Process Approach And Modelling In Organisation Competitiveness Management System

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Abstract In this article there has justified the usefulness of the process approach and modelling in the analysis and objective quantification of organisation and products competitiveness within organisation competitiveness management system (OCMS). Particular attention is paid to the interrelation of business processes and performance indicators of the organisation that functioning as a single organisational-economic system; identification and modelling of these interrelations as a function in the development of models for quantitative evaluation of the organisation and products competitiveness.

There have been formed the main stages of the assessment and analysis of the organisation and products competitiveness within the OCMS based on the process approach and modelling.

Keywords organisation competitiveness management system, process approach, competitiveness analysis, competitiveness assessment, modelling in competitiveness assessment

1. Introduction

In contemporary world of intense competition conditions, emerging economic crisis, dynamic markets, demand volatility the key issue of competition is determination of the market place of organisation, retaining and increasing its competitive advantage.

It is not enough to qualitatively assess the level of the organisation and its products competitiveness in the market (the current competitiveness level) for retaining their competitive positions. In the modern dynamical markets it is necessary to manage the process of creating competitive advantages, having the complete information about the strengths and weaknesses of the organisation and its products from the point of view of competitiveness, the causes of the current competitive position of the organisation.

Improvement of management mechanisms, in our opinion, should be based on deep market monitoring, forecasting, industry economy, modelling economic and production parameters of the organisation state, the application of economic mechanisms for the creation of competitive advantages of the organisation and its products.

The relevance of this article is the necessity to create organisation competitiveness management system (OCMS) able to quantify the competitiveness of products and the organisation as organisational-economic system, to ensure the objectivity of such evaluation and determination of its sensitivity to changes in factors of external and internal environment through functional description (including weight) of the impact of all external environment factors of the organisation, as well as the complexity and interconnectedness of its business-processes.

2. Approaches To Competitiveness Management. The Methods Of Analysis And Assessment Of Competitiveness

In previous works [1, 2, 3] there were proposed conceptual approaches to the management of competitiveness of the organisation and its products, which in particular are:

1) for the first time there was given a theoretical interpretation of the concept of the organisation competitiveness management system as a man-machine organisational-economic system that allows managers to consciously affect the organisation's ability to maintain and expand sales markets through targeted activities for creating competitive advantages related to the qualitative characteristics of products and manufacturers-competitors. The main target of these activities is to improve the competitiveness of products and the organisation as a whole;

2) there were developed approaches to the creation of a organisation competitiveness management system based on the known methods of reengineering of business processes of the organisation, modelling, system approach, application of automated management systems;

3) there was identified the need for establishing functional interrelations and interdependencies between indicators of organisation competitiveness, which allows to determine the degree of dependence of the integrated competitiveness of the organisation and its products on any private or generalized indicator of their competitiveness, to determine quantitatively how much the competitiveness of the organisation and its products in total will change when any private or generalized indicator of competitiveness is changed.

Using of reengineering methods of organisation business processes (next: processes) referred to in clause 2, is based on the process approach used in organisation management system for increasing its management quality and its effectiveness and competitiveness [4, 5, 6, 7, 8, 9].

To provide an objective assessment of the organisation and its products competitiveness within the organisation competitiveness management system there were analyzed the existing methods of competitiveness assessment and analysis.

Simple and obvious way for assessing the competitiveness of goods is associated with its definition as the degree of preference to competing products in the

market [10]. In this case competitiveness indicator is the market share of the existing product or an expert determined probability of the consumer preferring evaluated product to market similar products.

Contemporary organisations use qualitative and quantitative competitiveness analysis.

Qualitative competitiveness analysis is descriptive and represents a methodological basis for the quantitative evaluation of competitiveness. The following methods are basic for analysis of the competitive environment:

– structural analysis of the organisation competitive environment;

– cost structure and added value analysis;

– value chain competitors analysis;

– strategic group analysis (cluster analysis).

The mainstream methods of the competitive environment analysis, such as GE-McKinsey matrix, Ansoff matrix, Porter's four corners model, Porter's five forces analysis, SWOT analysis, ect. [11, 12, 13, 14, 15] are related to strategic analysis methods and are expert methods. They estimate their parameters (that are directly or indirectly influencing the organisation and its products competitiveness) using predefined scales and in accordance with the subjective opinion of the experts, conducting the analysis.

Obviously, the qualitative analysis does not allow to objectively assess the quantitative level of the competitiveness and the degree of influence of external and internal environment factors of the organisation.

Quantitative analysis is a quantitative assessment of the competitiveness and is often carried out by the following methods [16]: differential, integrated, mixed, desirability function, multi-criteria optimisation.

Note that none of these methods do not allow to determine a functional interdependency between the organisation and its products competitiveness indicators and technical, economic, organisational indicators of the organisation, taking into account the interrelation of the organisation business processes.

Such methods are not able to objectively assess functional interrelation of these indicators with the organisation's external environment indicators and to quantitatively assess the impact on the organisation and its products competitiveness by listed indicators and organisation business processes operation changes. That is, these methods do not allow to quantitatively determine the changes of the value of the organisation and its products competitiveness by quantitative changes of the organisation's external and internal environment. But without establishing these interrelations, it is impossible to objectively assess the sensitivity of the organisation and its products competitiveness to the changes in factors of external and internal organisation environment and to make timely constructive management decisions to optimise the competitiveness, eliminating its «weaknesses» in the rapidly changing conditions of contemporary market economy.

In addition to the above-mentioned competitive environment analysis for forming the OCMS and the assessment of the level of the organisation competitiveness there were considered widely used: competitive profile analysis; financial analysis; scenarios development; the methods of game theory; modelling [11, 12, 13, 14, 15, 17, 18, 19]. It was determined [3], that modelling is the most appropriate method for forming the OCMS and the assessment of the level of the organisation competitiveness. This method represents one of the most difficult methods of the competitive environment analysis. Modelling of competitive environment requires knowledge of the nature of the interrelation between different variables of the organisation's external and internal environment. This is not always possible because the cost of obtaining such information can be quite high.

But unlike other methods, the modelling allows to take into account all the necessary values and characteristics that directly and indirectly, inside and outside affect the organisation competitiveness, and also to take into account the functional interrelations of the indicators, to use the methods of probability theory and mathematical statistics to describe the random effects. In addition, modelling allows to consider some of the features of OCMS, particularly, changes in time and weightiness of the foregoing indicators that influence the organisation and its products competitiveness in forming the organisation competitiveness as a whole (that is, their ranking); the interrelations of these parameters. The modelling allows to define and formalise the purpose of the operation of the OCMS and its subsystems, including the purpose of improving the competitiveness of the organisation and its subsystems; to provide functional interdependencies between subsystems and within them; to identify and manage specific factors that characterise the competitiveness of organisation and its products as a whole – competitive advantages. Such advantages are set of properties of the organisation activity's results (products) that make them more attractive to consumers.

Evaluating the organisation competitiveness by modelling, it is necessary to provide the creation of economic-mathematical mechanism for determining the competitive advantage of the organisation, private, generalized indicators of internal and external environment that directly or indirectly affect the organisation competitiveness. Therefore, the modelling allows to assess the impact of changes in the external and internal environment of the organisation in the formation of complex (integrated) indicator of the organisation competitiveness, quantitatively reflecting the level of its competitiveness. Using the generated within OCMS indicators it is able to assess and manage the organisation competitiveness as a whole.

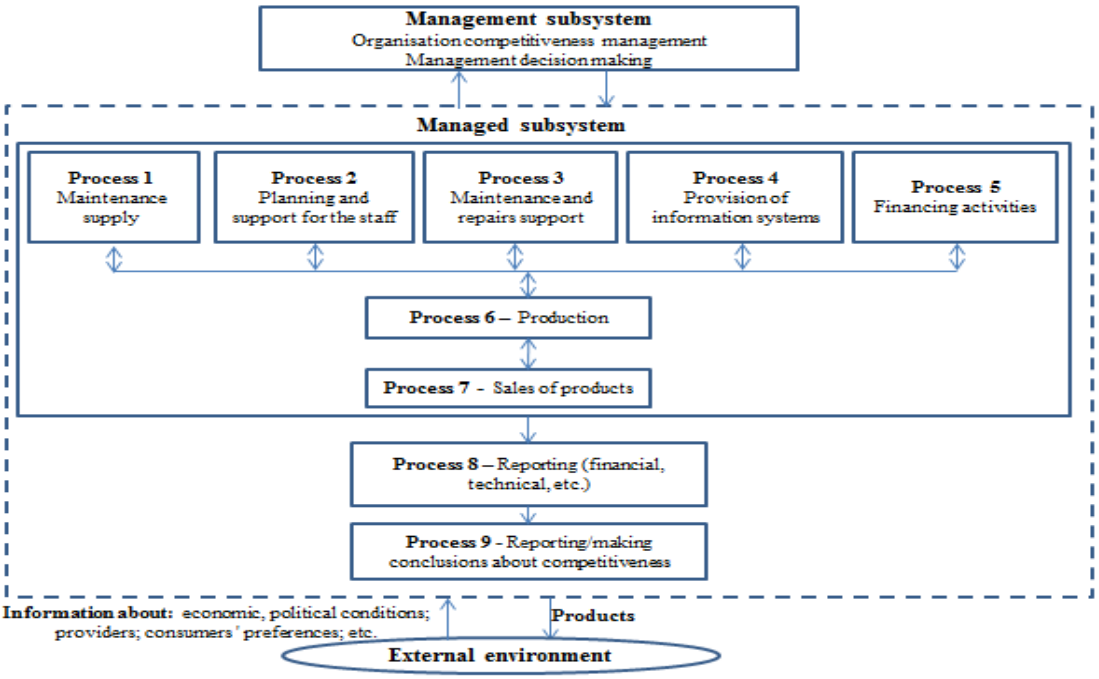
Assessment of competitiveness indicators allows to initiate the development of new competitive products, optimally considering all the competitive advantages of the organisation at all stages of its activities.

3. Process Approach And Modelling In Organisation Competitiveness Management System

Besides the obvious benefits of the process approach to the management organisation [7, 20], its application in the management of the organisation competitiveness allows, in particular, to ensure the establishment of functional interrelations and interdependencies between indicators of competitiveness of the organisation and its products through established functional interdependencies and interrelations between business processes. This allows to ensure the reflection of changes in the external and internal environment within the formation of an objective quantitative assessment of the competitiveness of the organisation and each kind of its products and forecasting of this assessment. That is, to determine the sensitivity of such kind of assessment to the mentioned changes.

Through the use of these features OCMS can respond timely to negative changes in the external and internal organisation environment and prepare management proposals (including priority of information) for timely decision-making on regulation of competitiveness.

According to [2, 21], organisation competitiveness management system, like any management system, is a special type of a system containing two objects: the managing and the managed subsystem. Taking into account the above and [2], as an example, a scheme is developed, which is illustrating the interaction of the main processes of industrial organisation within the operation of the management system of its competitiveness and its products (see figure 1).



Source: developed by the author

Figure 1. Scheme of interaction of the basic organisation's processes

The managing subsystem affects the managed subsystem by management decision making. The managed subsystem informs the managing subsystem about its states (technical, economic parameters of the organisation activities, reporting), including information on the processing and implementation of any management decision into the business processes operation of the organisation. Based on this information within the managing subsystem there are being produced new management decisions on regulation of the organisation activities, taking measures to increase its efficiency and competitiveness, the prevention of negative consequences of changes on factors of external and internal environment. Thus, as a result of OCMS operations, people responsible for decision-making (management of organisation), using the obtained information about the state of the managed subsystem and options of management decisions and their rationale from the managing subsystem, possess the full amount of reliable information. Using this information about the organisation, its competitiveness, possible «weaknesses» of competitiveness, requiring immediate strengthening the management can use the OCMS's recommendations when making their own management decisions.

The external environment (customers) receives finished products from the organisation, and it effects on the managed subsystem by different conditions: political, economic conditions, demand changes, suppliers prices and so on. The managed subsystem can also effect itself (auto-interaction), expressed as the changes in some of the processes activities under the influence of the changes in other processes activities – interdependence and mutual influence of the various processes of the organisation.

The reporting processes on the organisation activities and making conclusions about the organisation and its product competitiveness (processes 8 and 9) include outcome indicators of the organisation business processes operation. These processes are a kind of generalisation of the results of the organisation operations, and reflect the results of the application of any management decisions made within the operation of the managing subsystem.

The processes, Proposed in figure 1, are not the only once of key processes of the industrial organisation. Their list according to the specifics of the organisation should be supplemented. To provide an objective assessment of the organisation and its product competitiveness, determination of the interrelations and interdependencies of competitiveness indicators it is necessary to divide the main processes of an organisation into more detailed once, able to integrate for a general assessment. At each stage of this separation it is necessary to determine the competitiveness of each process and its significance (weightiness) in the formation of integral assessment of the organisation and its product competitiveness and to determine its functional interdependence within the organisation. The number of such divisions depends on the depth of the analysis and evaluation of the organisation and its product competitiveness, the need to achieve greater or lesser accuracy of the final assessment, as well as the complexity of the process.

As an describing example of the organisation process figure 2 shows a flowchart of a process of «Maintenance and repairs support», revised by the author, taking into account [22], for using within the organisation competitiveness management system.

The described process interrelates closely with other processes of the organisation. Thus, the input data for the described process is:

– «Development plans». Data comes from the managing subsystem of OCMS. They are formed taking into account the available data on the previous states of the process «Maintenance and repairs support»;

– «Budgets». Data comes from process 5 «Financing activities»;

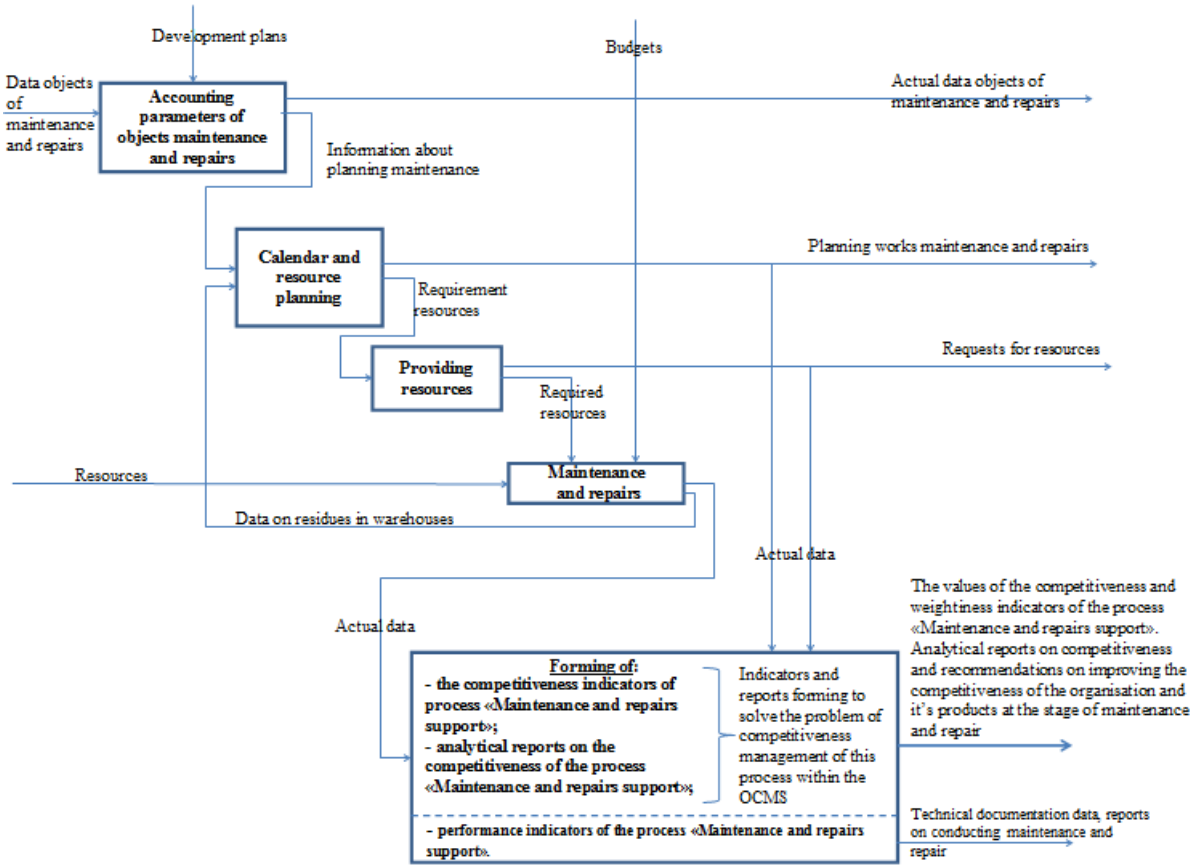
– «Resources». Data come from process 1 «Maintenance supply» and process 2 «Planning and support for the staff».

The output data for the above process is:

– «Actual data objects of maintenance and repairs». Data comes, in particular, to the managing subsystem for timely management decisions about the need to replace obsolete equipment, downtime in repairs, the number of failures;

– «Planning works maintenance and repairs». Data comes to processes 1, 2, 5 for the timely planning of the supply process «Maintenance and repairs support» by human, material and financial resources, planned works;

– «Requests for resources». Data comes, in particular, to process 1 «Maintenance supply» and process 2 «Planning and support for the staff» to ensure timely execution of planned works for the maintenance and repairs by human and material resources.



Source: developed by the author taking into account [22]

Figure 2. Process «Maintenance and repairs support»

The results of the operation of the process «Maintenance and repairs support», modified for use in OCMS, in addition to traditional forms of reporting (technical, planning and other) are:

– the values of the competitiveness indicators of the process and the value of its weightiness in the formation of the organisation and its product competitiveness;

– the analytical reports that include information about the changes in the process competitiveness, comparing performance indicators with competitors (or targets values), revealing its «weaknesses», the conclusions to develop options for management solutions to improve competitiveness and retain competitive advantages in the operation of this process.

Listed output data of a process is the input data for the managing subsystem. This data shows the state of the process «Maintenance and repairs support» to the managing subsystem for each accounting period or upon request. Such information is crucial for the development and acceptance of management decisions on the adjustment of this process operation, identification of "weaknesses" in its competitiveness, the acceptance of measures to improve the organisation and its products competitiveness in maintenance and repairs.

As competitiveness indicators of the process «Maintenance and repairs support» can be:

– the productivity of maintenance and repairs personnel;

– the amount of downtime of equipment, repair objects;

– the wearing-out indicator of the various kinds or groups of fixed assets;

– the share of automated and manual labor in the maintenance and repairs;

– the materials consumption of ongoing repairs;

– the unit cost of repairs by equipment kinds, repair objects;

– the unit cost of service per unit of time of equipment operation;

– and others.

According to [3] the interrelation between private indicators of the organisation competitiveness can be shown by the example of evaluating the degree of the equipment deterioration. Within the production activities of the organisation there should be provided the opportunity for equipment replacement because of moral and/or physical deterioration.

The private wearing-out indicator of the various kinds or groups of fixed assets (including equipment):

$$I_d = C_w / C_{in}, \quad (1)$$

where C_w –cost of fixed assets wearing-out;
C_{in} –initial cost of all or separate kinds or groups of fixed assets.
This coefficient allows us to determine the share of wearing-out equipment of the organisation at the moment.

The share of newly introduced equipment is calculated by the formula:

$$I_{new} = C_{new} / C_{end}, \quad (2)$$

where I_{new} – private indicator of fixed assets renewal;
C_{new} –cost of the newly added fixed assets for a certain period;
C_{end} –cost of fixed assets at the end of the same period year.

The disposal share of fixed assets allows you to calculate the private disposal indicator:

$$I_{dis} = C_{dis} / C_{beg}, \quad (3)$$

where C_{dis} –cost of fixed assets disposal during a certain period;
C_{beg} –cost of fixed assets at the beginning of the same period.

The products competitiveness coefficient of the separate characteristic, described by the corresponding private indicator, can be calculated by the formula:

$$K_i = s_i / s_{i0}, \quad (4)$$

where s_i – value of the i-th analyzed product private indicator of the private indicators set ($s_i \in S$);
s_{i0} – value of the i-th basic private indicator of the product sample from its private indicators set ($s_{i0} \in S_0$);
K_i – competitiveness coefficient for the i-th private indicator of the product.

The sample here is the competitor product or other sample product with which the organisation product is compared for assessing the level of competitiveness.

Note, when calculating, for example, the competitiveness coefficient in cost or price the dependence is reverse:

$$K_i = s_{i0} / s_i. \quad (5)$$

From formulas (4) and (5) one should select that, according to which the growth rate K_i corresponds to an increase competitiveness. For example, if the cost of buying the material is below than the cost of a competitor for the same material purchase, then according to this indicator the product is more competitive, and that should be reflected in the formula as an inverse dependence of the parameters of (5).

Generalized indicators can be calculated by the following formula:

$$Q = \sum_{i=1}^{n1} K_i \alpha_i, \quad (6)$$

where K_i – competitiveness coefficient for the i-th private indicator (costs for materials and components, inflation, wages);
$n1$ – number of private indicators;
α_i – ratio reflecting the weight (weighting coefficient) of that private indicator in assessing the product competitiveness of using the generalized indicator.

The significance (weightiness) of private indicator, as a rule, is determined by economic laws and described by mathematical dependencies, as well as by an expert and takes values $0 \le \alpha_i \le 1$. Moreover, when calculating each of the generalized indicator for weighting coefficients of private indicators, included in this generalized indicator, the condition should be observed:

$$\sum_i \alpha_i = 1. \quad (7)$$

Based on formula (7) the level of the product competitiveness can be calculated:

$$K_I = \frac{\sum_{i=1}^{N} Q_i \alpha_i}{\sum_{i=1}^{N} \alpha_i}, \quad (8)$$

where Q_i – generalized indicator of the product competitiveness;
α_i – weighting coefficient of the generalized indicator of the product competitiveness;
N – number of significant generalized indicators of the product competitiveness.

Obviously, the purpose of any organisation is to achieve such values of generalized indicators of the product competitiveness, which satisfy the condition

$$K_I \to \max. \quad (9)$$

The above mathematical dependences of the definition of the product competitiveness allow to systematically take into account the effect of all private and generalized indicators for achieving the purposes of improving the product competitiveness:

$$\begin{cases} K_i > 0, \qquad (i = 1,..., N_1) \\ Q_i = \sum_{i=1}^{j(i)} K_i \alpha_i, \qquad (i = 1,..., N_2) \end{cases}$$
$$K_I = \frac{\sum_{i=1}^{M} Q_i \alpha_i}{\sum_{i=1}^{M} \alpha_i} \to \max, \quad (10)$$

where K_i – competitiveness coefficient for the i-th private indicator;
N_1 – number of private indicators of the product competitiveness;
Q_i – the i-th generalized indicator of the product competitiveness;
N_2 – number of generalized indicators of the product competitiveness;
α_i – weighting coefficient of the product competitiveness coefficient K_i;
$\sum_{i=1}^{j(i)} \alpha_i = 1$ for any generalized indicator Q_i;
$j(i)$ – number of private indicators of the product competitiveness in the i-th generalized indicator;
K_I – integrated indicator of the product competitiveness;
M – number of generalized indicators of the product competitiveness in the integrated indicator;
$\sum_{i=1}^{M} \alpha_i = 1$ for integrated indicator K_I.

The competitiveness coefficient of the organisation of the separate characteristics described by the corresponding private indicator can be calculated by the formula:

$$H_i = u_i / u_{i0}, \quad (11)$$

where u_i – value of the i-th analyzed organisation private indicator of the private indicators set ($u_i \in U$);
u_{i0} – value of the i-th basic private indicator of the organisation sample from its private indicators set ($u_{i0} \in U_0$);
H_i – competitiveness coefficient for the i-th private indicator of the organisation.

Note, when calculating, for example, the competitiveness indicator of the laboriousness the dependence is reverse, because, ceteris paribus, reduction in the laboriousness leads to increased competitiveness:

$$H_i = u_{i0} / u_i . \qquad (12)$$

From formulas (11) and (12) one should select that, according to which the growth rate H_i corresponds to an increase in competitiveness. For example, if the cost of buying the material is below than the cost of competitor for the same material purchase, then according to this indicator the organisation more competitive, and that should be reflected in the formula as an inverse dependence of the parameters of (12).

As generalized indicators consist of private, indicators within the dependencies of various types of private indicators the dependencies between the corresponding generalized indicators of the organisation competitiveness are taking into account.

To provide an objective assessment of the organisation competitiveness the generalized indicators should be taken into account in the form of a system of functional dependencies of private indicators presented in the general form:

$$F(U) = \begin{cases} f_1 = f_1(u_{1,1},\ldots,u_{1,N_1}) \\ \ldots \\ f_w = f_w(u_{w,1},\ldots,u_{w,N_w}), \end{cases} \qquad (13)$$

where f_i – the i-th function, described interdependency N_i of private indicators of the organisation competitiveness ($u_{i,1},\ldots,u_{i,Ni}$) for $i=1\ldots w$ and $u_{i,1} \in U,\ldots,u_{i,Ni} \in U$;

U – set of all private indicators of the organisation competitiveness;

w – number of functional dependencies f_i in the system $F(U)$.

The generalized indicators of the organisation competitiveness are formed by analogy with generalized indicators of product competitiveness. Note, the number of generalized indicators should be optimal for determining the organisation competitiveness.

For the organisation the system of generalized indicators of competitiveness has a more complex hierarchy due to the complexity of organisational system, its processes, interrelations and interdependencies of some indicators with others.

As a result there is a hierarchy of generalized indicators, including indicators of the first level of generalization, which consist of private indicators of the organisation competitiveness, taking into account their weight in this generalized indicator:

$$R_{1,j} = \sum_{i=1}^{M_{1,j}} H_i \cdot \beta_{0,i} , \qquad (14)$$

where $R_{1,j}$ – the j-th generalized competitiveness indicator of the generalized first level;

$M_{1,j}$ - number of private indicators of the organisation competitiveness, participating indicator $R_{1,j}$;

$\beta_{0,i}$ – weighting coefficient of the i-th private indicator, participating generalized indicator $R_{1,j}$ on the generalization first level ($i=1\ldots M_{1,j}$). And the condition should be observed:

$$\sum_{i=1}^{M_{1,j}} \beta_{0,i} = 1 \qquad (15).$$

For any generalization p-th level ($p>1$) generalized indicators consist of generalized indicators of the organisation competitiveness of previous (p-1)-th generalization level, taking into account their weight in this generalized indicator:

$$R_{p,j} = \sum_{i=1}^{M_{p,j}} R_{p-1,i} \cdot \beta_{p-1,i} , \qquad (16)$$

where $R_{p,j}$ – the j-th generalized indicator of the organisation competitiveness of the generalization p-th level;

$M_{p,j}$ – number of generalized indicators of the previous level $R_{p-1,i}$, participating indicator $R_{p,j}$;

$\beta_{p-1,i}$ – weighting coefficient of the generalized indicator $R_{p-1,i}$. And the condition should be observed:

$$\sum_{i=1}^{M_{p,j}} \beta_{p-1,i} = 1 \qquad (17).$$

At the top level of the generalized indicators hierarchy (P) of the organisation competitiveness there are generalized indicators of the organisation competitiveness in all major areas of organisation activities – of its business processes (see figure 1): maintenance supply, planning and support for the stuff, financing activities, production, sales of products and etc.

A number of these indicators depends on the complexity of the production activities of the organisation.

Thus, for each business process of the organisation, using the formula (16), there should be formed a general indicator of competitiveness, quantitatively reflecting the impact of private and generalized indicators, taking into account their weight, affecting the organisation competitiveness in this business process.

The operation of business processes of the organisation has a variety effect on its competitive advantages and overall competitiveness. Production activities of the production organisation affect its competitiveness in a greater degree than, for example, financial activities. Priority of business processes in the formation of the overall organisation competitiveness should be considered when determining the integrated indicator of the organisation competitiveness, that summarized aggregated indicators of the hierarchy upper level, taking into account their weightiness:

$$H_{I,opg} = \frac{\sum_{i=1}^{M_P} R_{P,i} \cdot \beta_{P,i}}{\sum_{i=1}^{M_P} \beta_{P,i}} , \qquad (18)$$

where $R_{P,i}$ – generalized indicator of the organisation competitiveness for the i-th business process;

$\beta_{P,i}$ – weighting coefficient of the indicator $R_{P,i}$, represents the competitiveness share, formed on this business process of the organisation;

M_P – number of generalized indicators of competitiveness of the hierarchy highest level (the main business processes of the organisation).

For the organisation management, effective variation of the previously defined generalized and private indicators of competitiveness and their weight the integrated indicator of the organisation competitiveness should increase:

$$H_{I,opg} \rightarrow max. \qquad (19)$$

Based on the foregoing there may be composed the following mathematical model for determining the organisation competitiveness, taking into account the optimality of generalized indicators of the organisation competitiveness and

the Interrelations of private and generalized indicators of the organisation competitiveness

$$\begin{cases} f_{i_1} = f_{i_1}\left(u_{i_1,1},....,u_{i_1 N_{i1}}\right), \quad (i_1 = 1,..., I_f) \\ H_{i_2} > 0, \quad (i_2 = 1,..., I_2) \\ R_{1,j} = \sum_{i=1}^{M_{1,j}} H_i \beta_{0,i} \quad (j = 1,..., J_1) \\ R_{p,j_p} = \sum_{i=1}^{M_{p,j_p}} R_{p-1,i} \beta_{p-1,i}, \quad (p = 2,..., P; \quad j_p = 1,..., J_P) \end{cases}, \quad (20)$$

$$H_{I,opc} = \frac{\sum_{i=1}^{M_P} R_{P,i} \cdot \beta_{P,i}}{\sum_{i=1}^{M_P} \beta_{P,i}} \to \max.$$

where f_{i1} – the i_1-th function, describing interdependency N_{i1} of private indicators of the organisation competitiveness $\left(u_{i_1,1},\ldots,u_{i_1,N_{i1}}\right)$ and $u_{i,1} \in U,\ldots,u_{i,Ni} \in U$;

U – set of all private indicators of the organisation competitiveness;

I_f – number of functional interdependencies;

H_{i_2} – competitiveness coefficient of the i_2-th organisation private indicator;

I_2 – number of coefficients H_{i_2};

R_{1,j_1} – the j_1-th generalized indicator of competitiveness of the first level of generalization;

$M_{1,j1}$ – number of private indicators of the organisation competitiveness;

J_1 – number of indicators R_{1,j_1} on the first level of generalization;

$\beta_{0,i}$ – weighting coefficient of the i-th private indicator on the first level of generalization (i=1… $M_{1,j1}$). And the condition should be observed:

$$\sum_{i=1}^{M_{1,j1}} \beta_{0,i} = 1 \quad (21);$$

$R_{p,jp}$ – the j_p-th generalized indicator of the organisation competitiveness on the p-th level of generalization;

$M_{p,jp}$ – number of generalized indicators of the previous level R_{p-1,j_p}, forming the indicator R_{p,j_p};

J_p – number of indicators R_{p,j_p} on the p-th level of generalization;

P – number of the generalization levels;

$\beta_{p\text{-}1,i}$ – weighting coefficient of the generalized indicator $R_{p\text{-}1,i}$. And the condition should be observed:

$$\sum_{i=1}^{M_{p,jp}} \beta_{p-1,i} = 1 \quad (22);$$

$R_{P,i}$ – generalized indicator of the organisation competitiveness for the i-th business processes;

$\beta_{P,i}$ – weighting coefficient of the indicator $R_{P,i}$, represents the competitiveness share, formed on this business process of the organisation;

M_P – number of generalized indicators of competitiveness of the hierarchy highest level (the main business processes of the organisation);

$H_{I,opc}$ – integrated indicator of the organisation competitiveness.

4. The Stages Of The Competitiveness Assessment And Analysis

Based on the above, there can be formulated the main stages of the assessment and analysis of the organisation and its products competitiveness within the OCMS on the basis of the process approach and the modelling:

1. the definition of all key organisation processes and their components (depending on the required accuracy assessment);
2. identification of interrelations and interdependencies between existing processes on the basis of analytical, technical, financial and other organisation reporting, as well as using statistical methods or by experts;
3. formalization identified in clause 2 of the interrelations and interdependencies between the existing organisation processes in the form of a mathematical functional dependencies by modeling;
4. formation of private and generalized indicators of the organisation and its products competitiveness;
5. assessment of the level of the organisation and its products competitiveness as an integrated indicator of the organisation and integrated indicators of each type of products;
6. realization of the sensitivity analysis of the competitiveness, i.e. the sensitivity analysis of the evaluated in p.5 indicators of the organisation and its products competitiveness to changes in any organisation processes indicators (through previously defined interrelations and interdependencies between the organisation processes);
7. formation of management decisions (based on the results of the events of clause 4 for optimizing the organisation and its products competitiveness and for achieving the optimal values of the competitiveness indicators.

5. Conclusions

The obtained estimates of private and generalized indicators of the organisation and its products competitiveness, analysis of their sensitivity to changes in various technical and economic indicators of different organisation processes, establishing the significance of these changes for separate processes and for the organisation as a whole allow to establish what organisation processes to a greater or lesser degree affect the results of the assessment of the organisation and its products competitiveness.

Consequently this analysis reveals how the changes of any organisation process affect its competitiveness. This approach gives a more exact and objective final assessment of the organisation and its products competitiveness.

Given in the article mathematical functional description of the interrelation between private and generalized competitiveness indicators shows quantitatively how the change of any indicator of the process affects the indicators of another process and how it affects the organisation and its products competitiveness. And such functional dependencies allow to determine how significant this changing for the organisation and its products competitiveness.

This, in turn, allows to make timely management decisions for achieving the required values for the competitiveness indicators, to identify and promptly resolve the «weaknesses» of the organisation and its products competitiveness, to take timely decisions for optimization of the organisation activities.

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