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IT PROJECTS FEASIBILITY ASSESSMENT AS AN ALTERNATIVE TO ECONOMIC EFFICIENCY ASSESSMENT

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ОЦЕНКА ЦЕЛЕСООБРАЗНОСТИ ВНЕДРЕНИЯ IT-ПРОЕКТОВ КАК АЛЬТЕРНАТИВА ОЦЕНКЕ ЭКОНОМИЧЕСКОЙ ЭФФЕКТИВНОСТИ

Assessment of the practicability of IT projects deployment in business practices is just one element in the group of computerization issues. Today, this task is solved through determination of economic efficiency of an IT project. Techniques used for assessing economic efficiency turn out rather labor-intensive, expensive and do not provide a reliable assessment of IT impact on company performance, which brings into question their value and validity. Seeking to share information on the specific features of ICT deployment processes, the article offers a brief description of techniques currently used by Russian businesses to justify practicability of introducing information technologies. The article also describes a new approach to assessing the practicability of computerization of a business entity based on the conceptual framework that is different from conventional profit-oriented philosophy. Using the concept of a company's target image that combines the targets of growth, development and profit, this article proposes a model for justifying the practicability of IT deployment based on the priority of growth target. Computerization option that maximizes the company's sale volume shall be determined through monitoring the operational safety level, provided a number of additional constraints are met. The model uses a modified breakeven point formula that takes into account the multivariable function of costs. The model is based on a number of assumptions, is fairly simple and considered as a possible express analysis technique for selecting the option of computerization. The proposal is up for further discussion. Evolution of the concept of assessing the practicability of IT projects deployment in business practices based on the target image is envisioned through the search of indicators and criteria that demonstrate the impact of IT on the attainment of the third target, i. e. development.

IT PROJECT; ECONOMIC EFFICIENCY; TARGET IMAGE; GROWTH TARGET; OPERATIONAL SAFETY LEVEL.

Оценка оправданности внедрения IT-проектов в практику бизнеса является одним из элементов совокупности проблем информатизации. Сегодня эта задача решается путем определения экономической эффективности IT-проекта. Методики оценки экономической эффективности на практике оказываются трудоемкими, дорогостоящими и не позволяющими в достаточной степени надежно оценить степень влияния IT на результаты деятельности компании. Это ставит под вопрос их ценность и оправданность применения. В целях обмена информацией об особенностях процессов внедрения ИКТ приведена краткая характеристика методик, используемых в настоящее время российскими компаниями для обоснования целесообразности внедрения информационных технологий. Предложен новый подход к оценке целесообразности информатизации бизнеса, основанный на концептуальной основе, отличной от общепринятой ориентации на прибыль. Отталкиваясь от концепции целевой картины компании, объединяющей цели роста, развития и прибыли, в данной статье предложена модель обоснования целесообразности внедрения IT, предполагающая доминирование цели роста. Определение варианта информатизации, максимизирующего объем реализации компании, осуществляется под контролем показателя уровня операционной безопасности при соблюдении ряда дополнительных ограничений. В модели использована модифицированная формула точки безубыточности, учитывающая многофакторность функции затрат. Модель построена на ряде допущений, является простой и рассматривается как возможный способ экспресс-анализа при решении проблемы выбора варианта информатизации. Предложение внесено для дальнейшего обсуждения и дискуссий. Дальнейшим расширением концепции оценки целесообразности внедрения IT-проектов в практику бизнеса на основе целевой картины представляется поиск показателей и критериев, отражающих влияние IT на достижение третьей цели – цели развития.

IT-ПРОЕКТ; ЭКОНОМИЧЕСКАЯ ЭФФЕКТИВНОСТЬ; ЦЕЛЕВАЯ КАРТИНА; ЦЕЛЬ РОСТА; ОПЕРАЦИОННЫЙ УРОВЕНЬ БЕЗОПАСНОСТИ.

Introduction. Today ICTs are most commonly characterized from the perspective of success in the IT industry. This includes forecasting the IT products market growth and market structure change, as well as analyzing the results. In all the developing economies IT market growth caused

by the overall slowdown of average global economic growth continues despite a certain decline.

Still the agenda of processes computerization is not restricted merely to learning the prospects of the ICT market. Some other important tasks include finding how much IT affects the economy in general and searching for the best techniques to assess practicability of deploying IT projects by companies.

The former task is associated with the Solow paradox that came to light in the end of the 20th century. As we know, the paradox of R. Solow [1] and the article by E. Brynjolfsson [2] put into question the efficiency of investment in IT on the brink of the 21st century. Still, the development of general-purpose technologies concept [3–4], as well as the results of empirical studies obtained in the early 21st century based on the new ideas [5], have already confirmed the efficiency of investment in IT assets. However, researchers believe that the existence of this relation needs to be confirmed for each individual country.

The latter task rises from the existence of a wide range of methods used for calculating the economic efficiency of IT projects [6–7], which in itself proves that nobody has proposed a valid method as of yet. This leads to the following question: why don't we look for other ways to solve this problem?

This article intends to provide a brief outline of techniques currently used by Russian businesses to justify the introduction of information technologies. At the end of the article, the authors also propose a new approach to assessing the feasibility of computerization based on a conceptual framework that is different from conventional profit-oriented philosophy.

Techniques in assessing the economic efficiency of IT deployment in Russian business practices today

There is hardly any doubt that information technologies are a must-have for corporations today. Still, there are both fierce supporters of computerization of business and those who look at this with skepticism, especially when it comes to small businesses. A study in computerization processes in the Russian business domain indicates that «the attitude of business owners and executive officers to IT is rather mixed. One see IT as a fashion trend that is to be followed only because everyone does today, and for others IT means good image and one of the means to increase the value of company's assets. Still, there are much more entrepreneurs who see information technologies exclusively as a source of trouble and needless incidental expenses» [8, p. 2].

Situations when company management decides to deploy certain information products may be just as alarming. A decision to purchase an information system (IS) is often based on such criteria as

«1. The name of the IS recently deployed by a successful competitor.

2. The first result in a search engine with a bright description of unlimited capabilities of a new product on the software market.

3. An earnest narrative by a computer outlet manager or work fellow, or a cover of a promotional booklet accidentally seen on the desk. This list of options is far from being conclusive» [9, p. 23].

It is interesting to note that assessment of management processes computerization efficiency is not a new issue. Russian researchers and enterprises of the 1970s and 1980s focused extensively on developing the methodology and discussing economic efficiency of management computerization (e. g., see [10–12]). Of course, these techniques were developed for the economic mechanism in place at that time. Still, one of the essential issues of computerization that was identified then and remains relevant to this date is the question why the efficiency increased – was it a result of information technologies deployment or did it occur after the re-engineering of business processes driven by the computerization.

Today, techniques based also on the evaluation of economic efficiency and primarily developed in the West prevail among the tools used to assess the practicability of implementing information technologies. A wide range of approaches has been developed for assessing economic efficiency [6–7]. Admittedly, financial techniques are employed predominantly. These are mostly the techniques that can be referred to as conventional, including the ROI and EVA calculation. Another technique that has become very popular these days is the TCO (Total Cost of Ownership) assessment developed by Gartner Group research company. Other popular techniques include the TEI [13] and REJ (Rapid Economic Justification) methods developed by Microsoft. In addition to the financial techniques of assessing economic efficiency of information technologies, there are also

quality-based and probability-based techniques. The quality-based techniques include Balanced Scorecard system, IT Scorecard method and Portfolio Management technique, and the category of probability-based techniques is represented by Real Options Valuation (ROV) and Applied Information Economics (AIE) methods.

Some researchers classify the efficiency assessment techniques into comparative, cost and income methods [14], putting TCO into the category of cost methods, and ROI calculation – into income methods. In the latter case, income is understood as net profit from sales of a project. Comparative methods can be exemplified by the use of techniques described in [15]:

– comparison of IT costs as a percentage of company income with a group of similar companies (by activity profile or other criterion);

– comparison of IT costs as percentage of company income with other companies of similar size (in this case, size should be understood as sales volume of the company);

– comparison of IT costs per one employee of IT department with similar companies or for the market in general;

– assessment based on the P. Strassmann formula determining the correlation between the amount of IT budgets and the group of costs including management and administration, promotion and sales support (Sales, General & Administrative – SG&A) [16].

All of these approaches are employed in Russia. For example, TCO assessment is used in the field of healthcare information systems [17], and the TEI technique appears of great interest, as well, e. g., see [18].

However, comparative analysis of the above techniques carried out by different groups of researchers, both overseas, e. g., [7] and in Russia, e. g., [14, 17, 19], leads to the conclusion that it is fairly difficult to suggest the optimal method. Each technique has its advantages and constraints, and all of them are quite complex, labor-intensive and therefore expensive.

Russian researchers also take interest in the issues of justifying deployment of information technologies. The matters of economic efficiency of business computerization are studied from both theoretical and practical aspects.

The group of studies focusing on the theoretical aspects of the issue includes, among others, the studies of practicability of IT deployment from the perspective of the institutional theory, e. g., papers by V. Platonov [20], R. Shchemelev [21] V. Ananyin [22–24]. Both theoretical and practical researchers focus extensively on the various aspects of employment of system analysis methods, specifically the hierarchy analysis method [19] developed by T. Saaty [25], a as well as the complex expertise models, e. g., see [26] based on the application of A.A. Denisov's [27] information approach. A number of studies on the use of information systems by companies increasingly state the importance of additional benefits resulting from computerization, which turns the IT into an intellectual resource of the company [18, 28]. To be more accurate, based on the current terminology that reflects the nature of knowledge approach [29], information technologies and knowledge bases are seen as an element of structural capital that encourages the development of human and client capital, thus adding to the overall value of the company.

Determination of the impact of information technologies on business efficiency indicators is the priority field of research today These issues have been reflected in both theoretical [20, 21, 24] (Platonov, 2007; Shchemelev, 2009; Ananyin, 2010) and empirical studies by Russian scientists. Results of empirical studies based on the E. Brynjolfsson [5] technique were demonstrated in the course of IT-Value.ru project and confirmed both the correlation between IT budget and the amount of business and administrative costs for Russia, and the efficiency of investment in IT assets in Russia [30].

In addition to theoretical and empirical studies, various techniques for assessing the economic efficiency of IT projects are being developed, and each of these techniques has certain highlights. For instance, authors of the [31] method assume that efficiency of management computerization may be expressed «not only in economic values of performance of the enterprise, but also in technical values typical for an information system as a software package. Thus, the nature of efficiency of a management information system is dual, and both of its aspects are closely related with each other.» The use of information systems is now seen as a way to support and manage the information operations of a business [32]. The study by [33], IT products are viewed as a tool for re-engineering of business processes. The assessment of company performance

resulting from such re-engineering is proposed by benchmarking the resulting values of performance indicators with the forecasted business indicators calculated as suggested by W.W. Jekkerson [34]. On the other hand, the study by [9] offers a technique based on the systemic approach, re-engineering of business processes and qualimetric analysis method.

These techniques try to incorporate the benefits that may result from the implementation of IT, but they also demonstrate that the impact of information technologies on company performance is not always obvious and mostly mediated.

Consequently, with all the diversity of existing approaches to economic efficiency assessment, corresponding assessment techniques are usually cumbersome, expensive and do not take into account the impact of IT on the company performance. These shortcomings are specifically prominent for small businesses that would like to use an easier way for justifying the deployment of IT.

In addition to these purely practical considerations, there is also a question of why the justification of IT implementation is considered from the perspective of economic efficiency. This approach is conventionally explained by the point that profit is the goal of any profit-making organization. Still, profit is not the only goal for business. Strategic view on company's operations is much wider.

IT technology implementation practicability assessment based on the assessment of operational safety level

Target image as a complex of basic target areas of business represents a key element of a company's qualification from the strategic viewpoint. Controlling focuses extensively on this target image today. For example, the studies of A. Dale [35, p. 17], one of the most reputed ideologists of controlling, view the target image of a company as a complex of targets of growth, development and profit. It is important to understand that these targets must be balanced in the long run, but one of the targets takes priority in the short term. More often than not, a business puts growth as such prevailing target, i. e. it seeks to increase production and sales of products (services) that are already recognized in its business programme.

As a follow-up of this approach, this article proposes a technique for assessing practicability of IT implementation that relies on the following basic provisions:

1. Growth of sales volume (products or services) is considered the prevailing target.

2. Different computerization options are considered as free variables. For the sake of simplicity, let us presume that each option is determined by two parameters (e. g., various options of new equipment and various options of communication expenses).

3. A sales growth factor is attributed to each computerization option. It is presumed that company employees are capable of achieving the potential of forecasted sales increase.

4. Constraints include the company's production capacity and the amount of funds that company management is ready to spend on computerization.

5. Operational safety level is used as the criterion for selecting the optimal computerization option.

When a company focuses on the growth target, operational safety level may become a good criterion for selecting the subject of investment:

$$F = (Q - Q^*) / Q \cdot 100, \quad (1)$$

where F is the operational safety level (%), Q is the expected amount of business (ea/period), and Q^* is the breakeven point (ea/period).

Traditionally,

$$Q^* = C_{fix} / (P - C'_{var}), \quad (2)$$

where C_{fix} is fixed costs (monetary unit/period), P is price (monetary units), and C_{var} is specific variable costs.

Clearly, the higher the positive value of operational safety level F, the better it is from the perspective of the growth target. Breakeven point in this case represents a sort of economic guarantee. Then the problem of IT selection will, generally speaking, look as follows: find the computerization option (ij) that takes the company to

$$\max Q_{ij} \quad (3)$$

given that

$$Q_{ij} \le M, \quad (3a)$$

$$K_{ij} \le K, \quad (3b)$$

$$F(Q_{ij}) \ge F_0, \quad (3c)$$

where M is the production capacity, K is the amount that the company management is ready to spend on computerization, (ij) is the computerization option index, Q_{ij} is the sales

volume in case of the (*ij*) option, F_0 is the lower limit of operational safety level that company management deems satisfactory, and K_{ij} is the amount of investment for the (*ij*) option,

$$K_{ij} = B_i + L_j, \quad (4)$$

where B_i is the i – value of B – first element of the IT package (money units), $i = 1, ..., I$; L_j is the j – value of $Л$ – second element of IT package (money units), $j = 1, ..., J$.

However, it is difficult to determine the breakeven point in this case, while normally its calculation is based on the assumption that costs are a function of only one variable – amount of business: $C = f(x)$, which gives rise to two kinds of cost – fixed and variable, i. e. $C = C'_{var} \cdot Q + C_{fix}$.

In our case, there will be two more drivers impacting cost in addition to the amount of business, i. e. the options of each two elements of the IT package. Thus, cost becomes a function of several variables $C = f(x_1, x_2, ..., x_n)$. Let us assume that the value of these options impacts the value of fixed costs only, i. e. the breakeven point formula will include a variable value of fixed cost (C_{fixij})

$$C_{fixij} = C_{fix} + B_i + L_j. \quad (5)$$

Consequently, the following modified formula can be used to calculate the breakeven point:

$$Q^{**}_{ij} = (B_i + L_j + C_{fix})/(P - C'_{var}) = Q^* + (K_i + L_j)/MR', \quad (6)$$

where C_{fix} is the basic fixed cost (monetary unit/period); P is the product unit sale price (monetary units); Q^{**}_{ij} is the modified breakeven point for the i-value of factor B and j-value of factor $Л$; Q^* is the conventionally calculated breakeven point (for C_{fix}); MR' is the specific marginal revenue, $MR' = P - C'_{var}$.

Let us introduce the following coefficients to take into account the impact of IT on sales growth:

kb_i – coefficient of company sales volume increase due to the i-factor (element B),

kl_j – coefficient of company sales volume increase due to the j-factor (element $Л$)

And now let us make another assumption: the two factors collectively give rise to the synergy effect, and the sales growth process becomes more intensive. The synergy effect is introduced by the following coefficient:

kc – coefficient of synergized sales growth.

Consequently, the forecasted sales volume (Q_{ij}) will be calculated as follows:

$$Q_{ij} = Q_0 \cdot kb_i \cdot kl_j \cdot kc, \quad (7)$$

where Q_0 is the basic value of sales volume.

The most convenient way to solve this problem is by arranging the values in a table.

Let us look at the following example.

Let us say that company operations may be described as follows: $P = 10$ m. u.; Q_0 – initial sales volume equals 700 ea/period, $C'_{var} = 4$ m.u./ea., $C_{fix} = 2.000$ m. u./period, $M = 935$ ea./period, $K = 750$ m. u., and $F_0 = 30$ %. $MR' = P - C'_{var} = 6$ m. u./ea.

It is then obvious that $Q^* = 334$ ea., and $F = 52.4$ %, which is a good figure. At the same time, company management thinks that market demand allows engaging extra clients and increasing sales volume through the deployment of an IT product.

Let us presume that the company considers three options of using the B element and four options of using the $Л$ element. Cost estimates for these options are provided in Tab. 3. We will then use formula (5) and basic values of fixed cost ($C_{fix} = 2000$ m. u.) to obtain the modified values of fixed cost (see Tab. 1).

Table 1

Values of modified fixed cost (C_{fixij}), m. u./period

		L_j, Options of the second package element, m. u.			
		50	75	150	200
B_i Options of the first package element, m. u.	400	2450	2475	2550	2600
	600	2650	2675	2750	2800
	900	2950	2975	3050	3100

Now, we will use formula (6) to determine the corresponding values of the modified breakeven point (Tab. 2).

Table 2

Values of modified breakeven point (Q^{**}_{ij}), ea/period

		L_j, Options of the second package element, m. u.			
		50	75	150	200
B_i Options of the first package element, m. u.	400	408	413	425	433
	600	442	446	458	467
	900	492	496	508	517

Table 3

Forecasted sales volume (Q_{ij}), ea/period

			Lj, Options of the second package element, m. u.			
		kl_i	1.01	1.015	1.03	1.01
	kb_i	L_j / B_i	50	75	150	200
B_i Options of the first package element, m. u.	1.1	400	856	860	872	856
	1.12	600	871	875	888	871
	1.2	900	933	[937] 935	[951] 935	933

Next, we will present the calculated results of forecasted sales growth based on formula (7) (Tab. 3). Values of coefficients kb_i and kl_j are also provided in Tab. 3. Let us presume that synergized growth coefficient $kc = 1.1$.

Sales volume forecast shows that options (B_3, L_2) and (B_3, L_3) do not meet formula (3a), because production capacity $M = 935$ ea/period. Therefore, when calculating the operational safety level for these options, forecasted sales volume is assumed to be equal to production capacity, i. e. $Q_{32} = Q_{33} = 935$ ea/period. Let us calculate the operational safety level using formula (1), with conventional safety point (Q^*) replaced by the modified safety point (Q^{**}_{ij}). Calculation results are shown in Tab. 4. The same table contains the details of investment amounts for option (ij) that are calculated using formula (4).

Now, based on formula (3b), we will discard all the options that do not meet this formula. For example, if $K = 750$ m. u., then all options where $K_{ij} \geq K$ will be discarded (see Tab. 5).

Table 4

Operational safety level (F_{ij}), % and investment amounts (K_{ij}), m. u.

K_{ij}		L_j, Options of investment in personnel development, m. u.			
F_{ij}		50	75	50	200
Bi Options of the first package element, m. u.	400	450 / 52.3	475 / 51.9	550 / 51.3	600 / 49.2
	600	650 / 49.3	675 / 49.0	750 / 48.4	800 / 46.5
	900	950 / 47.4	975 / 47.0	1050 / 46.5	1100 / 44.6

Table 5

Revised table of operational safety levels (F_{ij}), % and forecasted sales volume (Q_{ij})

Q_{ij}		L_j, Options of investment in personnel development, m. u.			
F_{ij}		50	75	150	200
B_i Options of the first package element, m. u.	400	856 / 52.3	860 / 51.9	872 / 51.3	856 / 49.2
	600	871 / 49.3	875 / 49.0	888 / 48.4	
	900				

Note the resulting operational safety level in all the calculated options is lower than the initial value $F = 52.4$ %. Still, given that the minimum threshold is $F_0 = 30$ %, all the options are considered acceptable based on formula (3a). In this case, Q_{ij} reaches its maximum under options (2, 3). If the company management is prone to risk, it may choose the option with the amount close to optimal, but with higher operational safety level. This will be option (2, 2), where $Q_{22} = 875$ ea. and $F_{22} = 49.0$ %.

As a result, we solved the problem and chose the option of an IT package that would enable maximum possible sales based on the growth target with the designated values of production capacity, acceptable operational safety level and the amount of funds that the management is ready to use for IT implementation.

The proposed calculations are based on a number of assumptions:

– it is possible to assess the increase in sales caused by the use of IT systems. Forecasting the sales volume is one of the most complex issues, and this problem is often solved using the statistical data or expert evaluations;

– only fixes costs change after computerization. In reality, IT have an impact on variable costs, as well, and the proposed calculation pattern can be modified to take into account this factor;

– company employees will be able to fully unlock the potential offered by the purchased IT system. Management computerization must come hand in hand with personnel development, and not only in computer technologies, but also in the knowledge of economy.

Results obtained after solving the above example shall not be used as a basis for any deductions

regarding the behavior of parameters considered in this model. The purpose of these calculations was only to demonstrate the calculation pattern.

This method should be considered as a possible express analysis technique for selecting the option of computerization.

Conclusion. This article intends to provide a brief outline of techniques currently used by Russian businesses to justify the implementation of information technologies.

This has a long history and there have been significant findings behind the theoretical and practical studies of economic efficiency assessment in Russia, but the transition to a new economic mechanism brought about the need of new methods that better meet the new requirements.

Techniques based on the determination of economic efficiency and often developed in the West are now used in Russia for assessing the practicability of IT implementation.

At the same time, Russian researchers study foreign practices, test them with Russian realities and develop their own approaches to assessing the practicability of IT deployment.

Most techniques that focus on the assessment of economic efficiency turn out rather labor-intensive, expensive and do not provide a reliable assessment of IT impact on company performance, which brings into question their value and validity.

Using the concept of a company's target image that combines the targets of growth, development and profit, this article proposes a model for justifying the practicability of IT deployment based on the priority of growth target.

A computerization option that maximizes the company's sale volume shall be determined with monitoring of operational safety level, provided a number of additional constraints are met.

The model uses a modified breakeven point formula that takes into account the multivariable function of costs.

The model is based on a number of assumptions, is fairly simple and considered as a possible express analysis technique for selecting the option of computerization.

The proposal is up for further discussion. Evolution of the concept of assessing the practicability of IT projects deployment in business practices based on the target image is envisioned through the search of indicators and criteria that demonstrate the impact of IT on the attainment of the third target, i. e. development.

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