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ASSET APPROACH TO IT COST MANAGEMENT IN INDUSTRIAL COMPANIES

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Abstract: The article introduces the authors' estimation method for measuring the current level of information technologies in companies by four aspects (hardware, software, IT services, and telecommunication equipment) using the proposed original indicators. On the example of 50 sample Russian industrial companies the authors have built and tested an econometric model, which allows to measure how IT costs are affected by such factors as: the current level of IT development, net profit value, number of employees, general wages, salaries of IT specialists, percentage of qualified workers.

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IT costs measurement and management is a complex process. Many scientists and experts have been investigating this subject for many years. Despite a fifty-year history of both Russian and international research in this area, the issue of IT costs measurement is still challenging and debatable. The peculiarity of the subject of measurement (i.e., the issue of defining the scope of measurement) is not the only aspect that makes the issue complex. Another problem is that various models of ICT estimation are not only constructed to give a numerical value of the subject, but also to be used in managing the IT development process.

The authors conceive that IT development costs should first of all depend on the current IT situation in a company, and on a range of factors, which determine both operational and economic activity of a firm (volumes of production, annual turnover, net profit, number of employees, percentage of competent workers, their wages, etc.). This idea is corroborated by Russian and international researchers (Garlikova, 2004; Zubova, 2004; Aoun, 2008; Atzeni, 2006; Bayo-Moriones, 2007; Dehning, 2006; Hanafizaden, 2009; Loukis, 2009; Melville, 2007; Mouehli, 2009; Seo, 2009, etc.).

To measure the current IT situation we suggest an informational index calculation method, based on an asset approach to building a system of rates and indicators. Information technologies in industrial enterprises are examined as a specific variety of IT assets, which are utilized in the company's operational activity to achieve their strategic goals. The informational index of company is calculated using special values and indices, characterizing the hierarchical subject structure of IT elements (Table 1).

TABLE 1. INFORMATION TECHNOLOGIES ELEMENTS CLASSIFICATION

IT Assets Domains	Types of IT asset
Hardware	- Personal computers (PCs) - Servers - Peripherals and components - Data storage systems, etc.
Software	- System and infrastructure software - Software tools - Custom applications
IT services	- Hardware installation and technical support - Software installation and technical support - System and network integration - Consulting and software customization - Custom software development - IT training - IT consulting - Business application consulting - IT management - Business application outsourcing
Telecommunications equipment	- Communication services - Data communications equipment - Local networks - Global information networks including Web.

It is expedient to estimate each type of asset, its' level of development and utilization by two characteristics: state (presence of an assets, up-to-dateness); level of utilization (quantity, employees' equipment, etc.).

Therefore the model of values and indicators system formation may be represented as follows (Figure 1).

To aggregate the initial values we use indices, which are aggregated into indicators. Generally, the indicators system for IT measurement of any specified subject has the kind of form suitable for the hierarchical structure form of information technologies. Using the indices of a particular company, this allows us to itemize (disaggregate) or generalize (aggregate) the rates, which indicate the current state and maturity of various types of IT, along with the trend of IT applications. On the other hand, the informational index of an industrial company shows a general evaluation of the IT state, development and utilization in organizations by the indicators of the highlighted IT domains: hardware; software; IT services; telecommunications equipment.

FIGURE 1. PARAMETERS AGGREGATION MODEL FOR IT ESTIMATION IN INDUSTRIAL COMPANIES

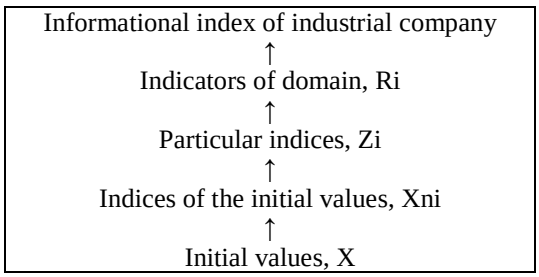

TABLE 2. OVERALL PERFORMANCE OF THE MODEL PARAMETERS

Parameter	Mean	Median	Standard deviation
Informational index value, J	2.33	2.35	0.617
Net profit value, h	192.00	195.00	65.78

TABLE 3 .REGRESSION EQUATION PARAMETERS

Parameters			Values
Multiple R			0.773626
R-square			0.596188
Standardized R-square			0.579005
Standard error			440.273
Observations			50
F-criterion			34.70
F-criterion significance			0.0000
Factorial variance at one degree of freedom			6725375
Residual variance at one degree of freedom			193840
	Coefficient	Standard error	t-stats
Y-piercing	-363.843	260.759	-1.395
Informational index value, J	668.800	114.027	5.865
Net profit value, h	2.855	1.069	2.671

With the developed method of IT index measurement we conducted an experimental investigation in 50 sample enterprises[1]. Basing on the results, we estimated the relation between IT costs and a current level of IT development, and also a range of other aspects, which determine both operational and economic activity in a company. The experimental calculations after inspections in 50 Russian industrial companies showed a significant differentiation of companies by their informational index and a dependency of this division on a range of factors, characterizing the volumes and conditions of operational activity in organizations.

The IT assets measurement by means of composite informational index may serve as a workable basis for a standardized IT expenditures forecasting using the econometrics models. After analyzing both theoretical concepts and the existing practices of the econometric model-building, we checked how IT expenditures in a company are being influenced by a range of factors,

1 Relatively homogenious sampling of companies has the following parameters: 500 to 1100 - average number of employees; USD 2.5 to 14.5 million - average annual net profit; USD 0.02 to 0.21 million - average annual expenditures on IT.

including: the value of informational index, net profit, average number of workers, percentage of qualified employees, average annual wages and average annual salaries in IT department. Overall performance of the resulting econometric model is shown below (Table 2).

A correlation analysis (how IT costs depend on the above factors) indicated, that the relation between average annual wages, number of workers, percentage of qualified employees, IT department salaries and IT costs is weak. Therefore these factors have been excluded.

As there is no collinearity in this model, we estimated the parameters (Table 3) in the regression equation and came to the following results:

The null-hypothesis H_o about the absence of any relation between IT costs and such factors as informational index and net profit was not corroborated:

- critical value of Student t-criterion at the level of α = 0.05 (bilateral), under the number of freedom degrees (df) equal to 40, is 2.0211, therefore $|t_{crit.}| < t$;
- Fisher F-criterion equals to 34.7; critical value of Fisher F-criterion at the level of α = 0.05, under 40 and 2 degrees of freedom, is 3.23, or $|F| > Fcrit.$;
- raw coefficient of multiple determination R^2_{Jh} = 0.60 indicates a quite high relation between factors and results.

Basing on the output computation we may compose a multiple regression equation:

$$y = -363.843 + 668.8J + 2.86h,$$

At that the mean error of approximation is $\overline{A} = 22.24\%$. Although the mean error of approximation value is quite high, it could have appeared, because the initial surveys had been represented in the interval values and with a substantial data smoothing (over three-year periods). Other values, such as Fisher F-criterion and Student t-criterion, show that the model is stable – parameters' values have been formed under the impact of nonrandom factors.

In practice this model may be used for IT expenditure forecasting, depending on the IT structure chosen by the leadership of the organization. This model is advisable for industrial companies with the following values: 500-1100 employees, USD2.5-14.5 million of net profit and USD0.02- 0.21 million of average annual IT costs, because the research has been held in companies with the same limits.

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