tools which allow realizing multimeasures analysis comparing the level of efficiency of informatics ventures to such areas as employment rate, capital involved, sales level. Such analyses are made from a few perspectives, for example, before the investment starts, after the informatics analysis has been started, or comparing to the investment conducted in another area of business activity. Such a point of view allows getting the wider picture showing the effectiveness of taken informatics venture. In this group one can include such methods of projects evaluation as Total Cost of Ownership – TCO, Total Economic Impact – TEI or Real Options Valuation – ROV.

The last group of measures is the tools of analyzing the investment portfolio. They allow getting answers to the questions connected with decisions about taking the steps in the area of informatics projects. For example, if a company should take such investments, if yes – to what extent, what applications should be implemented, etc. In such methods it is important to keep balance between the evaluation of qualitative and quantity effects, which are taken while realizing informatics projects. In this group of tool for projects evaluation there are the most often mentioned Expected Value of Information – EVI and Applied Information Economics [Syska, Krzykowski 2003, p. 364].

No matter what the tools of financial evaluation will be, their main task is to decrease the risk and uncertainty connected with taking up informatics projects.

4. Balanced Scorecard as an example of multimeasure project evaluation

Using the methods of multi-criteria evaluation of projects is to reduce the financial measures, such as:

- narrow range of information about the functioning of a company connected only with the economic results,
- short term perspective in a decision-making process,
- difficulties in translating work effects of organizational functions into financial effects,
- difficulties in decomposing company results into organizational functions or particular workers,
- the lack of a full view of the results and directions of development of a company,
- analysing the information connected with the results of activities without the diagnosis and recognizing the causes of these results [Gołdysiak 2010, pp. 143–146].

To get rid of the above limitations, more and more companies use the methods of multicriteria projects evaluations.

One of the most often used methods to measure the effects and effectiveness of projects is the Balanced Scorecard, which is used more and more often to evaluate company management. It is one of the most modern tools of results evaluation, because its construction takes into consideration the vision or strategy of companies, joining various perspectives of functioning evaluation of a company [Chomiak-Orsa 2010b, pp. 91–100]. It is to ensure the balance between the short-term and long-term goals of a company. It is also to evaluate projects by means of financial as well as non-financial criteria. It allows quantifying the quality evaluation by introducing the quantity measures.

This concept of the evaluation of company performance created in the 1990s by Kaplan, Norton [2001, pp. 22–45] found very wide implementation in the evaluation

of project ventures. It is to describe and put parameters of activities which should be measured to get the effectiveness of such activities in relation to implemented strategies. This allows translating the strategy of organization into the objectives and then the particular business processes. Such connections of the strategy with the projects allows measuring and evaluating the meaning of a planned venture for the strategy realization [Kludacz 2009, pp. 177–178].

The main advantage of using the BSC in projects evaluation is that it allows creating the measures connected with all characteristics of the venture which should be evaluated. The main idea of the card is to make the effectiveness evaluation of the venture in four perspectives:

- Financial perspective – whose aim is the evaluation of the increase of the value of the company resulting from a project. From the financial perspective, to monitor the realization of complicated aims, classic measures are used: effectiveness of capital or other financial tools of investment projects evaluation. More and more companies consider also the risk connected with the project.
- Perspective of the client of a company – in this area the evaluation considers mainly the expectations of clients of a company and the level of meeting the requirements. One can measure such areas as market share, the speed of new clients finding, the level of keeping customers, satisfaction and loyalty. In free market economy, where the client is the main motivator and motivator of the evaluation, analysis and mastering of organization activities, it is the key perspective that is evaluated.
- Perspective of internal processes – it allows connecting the evaluation of projects from the financial and client perspective and identifying the possibilities of development and modification of companies activities. Managers identify the activities and key processes to reach the goals stated in a project. Only the most important processes should be evaluated, which means the ones connected with meeting clients requirements.
- Perspective of innovation and learning – it allows evaluating a project in the context of further development. In this area, the development may be regarded and evaluated in a few directions. It may consider the development of an organization by enlarging the range of products, intensifying the ploys on the market. It is also important to evaluate the possibilities of the development of organizational culture by improving workers qualifications and so such aspects of company activities as the quality and the time of process realization [Chomiak-Orsa 2011, pp. 133–142].

The aim of using the BSC to evaluate ventures in the area of ICT is to make it possible first of all to evaluate the effectiveness of undertaken projects. Taking the perspective of business projects as the main elements being evaluated in BSC allows for:

- complex identification – by creating the picture of an organization on the map of processes,
- the evaluation of current situation – by stating the measures used to evaluate and by actual evaluation,

- identification of the directions of the development and improvement of processes
 - which will be identified and evaluated in the perspective of development and innovation.

An important advantage of BSC is the fact that it does not end only with forming the strategy of an action in the area of business process evaluation. It also creates the proposals of solutions and then evaluates the level of their implementation and profits for an organization [Wierzbiński 2008, pp. 12–128].

5. Conclusions

The process of ICT projects implementation is a complex one and it may result in a coherent set of informatization system elements after it has been completed appropriately. However, to achieve the highest level of effectiveness, it is important to use appropriate measures. They usually help a company evaluate, monitor and change projects if it is necessary.

The most valuable methods are connected with financial aspects as well as with the perspective of company clients. Often it is the client perspective that decides if a project of strategy that it follows is successful or it fails. It is especially important in the contemporary competitive word in which organizations operate. It is also important to check what the influence of a project on company processes is, because especially in the process management approach the construction and information flow within a company is one of the most important conditions to function well.

Furthermore, the Balanced Scorecard is a very efficient way to control and adjust ICT projects. It helps organizations see a wider picture of operations, including development possibilities and learning organization issues. Thus, it is necessary to first recognize the evaluation methods and then to choose and adjust them to the specific organization needs. Only then may a company establish an efficient ICT projects implementation system.

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WIELOKRYTERIALNE METODY OCENY PROJEKTÓW W OBSZARZE REALIZACJI PRZEDSIĘWZIĘĆ ICT

Streszczenie: Głównym celem artykułu jest wskazanie natury projektów ICT oraz zaproponowanie metodologii ich oceny. Jedną z grup metod oceny są te, które biorą pod uwagę okres realizacji, koszty inwestycji, przychody z inwestycji oraz stopę dyskontową. Metody wielokryterialne dotyczą wsparcia realizacji strategii organizacji, wpływu na udział w rynku, na satysfakcję klienta oraz na koszt zainwestowanego kapitału. W artykule autorzy zaproponowali również zastosowanie zrównoważonej karty wyników do oceny efektywności projektów ICT. Jest to metoda, która staje się coraz popularniejsza w organizacjach, gdyż bierze pod uwagę wizję i strategię organizacji oraz inne perspektywy jej funkcjonowania. Może zatem stanowić wszechstronne narzędzie oceny projektów.

Słowa kluczowe: metody oceny, informacyjno-komunikacyjne projekty, kryteria projektów, efektywność organizacji.