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**MANAGEMENT
SYSTEM
FORMATION FOR
EFFECTIVENESS OF
INSTITUTIONS OF
HIGHER
EDUCATION
ACADEMIC
ACTIVITIES**

High education is rapidly evolving and developing, expanding into
business-related industries and increasing competitive advantages. In the
market environment, Ukrainian and foreign institutions of higher
education are being transformed from state-funded education and
scientific and cultural centers into enterprises with all enterprises'
activities, including: advertising – to increase the volume of entrants,
diagnostic – assessment of efficiency and economic feasibility of
operating structural units, entrepreneurial – research into the cost of
training specialists, etc. Therefore, there is a need for a quick and
effective adjustment of the activities of institutions of higher education
to the external environment requirements.

In a competitive environment, where the ability of institutions of
higher education to respond quickly to environmental changes becomes
one of the most important components of successful functioning in the
education service market, the long-term development is of paramount
importance. Its main factors are sound strategic management of the

institution of higher education; the effectiveness of business processes occurring in the IHE; management of capital embodied in the knowledge and qualifications of academic staff; ability to retain and attract new students; innovative development and organizational improvements; investment in information technology (N. Obolyaeva, 2011).

Increasing competition in the education services market prompts IHE management to improve management efficiency. New economic conditions require new approaches to governance in higher education. In view of this, scientists are increasingly talking about the necessity for a strategic approach to managing institutions of higher education. A prerequisite for the successful functioning of the IHE in the modern world is compliance with the rule "the benefit of the result must exceed the cost of achieving it". The choice of performance assessment methods is one of the objectives of management accounting in the IHE performance management system. The interests of consumers of education services are of paramount importance, the interests of management subjects are secondary, therefore the strategic management of IHE should not be aggressive towards the external environment.

The analyzes of methods of assessment of IHE effective activity and their connection with other economic categories in their researches were paid attention by such Ukrainian and Russian scientists as: L.O. Voloshchuk, S.R. Demidov, N.V. Pankova, Bielialov T., Vlasiuk T., Gryshchenko I.M., Tarasenko I.O. and others.

N.V. Pankova's work (p. 12) provides a methodology for assessing the IHE effective activity related to the current transformations in the higher education system. S. R. Demidov (S. R. Demidov, p. 245) proposed a methodology for determining the IHE effective activity based on an assessment of the correlation of such indicators as the actual volume of intellectual goods and services, the demand for IHE intellectual products and services, the actual and regulatory excess of revenue over the costs remaining in the IHE, actual and regulatory costs resources for the creation and sale of intellectual products.

The issues of assessing the management effectiveness of social and pedagogical systems have been considered by such scientists as O.S. Bodnar, N.G. Korneshchuk, A.I. Chmil and others. They suggested authoring approaches to assessing such performance. There are also a number of concepts for assessing management effectiveness that have emerged in recent years, based on a comprehensive approach to organizing (usually production) as an open system. However, these concepts are not always interrelated and, to some extent, contradictory.

It should be emphasized that the concept "management mechanism" as a key element of the IHE is a relatively new and not well-researched concept. Mechanism in economics means the sequence of actions, states that determine a process or phenomenon (A.Borisov, 2010). Accordingly, the control mechanism can be defined as a clear sequence of actions (steps, stages, phases) that determine the control process. And, since control is a deliberate process in which certain tasks are solved, the control mechanism can be represented in the form of an algorithm, which is defined as a sequence of certain actions or steps to solve the given task (A.Goncharuk, 2010, p. 326).

The main types of management mechanisms are: organizational, economic, structural mechanisms, mechanisms of management, technical and administrative, information mechanisms and others. Most scientists consider the individual components of the general economic mechanism: organizational, economic or organizationally economic mechanisms. Given the managerial nature of the objectives of this study, the use of only an economic mechanism or organizational component would be incorrect.

Considering the above, the mechanism of managing the IHE effectiveness is a system of interrelated elements, including methods, organizational structures, operations, IT tools, levers and tools that interact with each other in a cyclical complex of strategic and operational tasks and functions for measurement and evaluation of efficiency, implementation of management actions and monitoring the results of performance, ensuring steady growth of indicators of IHE effectiveness.

Organizationally economic mechanism of management of the IHE effectiveness should be considered as a set of organizational and economic levers (each of which has its own forms of managerial influence) that have an impact on the economic and organizational parameters of the IHE management system, which contributes to the formation and strengthening of organizational and economic potential, obtaining the competitive advantages and IHE effective activity as a whole.

Summarizing the definition of organizationally economic mechanism for managing the IHE effective activity, all the information can be presented schematically in Figure 5.6. The application of the proposed methodological approach will help to solve one of the most important problems of managing modern education institutions – improving the effectiveness level of activity and competitiveness.
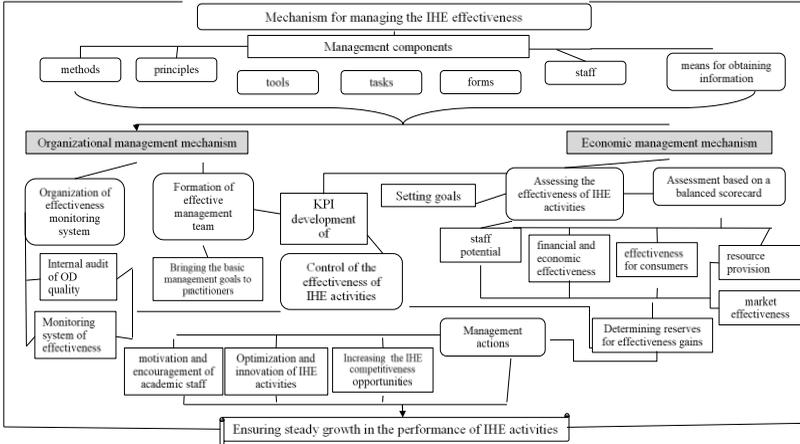
Figure 5.6 Organizationally economic mechanism for managing the IHE effectiveness

Source: authors' development

In the structure of the organizationally economic mechanism, three systems are distinguished: the system of provision, the functional system and the target system (A. Sadekov, 2006).

The system of providing the organizationally economic mechanism consists of subsystems of legal, resource, regulatory, methodological, scientific, technical, and information support of the process of managing the IHE effectiveness.

The functional system of organizationally economic mechanism for managing the IHE effective activity includes the following main subsystems: planning, organization, motivation, control and regulation.

The target system of the organizationally economic mechanism includes the goals and main results of the IHE activity, as well as the criteria for selecting and evaluating the results of achieving the specific goals of the IHE.

Therefore, in order to ensure a competitive position in the market for educational services, IHE must constantly work towards improving the effectiveness of its activities, which should be based on the dialectical combination of external and internal efficiency.

Accordingly, the formation and implementation of the mechanism for managing the IHE effectiveness will be provided by the following basic tools: economic, organizational, social-psychological, technical

and technological, marketing, legal, and use indicators that allow to evaluate the performance of each tool (Figure 5.6).

The organizationally economic mechanism of IHE effective management is determined not only by environmental factors, but first and foremost, its effectiveness depends on the actions of academic staff in the process of IHE activity, in the implementation of the developed plans and programs of development, in the process of achieving the set goals. That is, the management of the IHE effectiveness will depend on the compliance of the selected strategies with the IHE objectives, the optimal processes of the strategies implementation, the motivation of the personnel to achieve the goals, the qualification of the personnel, the technology and management style.

It should be noted that in the context of the human capital theory, higher education is considered to be an investment in the potential market value of an individual, as a participant in the labor market, where the economic efficiency of money spent on education and social effects is evaluated (Economic encyclopedia, 1980). The human capital theory interprets the effectiveness of higher education from the standpoint of the state, society and employer (the social effect of higher education is manifested not only at the individual level, but also extends to the whole society as a whole).

To date, the concept "management effectiveness" in relation to social and socio-pedagogical systems in the scientific literature is quite ambiguous. From the theory of economics and management it is known that effectiveness is considered as the ratio of the received effect (that is, the result) to the cost of resources that ensured the said effect. That is:

$$\text{Effectiveness} = \frac{\text{Result}}{\text{Costs for obtaining results}}$$

(5.1)

In view of this, we will perform the appropriate manipulations, and from the formula (5.1) we derive a formula for effectiveness control, which in the general expression will look like:

$$\text{Management effectiveness} = \frac{\text{Management effect (result)}}{\text{Costs for management}}$$

(5.2)

This formula is inherent in the concept of management effectiveness, called the target concept of management effectiveness. It is a concept according to which the activity of an organization is aimed at achieving

certain goals, and the management effectiveness is characterized by the achievement degree of the set goals (N.G. Korneshchuk, 2007).

In addition to this concept, a number of others have been considered in this study. For example, the functional concept of management effectiveness and the functioning of management staff and management effectiveness are characterized by comparing the results and costs of the management system itself. The concept of management effectiveness based on the achievement of "balance of interests" is a concept according to which the activity of an organization is aimed at meeting the expectations, hopes (interests) and needs of all individuals and groups interacting in the organization and with the organization. In the context of this concept, the focus is on the relative importance of different group and individual interests in the organization (A. Chmil, 2007). Within this concept, it is difficult enough to compare the two states of the management process, since changing managerial states may not only change the interests of different groups, but also their composition (new members may appear, groups may unite or disintegrate), new groups may appear, etc. Systemic concept of management effectiveness is a concept according to which the results of the organization's activity are influenced by both internal and external factors, and management effectiveness is characterized by the degree of adaptation of the organization to its environment (A. Chmil, 2007). With this in mind, this is the concept that most fully embraces the various aspects of the work of an institution of higher education, provided that there is a selection of criterion objects, the calculation of the management effectiveness which is not in doubt when using a certain methodology.

Thus, the modern approaches to assessing the IHE effectiveness (officially approved methods and development of different authors) can be divided into several main areas: assessment of compliance with licensing and accreditation requirements, assessment of the quality of educational service and professional qualities of the graduate, assessment of the effectiveness of budget expenditures for higher education, evaluation of the IHE effective economic (entrepreneurial) activity, rating of institutions of higher education. In Figure 5.7 an analysis of typical methods for each of these directions has been given.

As a result of the analysis of the methods of assessing the IHE effective activity (Figure 5.7), the following conclusions have been made:
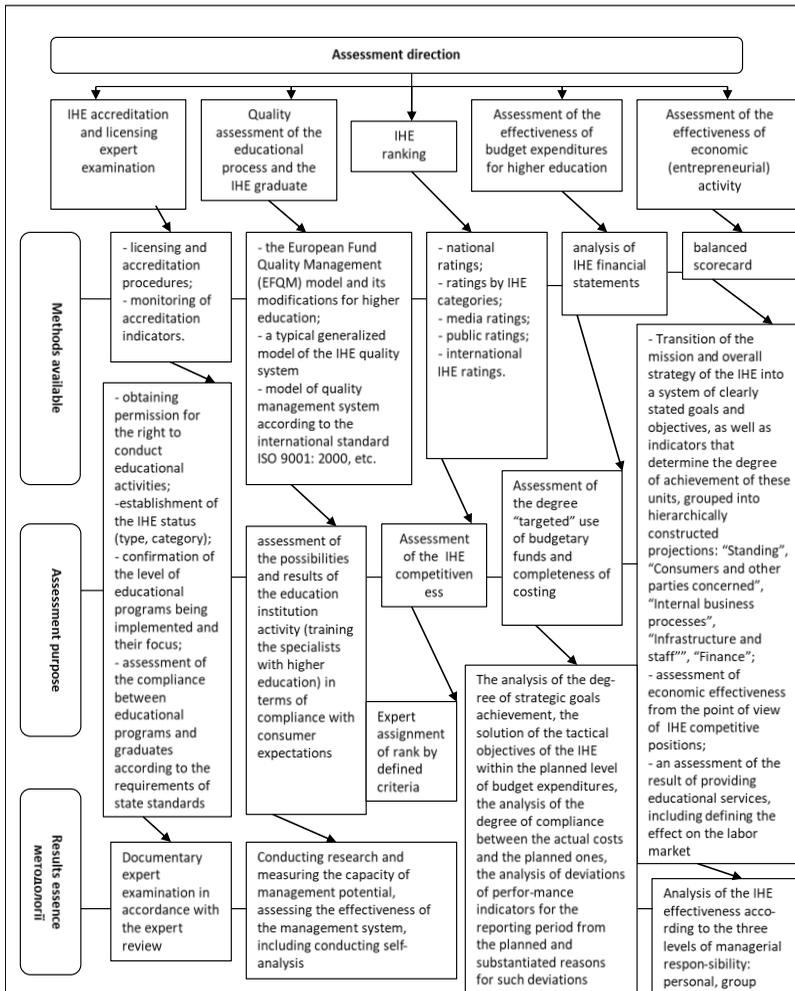
Figure 5.7 Approaches to assessing the effectiveness of IHE activity

Source: authors' development

– all the discussed techniques cover one or more of the aspects of the IHE effectiveness discussed above;

– there are different interpretations of approaches, evaluation tools and performance indicators among the techniques of one group affiliation;

– for the integral assessment of the effectiveness of IHE activities, it is necessary to clarify the basic directions, criteria parameters and methods of evaluation.

Against this background, it has been concluded that the effectiveness of institutions of higher education should be determined by four key points:

– from the state's position as a customer and guarantor of meeting public needs (external or macroeconomic effectiveness);

– from the perspective of the individual as a consumer of education services (individual effectiveness);

– from the position of the employer or the labor market as a whole, as a consumer of the final product of IHE (market effectiveness);

– from the position of IHE as a business entity (financial or economic or internal effectiveness).

In view of the above, the priorities of the IHE management should be formulated in a balanced way, taking into account the possibilities of ensuring the targets of social and economic effectiveness (individual and public).

Based on the results of the generalization of the conducted researches and the existing experience in the field of management effectiveness of activity of institutions of higher education the authors of the study have developed a methodical approach for assessing the effectiveness of IHE activity. The model for assessing the effectiveness of IHE activity is presented in Figure 5.8.

It should be emphasized that this model includes modified methods and approaches to collecting and processing information depending on the stage of its implementation.

It should be noted that the basis for assessing the effectiveness of an institution of higher education is based on resource-based approach to the calculation of effectiveness, because its use allows to assess the degree of achievement of the stated goal and using expert evaluation allows to take into account a sufficiently wide range of indicators for different areas of IHE activity in the calculation of the integral indicator of effectiveness. An important aspect of using a resource-targeted method to assess the performance of an institution of higher education is that IHE as a system is made up of different groups of the parties concerned, with whom it is in resource exchange depending on the activity direction, since the main purpose of IHE activity is not to maximize profits as for business organizations, but meeting the needs and requirements of the parties concerned.

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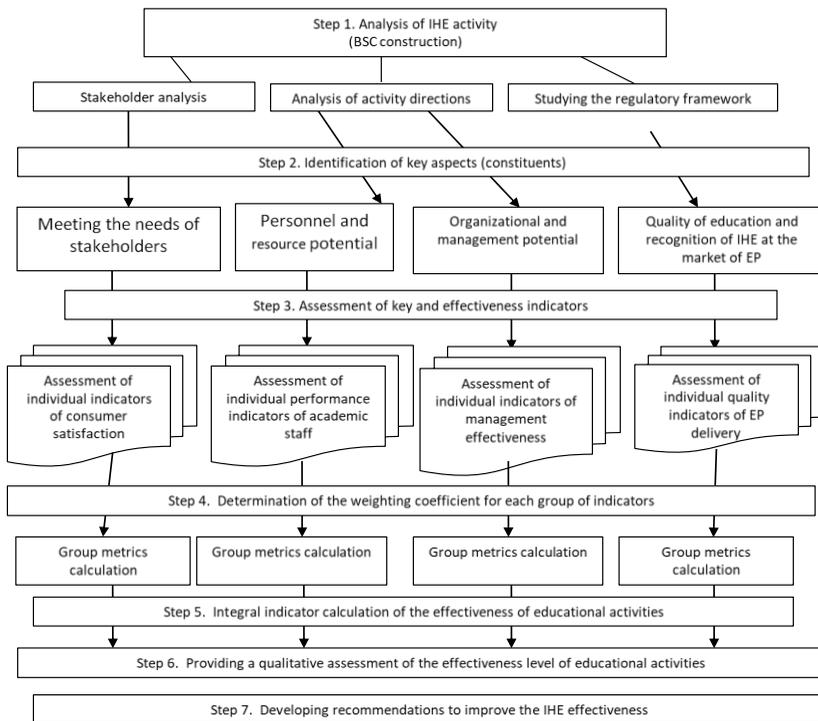
Figure 5.8 A model for assessing the effectiveness of IHE education activities

Source: authors' development

In the second stage, it is proposed to identify the key aspects (components) of the effectiveness of the IHE education activities. At that moment it identifies the resources that the parties concerned receive from, and transfer to, the IHE, and determines the effectiveness of the IHE resource exchange with each party concerned group (stakeholders). Against this background, the most appropriate

According to the proposed model (Figure 5.8), at the first stage of assessing the effectiveness of the activity of an institution of higher education, it is recommended to analyze the legal framework of the IHE, determine the main directions of its activity, and analyze the party concerned loyalty to the IHE approach to assessing the performance of

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an institution of higher education is to use a resource-based target effectiveness criterion.

In the third stage, it is proposed to assess the key indicators of the financial and economic activity of the IHE according to the criteria characterizing:

– education activities (number of students enrolled for studying, including by state order and on a contract base);

– the socio-economic status of the IHE (average number of staff members, average monthly salary, arrears of salary, costs of social events);

– financial status (receipt of appropriations from the state budget and special fund and the ratio between general and special funds, cash and actual expenditures by economic classification codes of expenditures, results of general and special fund estimates, accounts receivable and payable, etc.);

– availability of material base, its condition and use.

In view of the above, it is advisable to apply a systematic approach to assessing the performance of an institution of higher education, the essence of which is that relatively separate components are considered not in isolation, but in their relationship, in the system with others. The system approach allows to reveal the general system properties and qualitative characteristics of the constituent elements.

It should be emphasized that in the systematic approach IHE is considered as a set of the following interrelated components: goals of education activity, subjects of pedagogical process (a teacher and students), content of education (general, basic, professional), methods and forms of educational process and material-technical base.

In view of this, for each area of IHE activity, the target values are set, they are planned to be achieved in the course of the activity and the actual values for each line of activity, for which results are obtained in a certain defined period of time.

Thus, the developed methodological approach for assessing the performance of institutions of higher education includes the methodology of resource-based assessment and modified methods and approaches for collecting and processing information depending on the stage of its implementation.

In view of the above, the methodology of assessing the IHE effectiveness on the basis of resource-targeted approach will allow to assess the effectiveness of each line of activity separately, as well as taking into account the importance of the line of business, to assess the

effectiveness of the whole IHE activity. The resource-targeted method is the most appropriate for such tasks (R.E. Freeman, 1984), because the assessment of the effectiveness of an institutions of higher education only in financial indicators is insufficient (the use of a balanced scorecard is necessary), since the financial indicators do not reflect the level of use of intangible resources, especially resources based on knowledge.

As the studies evidenced at the level of commercial organizations as for the assessment of management effectiveness, the method of building key performance indicators (KPI) is often used (A.V. Kartuzov, 2011). This approach was taken as a basis for the development of key performance indicators for managing the IHE activity. This involved solving the problem of bringing the quantitative indicators specific to the higher education system into a single coordinate system. To solve this problem, scientists use the following methods and approaches:

1. An approach according to which this kind of coordinate system is not constructed at all, and different indicators of development should be eliminated, which often does not allow to reveal the general trend.

2. An expert method, according to which indicators different in terms of dimensions are reduced to a single coordinate system by expert way. A known disadvantage of this method is the subjectivity and bias of experts.

3. An index method, which uses not the actual performance indicators, but the rate of change, which allows you to compare differently measured indicators, as well as to create common indexes by multiplication (division) of individual indicators. In the initial form, within the framework of building a general performance index, only indicators representing the specific weight are usually used. This method, which is most relevant, is proposed to be adopted as a mathematical basis in the construction of a system of key indicators of the effectiveness of IHE education activities.

This leads to the conclusion that, in accordance with the general principle of systematic nature, it is advisable to use a wide range of indicators that characterize various aspects of the IHE activity: assessment of the EP quality by the labor market, the image of the IHE, satisfaction of the consumers' needs with educational services, the success of educational service recipients, the effectiveness of the academic staff, financial indicators of the effectiveness of the IHE development, etc.

Taking into account the indicated, effectiveness of IHE activities has been proposed to assess using the formula:

$$E_i = \sum_{i=1}^{k} \frac{P_i}{Pn_i}$$

(5.3)

where: E_i is the effectiveness of the ith activity; P_i is the actual local performance indicator; P_{ni} is the planned local performance indicator; k is the number of local indicators under study.

In the fourth stage, it has been proposed to determine the weighting factors for each group of indicators. A method of expert estimation was used to calculate the coefficients of significance (particles) of subsystems, since the degree of significance of subsystems in shaping the work results is different.

It has been established that the assessment of the relative importance of directions (factors, parameters) does not limit the processing of questionnaire data. The assessment of the indicator of the experts' opinions coherence degree by means of the indicators' system has an equally important issue for the scientific substantiation of the forecast.

For assessment of the general measure of opinions concordance in all directions (factors, parameters) the coefficient of concordance is used.

$$K_{\text{кон}} = \frac{\sum_{j=1}^{n} d_j^2}{\frac{1}{12}[m^2(n^3-n)-m\sum_{i=1}^{m} T_i]},$$

(5.4)

$$d_j = S_j - \frac{\sum_{j=1}^{n} S_j}{n}$$

(5.5)

We have to mention that the sum of ranks provided by experts in the jth direction is determined by the formula:

$$S_j = \sum_{i=1}^{m} R_{ij}$$

(5.6)

$$T_i = \sum_{l=1}^{L}(t_s^3 - t_s)$$

(5.7)

where: L is the number of related (equal) ranks; t_e is the number of related ranks in each group.

It should be emphasized that the coefficient of concordance takes a value from 0 to 1. The greater the value of the coefficient of concordance, the higher the degree of experts' agreement. If $K_{con} = 1$ there is complete agreement of experts' opinions; then when $K_{con} = 0$, then agreement is almost absent. The statistical value of the coefficient of concordance is checked by Pearson criterion (x_p^2):

$$x_p^2 = \frac{\sum_{j=1}^{m} d^2}{\frac{1}{12}\left[mn\cdot(n+1)\frac{1}{n-1}\cdot\sum_{i=1}^{m} T_i\right]}$$

(5.8)

The calculated value x_p^2 is compared with the table value of x_t^2 for n-1 degrees of freedom and confidence (P = 0.95 or P = 0.99). If $x_p^2 > x_t^2$, then the coefficient of concordance is significant, and if $x_p^2 < x_t^2$, then the coefficient is insignificant, and the experts' opinions are not agreed and it is necessary to increase the number of experts or brainstorm them.

Given this, if x_p^2 is significant, it is assumed that the weighting coefficients of each indicator are determined by the formula:

$$\omega_i = \frac{mn - S_i}{0{,}5mn\cdot(n-1)}$$

(5.9)

The calculation of group performance indicators of functional subsystems is recommended for summarizing the values of single (local) indicators of functional subsystems based on the use of a taxonomic indicator of development by the method of V. Plyuta. This method lacks the disadvantage of using hurdle constants, which is inherent in several other methods. According to this method, a data matrix consisting of standardized attribute values is used. The standardization eliminates units of measurement (both cost and positive). All attributes of the original population (both incentives and disincentives) are converted to indicators of incentives.

As a result of the conducted research it has been established that one of the most evident research methods of social-economic systems is the generalized function of E.K. Harrington. The construction basis of the generalized function of E.K. Harrington's idea is to convert (normalize) all dimensions, natural values of system states into dimensionless indicators (desirability functions), which change from zero (very poor quality and efficiency) to one (high quality and efficiency), that is, the positive values of individual indicators are transformed in dimensionless

on a single scale of desirability. E.K. Harrington's desirability scale refers to psycho physical scales.

The normalized value of the jth indicator of the effectiveness of the IHE education activity is recommended to be determined by the formula:

$$a_j = \frac{x_j - x_{jmin}}{x_{jmax} - x_{jmin}}$$

(5.10)

where: x_{jmax} and x_{jmin} are respectively the maximum and minimum values of the jth index among all similar indexes.

For this reason, the optimum value of the indicator that is at least 95%, and the worst one at 5%, and at least one more value should be specified to test.

According to the research data, the unilateral dependencies of E.K. Harrington are defined as following:

$$y_j = \exp[-\exp(-a_i)]$$

(5.11)

In view of the above group indicator of effectiveness assessment of IHE education activities has been proposed to determine by the formula:

$$I^\Gamma = \sum_{i=1}^{n} y_i$$

(5.12)

where: I^Γ is a group indicator of the effectiveness of education activities; x_i – the ith (local) indicator; n is the number of individual (local) indicators to be evaluated.

The positive dynamics of changing group performance indicators testifies an increase in the effectiveness of IHE activities as a whole.

The fifth stage is the formation of a comprehensive system for assessing IHE effectiveness. On the basis of the established system of indicators, an integrated assessment of the effectiveness of each activity and the IHE in general is carried out.

It should be noted that the integral indicator of the effectiveness of the activity of an institution of higher education is a general indicator that comprehensively characterizes the different directions of the IHE activities brought to a single system.

The need to calculate the integral index is due to a number of reasons, including:

– the availability of a large number of unit indicators that characterize the IHE and the difficulties involved in processing significant flows of information when obtaining objective results that complicate the analysis process. The use of an integral indicator of the IHE effectiveness will allow you to be quickly guided and make management decisions in a timely manner;

– the existing indicators of IHE performance assessment do not fully cover all areas of its functioning. The integrated indicator will allow to take into account all areas of activity of the IHE;

– the availability of an integral indicator of the IHE activity effectiveness will allow to make a generalized assessment with the assessment in separate directions;

– the usage of an integral indicator will allow to make a generalized comparative assessment. The integral efficiency index, classified by one feature, will be the same according to the calculation methodology.

Thus, the usage of a single, aggregated on the basis of a set of indicators covering all areas of the IHE activities, integrated indicator will allow a more informed approach to the objective management decision.

The integral indicator of the effectiveness of IHE education activities, based on the objective significance of each factor, has been proposed to calculate by the formula:

$$I_E = \sum_{i=1}^{k} I^{\Gamma} \cdot \varpi_i \qquad (5.13)$$

where: ϖ is the weighting factor of the ith group of indicators.

The sixth stage involves generalizing the results of the assessment of the effectiveness of the IHE activities and formulating conclusions.

According to the results of the research, it was found that of Harrington's function allows the transformation of any natural values of indicators into a dimensionless scale of desirability, which establishes a correspondence between the psychological (the analyst's subjective assessment) and the physical (values of indicators) performance of the IHE. The disadvantage of E.K.. Harrington's standard dimensionless scale of desirability (Table 5.5) is that numerical scores on this scale do not have a specific meaningful loading. For example, the choice of ratings on the scale of desirability of 0.37 and 0.63 is explained by the convenience of calculations (0.37 = 1/e, 0.63 = 1-1/e), and a score of 0.37 is generally considered to be within the permissible limit values. The rest of the scores on this scale are indicative.

Table 5.5

Harrington's scale of desirability

Levels of desirability	Parameter value according to the scale of desirability
Very good	1–0,8
Good	0,8–0,63
Satisfactorily	0,63–0,37
Bad	0,37–0,2
Very bad	0,20–0

Source: given according to the sources Harrington E.S. (1965)

Taking into account the given information, the integral indicator of the level of effectiveness of the IHE, it is proposed to determine on a scale from 0 to 1 with an expanded characteristic of the range of assessment:
• 0,75 – 1 – high efficient (leading) IHE;
• 0,5 – 0,75 – effective IHE;
• 0.25 – 0.5 – low efficient IHE;
• 0 – 0.25 – ineffective IHE

The seventh stage envisages the development of recommendations and measures to improve the efficiency of an institution of higher education.

Summarizing the results of the scientific literature elaboration, the main directions of increasing the efficiency of IHE activities have been identified, among which:
– social responsibility in education;
– modernization of education content;
– introduction of new functions and forms of control and assessment.

It should be noted that the proposed method allows to analyze the contribution of each component to the complex integral indicator of the effectiveness of IHE activities. The results of the analysis of the status and dynamics of individual and group indicators on the level of effectiveness of IHE activities are the basis for making managerial decisions in operational and tactical planning, as well as the substantiation of strategic directions for improving the level of effectiveness of the IHE education activity.

Given this, the proposed methodological approach envisages the development of a balanced system of indicators of the effectiveness of IHE education activity and their assessment using the resource target method and the theory of desirability.

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