STAGES OF DEVELOPMENT OF DIAGNOSTIC MODELS IN HIGHER EDUCATION

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ABSTRACT
This article describes the development of models used in the diagnosis of the quality of higher education and the logical study of the nature of the phenomena studied.

Keywords: Higher education, quality, economic diagnostics, model construction.

The development of models used in the diagnosis of the quality of higher education consists in a certain degree of clarification of generally accepted principles in their content. In the first approach, economic diagnostics involves the following steps:

determine the purpose of modeling the object and economic quantities;

identification of indicators (identification or determination of necessary indicators);

create a composition of indicators in the model;

measurement and analysis of results.

These steps can be named or imagined as follows:

a logical study of the nature of the phenomena being studied. Thus, the purpose of the research in the first stage is to determine the important features and factors of the phenomenon and the content of their interrelationships, to develop the necessary definitions for identification of factors and results, qualitative analysis, conceptual modeling, development or selection of standards;

development or selection of indicators. In the second step, indicators are selected to represent the properties of the object. Object properties are represented by concepts and concepts are broken down into parts to facilitate learning. Selection of indicators is carried out in quantitative and qualitative sections. They are integrated into an integrated system. The content and objectives of each indicator are defined;

model construction development. In the third stage, a model scheme is selected and a constructive model is created based on it. To do this, the boundaries of the indicators are taken, if necessary, the indicators are combined into an index, an analytical view of the relationship is found, a method of constructing the optimal form of the model is selected, a mathematical model is created and its mathematical analysis is performed. One of the important tasks at this stage is to determine the metric and nometric scales for the indicators.

measuring and analyzing the effects of factors. In the fourth stage, first of all, the quality of the existing database is assessed. Measurement of indicators is planned and performed. Information is processed according to the selected methods and algorithms in the formation of the model. The results are summarized, errors are identified. Based on them, a factor analysis is performed and reserves are disclosed. As part of the analysis, a comprehensive assessment will be organized, along with the calculation and analysis of specific indicators.

The diagnostic model combines the integration of certain indicators into a single system, the quantitative and qualitative disclosure of the interaction of indicators and their impact on the results, as well as the qualitative and quantitative assessment of the emergent properties of the system. In this context, an indicator or indicator can be considered as an initial experiment of a system. Substantiation, selection, development and application of the indicator also make it necessary to perform certain procedures. Hence, the inclusion of an

indicator in the model involves both conceptualization (theoretical substantiation), formalization (shaping), and operationalization (use).

Many indicators are used in the model. Each of the indicators used for modeling purposes serves to represent certain features or properties of the object. For the model, it will be necessary to form the indicator space according to the character space. To do this, it is necessary to study the character space in advance and distinguish the types of indicators on the basis of their classification.

Usually it is necessary to generalize (aggregate, summarize) the indicators to one degree or another. This is done on the basis of an initial analysis of the multidimensionality that is reflected in or represented by the indicators. In this process, the type of integral indicator (metric, nometric) is determined.

Depending on the modeling objectives and the characteristics of the object, the indicators should have a certain accuracy. To do this, an initial analysis of accuracy is performed. This determines the type of scales that allow for the required accuracy for the final indicator and indicators that represent the goal. It also determines the required level of metrological accuracy of the result indicator and indicators.

As a result of this work, the model is able to adequately constructively express the state of the object or phenomenon under study in meaningful spatial-temporal coordinates.

Operationalization refers to the development of an operational diagnostic model. As noted above, an operational model is a quantitatively identifiable model. At this stage, the following operations are performed with indicators:

formation of a set of indicators (selection of measurable indicators, disclosure of the availability of specific sources of information and, in this regard, identification of the model, analysis of access to information);

modeling (construction - quantitative expression of the relationship between indicators and performance indicators, construction of indicators and their system, interpretation of ratios and operations in the model);

determining the level of accuracy of modeling (the level of accuracy that can be achieved by indicators and integral indicators);

determine the comparability of the integral indicator;

assessment of compliance of the diagnostic model with the requirements;

make adjustments to the model design.

The described procedures do not change for the whole model, for the indicators, for the object, for the result indicators, and for the scale. Because they approach the ideal and serve to ensure the constructiveness of the definitions and increase the generality in the conclusions.

The complex diagnosis of HEI activity is based on the study of multidimensional processes. Therefore, the general nature of the changes is determined using integral indicators. At the same time, it is not advisable to draw conclusions based solely on integral indicators. In order to achieve accuracy and objectivity, a separate analysis of the underlying indicators will also be required. Systematic analysis, which involves a complete approach to it, requires the organization of economic diagnostics as a multi-level structure, ie adherence to the principle of "from general to specific", including:

first level - assessment of the general situation on the basis of calculation and analysis of integrated indicators of higher education;

second level - identification of factors that reduce the level of accuracy of the integrated assessment;

third level - to identify the main problems and areas of activity and to indicate under what factors they occur;

the fourth level is to determine the causes of the impact of the relevant factors.

The above diagnostic levels can also be called diagnostic stages in a sense, and they differ in the depth of the analysis, the number of indicators analyzed, the detail, the time allotted for analysis, the accuracy of the conclusions. Diagnosis of the quality of higher education can also be carried out at different levels of detail, depending on the specific goals, depending on the available information and software, technical and human resources.

In general, diagnostic levels can be divided into two groups:

express diagnostics of activity;

detailed analysis.

The purpose of express diagnostics is a generalized assessment based on the status and dynamics of the studied events or activities, the timeliness of the performed algorithms, and the fact that they are visual and not complex in terms of labor requirements. Typically, such a diagnosis uses some degree of detailed and integrated assessment. The purpose of the detailed analysis is to provide a detailed explanation of the status and dynamics, economic or other results of the university, to identify and assess short-term and long-term development prospects based on the analysis of the reporting period.

Identification of weak joints, which require special attention on the content of express-diagnostics, is to determine the nature of the disorders on the basis of their typical symptoms. The main purpose of express diagnostics is to draw conclusions that suggest the need for a more detailed study of the results of activities, and, more importantly, to indicate the direction of such analysis.

The first stage of express diagnostics is to calculate the integral assessments. However, it should be noted that it is necessary to rely on diagnostic normative models. Because integral estimates are based on exactly such models. With this in mind, express diagnostics records the condition of the object and the processes in it, and based on this helps to prepare proposals for improving the situation. To do this, it is necessary to identify the factors that affected the situation and assess their impact on the results. Therefore, in the second stage of express diagnostics, the factors that led to the decrease in integral assessments are identified. Of course, the factor is taken as the causes or elements that affect a particular indicator or set of indicators.

In addition to the disclosure of the factors affecting the object in the detailed diagnosis, the degree of their impact force must also be assessed sufficiently accurately and reliably. To do this, different methods of economic and mathematical calculation are used.

The traditional performance of factor analysis is as follows: any that characterizes the outcome indicator $y=f(x)$ function is given; $x=(x_1, x_2, \ldots, x_n)$, $f(x)$ the amount of function are dependent factors. $x_к$ the amount of the factor $\Delta x_к = x_k^0 - x_n^b$ the resultant indicator with change $\Delta Y = y^0 - y^b$ known to vary in quantity ($x_к^b$, y^b – base quantities, x^o, y^0 – reporting period amounts). It is necessary to determine whether any part of the change in the result indicator occurred with the change of each factor, that is, the increased part of the result indicator should be divided into components:

$$\Delta y=\Delta y(\Delta x_1)+\Delta y(\Delta x_2)+\ldots.+\Delta y(x_n),$$

here:

Δy – overall growth of the performance indicator;

Δy (Δx_i) – the part of the resultant indicator growth that occurs under the influence of factor i change.

When using normative models based on ordered factors, the resultant indicator is the assessment of the closeness of the ordered pairs of indicators (actual indicators and indicators in the normative model). The indicators that form the diagnostic normative model serve as factors. The task of factor analysis is to determine whether a quantitative change in proximity assessment is due in part to a change in the role of the indicators in the overall system of movement of the indicators that form the diagnostic normative model of each indicator:

$$\Delta B = \Delta B(x_1) + \Delta B(x_2) + \ldots + \Delta B(x_n)$$

here:

ΔB – general change in the assessment of the closeness of the actual order to the order of indicators established by the norm under the influence of changes in all indicators;

$\Delta B(x_i)$ – the change in proximity assessment under the influence of xi factor motion.

The tasks to be performed in factor analysis can also be performed using an ordinal, i.e., a ranking scale. It is known that in the diagnostic normative model, the indicators are the dynamics of the factors that either support or worsen the normative state of the object.

The dynamics of each particular indicator can cause different problems depending on which other indicators it interacts with (inversion). For example, when the amount of tuition is freely set, its high level is due to the high reputation of the university and the high quality of education. Subsequent declines may lead to a decrease in tuition fees.

Problems can occur for many different reasons. Such causes can be accidental, one-time, or they can be caused by chronic disruptions in the activities of the object. At the same time, it is necessary to pay close attention to outdated problems, that is, to consider the problems that have passed from time to time.

By sequentially placing the sums of monand elements in the matrices of distortions constructed for different periods, it is possible to identify the most negative inequalities of chronicity and to analyze their causes in more depth. Of course, the most recurring imbalances in the study of object activity also need to be explored accordingly.

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