THE DEVELOPMENT OF THE COMPLEX ENTERPRISE ADAPTATION LEVEL EVALUATION

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In the submitted article the choice of parameters for the enterprise adaptation level evaluation is considered.
From a variety of parameters we have chosen 25 basic ones that can be divided into 4 groups: 1) financial parameters 2) industrial parameters 3) manpower use parameters 4) market parameters. The additive model of an integrated parameter construction was applied for the adaptation level complex parameter evaluation. For ranging the factors of importance of each parameter we suggest using a universal method of hierarchy analysis. It takes into account multiple criteria and uncertainty of a problem, allows to make a decision from a set of alternatives of various types on the basis of both the quantitative and qualitative criteria.

In the process of the economic analysis of business and financial activities one has to deal with a system of parameters.

Business and financial activities of industrial, building, textile, agricultural, trading and other enterprises is measured by numerous economic parameters that can be reduced to a certain system. They can be subdivided into: a) cost and natural depending on the measuring instruments put into the basis; b) quantitative and qualitative depending on what side of the phenomena, operations, processes is measured; c) volumetric and specific depending on the application of separately taken parameters or their parities.

Specific parameters are secondary ones, derivatives of the volumetric parameters. The output and the number of workers are volumetric parameters, and the ratio of the first to the second, i.e. one worker production is a specific parameter. The output of one machine, one unit, one square meter of the floor space are all these specific (relative) parameters.

Other relative parameters of business plan execution, enterprise structure, dynamics and development intensity are also widely used in economic calculations.

Having studied the modern economic literature, devoted to the evaluation of economic, financial and industrial activities of an enterprise, we have come to the conclusion that most authors use different sets of parameters in carrying out the complex analysis of activity of the enterprise.

In our opinion the greatest interest in choosing factors for defining the enterprise adaptation level represents a four group content parameter classification:

1) Financial parameters;
2) Industrial parameters;
3) Manpower use parameters;
4) Market parameters.

Such a classification fully enough reflects the fields of activity of the enterprise and, hence, is convenient for choosing the parameters for the enterprise adaptation level evaluation.

The next step after dividing general parameters into the specified groups is choosing the most significant of them, the ones that will be used in finding the integrated parameter of the enterprise adaptation level.

The use of all the above listed factors of the enterprise adaptation level evaluation is not possible because it is too time-consuming.

Research has shown that the importance of factors is different for different kinds of economic activity. Moreover even for one kind of activity the degree the importance of a certain factor depends on the period of time.

The solution to the problem of choosing the most important factors for the enterprise adaptation level evaluation is the use of the expert evaluation technique which is now widely applied to interrelation of economic parameters. The number of the chosen parameters should be optimum, i.e. necessary and sufficient for the enterprise adaptation level analysis.

These parameters should be fully and accurately used in calculating the integrated parameter

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Table 1

Enterprise adaptation level evaluation parameters

Financial parameters $I_Ф$	- Sales Profitability (K1) - Equity Profitability (K2) - Autonomy of equity formation sources (K3) - Equity security (K4) - Absolute liquidity (K5) - Solvency (K6) - Equity turnover (K7) - Investment (K8)
Industrial parameters $I_П$	- Equipment in place (K9) - Operative equipment (K10) - Yield of capital investment (K11) - Extensive equipment use (K12) - Intensive equipment use(K13) - Stocks turnover (K14) - Fixed production assets (K15) - Reaction time to a change in market conditions (K16)
Parameters of manpower use $I_Т$	- 1 working person average annual production (K17) - 1 working person profit (K18) - Technical equipment (K19) - Staff turnover (K20)
Market parameters $I_Р$	- Variety of goods (K21) - Variety of goods updating (K22) - Goods quality (K23) - Enterprise market share (K24) - Enterprise image (K25)

of the enterprise adaptation level evaluation, commensurate with the system of parameters accepted for the production and economic activities results evaluation and correspond to the account and report system used at the enterprise.

Also, in our opinion, the chosen parameters should not only characterize the presence and efficiency of the use of the resources available to the enterprise, but also they should not duplicate each other.

The individual parameters of the evaluation chosen by the experts, who have taken into consideration the above stated requirements and four group content parameter classification of the industrial enterprise functioning, are shown in table 1.

For the enterprise adaptation level evaluation we suggest using the expression representing the connection between the analyzed parameters as the additive model, that is a model in which the factors influencing the result enter as the algebraic sum:

$$I = W_1X_1 + W_2X_2 + ... + W_nX_n,$$

Where: I - is an integrated parameter of the enterprise adaptation level; X_i - the parameters influencing an integrated parameter of the adaptation level; W_i - the weight importance of parameters.

Unfortunately, now there is no objective technique of definition of values of factors of weightiness of an integrated parameter. Such well-known methods as the methods of parametrical regression dependences, limiting and the evaluation values, equivalent parities and expert methods have the scopes and essential lacks. For the calculation of factors of weightiness one should use a rarely used, rather objective, universal method of the analysis of hierarchies. This method in comparison with other similar methods takes into account a lot of criteria and the uncertainty of the problem, allows make a decision, having a set of alternatives of various types, on the basis of the criteria expressing both quantitative and qualitative characteristics. The method consists of hierarchical decomposition of the system into simpler components and the further processing of a sequence of judgments made by the person making the decision, in pair comparisons. In this case expert evaluation criteria are formalized and one does not need any additional calculations.

The hierarchy here is understood as a multilevel system consisting of elements and alternatives, incorporated in the connected subgroups. At the top level of hierarchy there is

Table 2

The matrix of paired comparisons for the calculation of weights factor

	A_1	A_2	A_i	A_n	Rating a component of an own vector on a line	Normalization of result
A_1	1	$\frac{z_1}{z_2}$	$\frac{z_1}{z_i}$	$\frac{z_1}{z_n}$	$e_1 = \sqrt[n]{\frac{z_1}{z_1}\frac{z_1}{z_2}\ldots\frac{z_1}{z_n}}$	$W_1 = \frac{e_1}{\sum_{i=1}^{n} e_i}$
A_2	$\frac{z_2}{z_1}$	1	$\frac{z_2}{z_i}$	$\frac{z_2}{z_n}$	$e_2 = \sqrt[n]{\frac{z_2}{z_1}\frac{z_2}{z_2}\ldots\frac{z_2}{z_n}}$	$W_2 = \frac{e_2}{\sum_{i=1}^{n} e_i}$
A_i	$\frac{z_i}{z_1}$	$\frac{z_i}{z_2}$	1	$\frac{z_i}{z_n}$	$e_i = \sqrt[n]{\frac{z_i}{z_1}\frac{z_i}{z_2}\ldots\frac{z_i}{z_n}}$	$W_i = \frac{e_i}{\sum_{i=1}^{n} e_i}$
A_n	$\frac{z_n}{z_1}$	$\frac{z_n}{z_2}$	$\frac{z_n}{z_i}$	1	$e_n = \sqrt[n]{\frac{z_n}{z_1}\frac{z_n}{z_2}\ldots\frac{z_n}{z_n}}$	$W_n = \frac{e_n}{\sum_{i=1}^{n} e_i}$

the criterion function, at the intermediate level there are elements of hierarchies (parameters). The simplest hierarchy goes from the top level through the intermediate levels to the lowest level which, in our case, represents the list of individual parameters that are subject to evaluation. Then the parameters are compared to each other, in pairs, with regard to their influence (to "weight" or "intensity") on the generalizing parameter, and then to their influence on a general characteristic, i. e. on an integrated parameter. As a result the relative degree (intensity) of hierarchy elements interaction can be expressed. These judgments then are expressed numerically.

Complex group parameters influence differently the quality of a product. For the establishment of priorities of individual factors in the method of the analysis of hierarchies we should form a matrix of paired comparisons (table 2). The order of the matrix is defined by the number of parameter groups. In table 2 A_1, A_2..., A_n are groups of product quality parameters; z_1, z_2..., z_n - according to their weight.

For turning the qualitative information into the numeral in the method of the analysis of hierarchies the verbal - numerical scale of attitudes (table 3) containing numerical values with the appropriate substantiations of the given gradation is used.

The scale of attitudes allows us to find numbers corresponding to the degrees of preferences of one parameter over another. Paired comparisons of quality parameters are conducted in terms of domination of one parameter over another, i.e. we have to find a most significant parameter from our experts' point of view. Comparing two groups of parameters according to the degrees of their influence on the quality, the expert according to table 3 puts integers from 1 up to 9 or return values of these numbers. In the method of the analysis of hierarchies under

Table 3

The Scale of attitudes used in factors in the method of the analysis of hierarchies

Intensity of relative importance	Definition
1	Equal importance
3	Moderate superiority of one over another
5	Essential or strong superiority
7	Significant superiority
9	Very strong superiority
2,4,6,8	The intermediate decision between two next judgements
Return sizes of above mentioned numbers	If the comparison of one parameter with another one gives us one of the above-stated numbers (e.g. 3), then in comparison of the second parameter with the first we shall receive a return number (1/3)

the agreement relative importance of the left elements of the matrix is compared to the elements above. Therefore if the left element is a little bit more important than an element above, we put down 3/1, otherwise we put down the inverse number 1/3.

A comparative analysis of other scales use shows that the application of the scale of attitudes is very reliable. The efficiency of the method of the analysis of the hierarchies application is proved both theoretically and practically in solving a lot of criteria problems of objects evaluation in various spheres of economy.

The matrix of pair comparisons (table 2) is characterized by return symmetry features. A distinctive feature of this matrix, and the whole evaluation system, is stability and flexibility. Small changes and additions of other elements do not destroy the characteristics of hierarchical performance, i.e. with the removal or addition of hierarchical branches priorities of alternatives do not undergo qualitative changes. Small changes of parameter values result in minor changes of quantity indicators of priorities of alternatives which shows that the method is reliable.

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