

Запропоновано підхід до управління проектом сервісної екосистеми конкурентно-інтеграційного бенчмаркінгу підвищення конкурентоспроможності українських вищих навчальних закладів. Інструментарій процесно-орієнтованого підходу до управління проектом бенчмаркінгу базується на обґрунтуванні еталонної стратегії шляхом порівняння конкурентних переваг за виділеними 4P-підсистемами бенчмаркінгу управління кращих університетів: управління персоналом (People), партнерські відносини (Partnership), управління процесами (Processes), освітні послуги (Products)

Ключові слова: управління проектом, конкурентно-інтеграційний бенчмаркінг, процесно-орієнтований підхід, 4P-підсистеми, вищі навчальні заклади (ВНЗ)

Предложен подход к управлению проектом сервисной экосистемы конкурентно-интеграционного бенчмаркинга повышения конкурентоспособности украинских высших учебных заведений. Инструментарий процессно-ориентированного подхода к управлению проектом бенчмаркинга базируется на обосновании эталонной стратегии путем сравнения конкурентных преимуществ по выделенным 4P-подсистемам бенчмаркинга управления лучших университетов: управление персоналом (People), партнерские отношения (Partnership), управление процессами (Processes), образовательные услуги (Products)

Ключевые слова: управление проектом, конкурентно-интеграционный бенчмаркинг, процессно-ориентированный подход, высшие учебные заведения, 4P-подсистемы (ВУЗ)

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MANAGING A PROJECT OF COMPETITIVE-INTEGRATIVE BENCHMARKING OF HIGHER EDUCATIONAL INSTITUTIONS

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1. Introduction

Competition in the market of educational services requires from higher educational institutions (HEIs) continuous improvement of activity in all directions. Leading universities in the world are associated with the highest quality of education and traditionally are at the top of international rankings. They are forced not only to keep high their achievements and performance, but also work proactively. This allows them not to lose their high competitive positions. For universities, which are the world leaders or aspiring to become the ones, it is extremely important to be oriented to innovations in all spheres of activity. Such innovations offer considerable and unique competitive advantages. For universities, which are still trying to reach the international level, it is advisable to implement the management of the project of competitive-integrative benchmarking. Today, benchmarking finds its wider use in the corporative sector, but still it is not used sufficiently in the educational field.

“Benchmarking is a process of revealing, learning and adaptation of best practices and experience of other organizations for improvement of the activity of the own organization” [1].

International practice shows that to achieve competitive advantage, it is necessary to learn, know and use the experience of competitors, who have already achieved success in different

spheres of activity [2]. In this situation, it is necessary not just to use methodology of comparative analysis or benchmarking [1]. More relevant management of the project of competitive-integrative benchmarking (CBIU) is becoming increasingly relevant. This approach involves rejection from competition in favour of cooperation. Subsequently, it may become a driving force in changing the philosophy of vision regarding the process of management of modern higher education [3].

2. Literature review and problem statement

It is clear, that the methodology, already mentioned in this work, is not the only one, which is efficient and effective to improve the quality of the process of management of the University activity. In the sphere of management, a lot of ways and technologies have been offered and used. They are successfully applied in the system of higher education. The most common include total quality management (TQM), standardization by ISO 9000 version, the balanced scorecard (BSC) system and some others [4]. However, for a higher educational institution, management of the project of competitive-integrative benchmarking is one of the most effective tools to identify and adapt best practices. Such HEIs are seeking to become leaders, trace emergence of new prod-

ucts in the field of management, study competitors, partners, and fight for customers (applicants).

In this regard, the study of theoretical and methodological approaches to effective management of the project of competitive-integrative benchmarking seems timely and relevant. In turn, creation of applied developments facilitates its implementation in Ukrainian higher educational establishments. Research into issues of theory, methodology and instruments of competitive integration benchmarking is aimed at enhancing competitiveness of universities. This study is focused on deepening comprehension of mechanisms of selection of model strategies in the field of higher education [5]. Today it is a top priority scientific and practical problem. It is essential to enhance the image of the Ukrainian higher education in the international market of educational services.

In practice, benchmarking is “a process of studying and adapting best methods (best practices) of other organizations to improve the company’s own results” [1]. In the context of modelling of processes, benchmarking management may include both comparison of the structure of processes (structural benchmarking) and comparison of performance indicators of processes management (effective benchmarking). Performance indicators, which are used as a reference standard, are divided into “best practice”, “improved practice” and “common (usual) practice” of organization of production processes [6].

Formation of the system of views on modern management of HEI takes place on the basis of a large number of studies of scientists and experts in various areas of management and marketing, such as [6, 7] and others.

In the field of education, benchmarking started to be used relatively recently. In foreign practice, there are various approaches to definition of benchmarking in the area of educational services. Particularly benchmarking as a management tool in the area of education is studied in papers [8, 9], its use in the sphere of Ukrainian education is considered in articles [10, 11].

In the aforementioned papers, the authors mostly limited themselves to fragmentary and often contradictory definitions on these problems. None of them set a specific task of comprehensive analysis of competitive-integrative benchmarking, including universities, but rather considered this problem in relation to their subject matter of research.

In order to improve the use of benchmarking in higher education, the European Commission funded the project “Benchmarking in European higher education” in 2006–2010 [2, 3]. This research was based on understanding benchmarking as “a voluntary process of self-assessment and self-improvement through systematic and collaborative comparison of practice and performance with similar organizations. This process allows an organization to identify strengths and weaknesses, as well as to learn how to adapt and enhance organizational processes with the aim of countering the growing competition” [5]. However, the problems of systematization and dissemination of advanced principles of business excellence in HEIs are varied and complicated. Therefore, further research in this area is needed. It is expedient to focus on systems analysis and theoretical generalization of the management approach based on competitive-integrative benchmarking [4, 11].

There are not enough materials relating to benchmarking as an independent competitive strategy and separate business process, as well as regarding competitive-integrative benchmarking.

In addition to using traditional methods of provision of competitiveness of HEIs, it is necessary to develop the proj-

ect of benchmarking management and appropriate management technologies that provide for creation of institutional conditions and incentives for successful implementation of educational activities. In addition, benchmarking in this process is an indispensable tool for helping identify and adapt best practices.

The relevance of the problem, the lack of scientific development of its particular sides and a high practical significance determined the choice of the goal and objectives of this study.

3. The aim and objectives of the study

The aim of the study is to provide conceptual and methodological substantiation and verify reproductively-creative potential of management of the project of competitive-integrative benchmarking to provide competitiveness of higher education institutions. Its adaptation to market-institutional realities of Ukrainian economy, development of marketing technologies and tools will contribute to formation of sustainable competitive advantages of HEIs.

To achieve the set goal, the following tasks had to be solved:

- to explore the essence and content of benchmarking as a marketing tool for provision of competitiveness of HEI in the face of globalization;

- to identify the major patterns of management of a project of competitive-integrative benchmarking;

- to develop an arsenal of instruments of management of project of competitive-integrative benchmarking of HEI;

- to reveal the main competitive strategies of striving of HEI to the ideal;

- to propose a conceptual model of management of the process of competitive-integrative benchmarking for the University.

4. Methodology of market-institutional paradigm of management of project of competitive-integrative benchmarking of higher education institutions

Market-institutional paradigm of management of the project of competitive-integrative benchmarking of HEI includes certain stages-iterations. They are performed with the help of the tools of cluster, factor and discriminant analysis and reference comparison. The basis of the paradigm is methodological principles of theories of effective strategic management, competitive advantages, marketing, management, etc.

The instruments of management of the project of competitive-integrative benchmarking are based on the combination of competitive analysis of activity of HEI-partners, as well as their marketing interaction. Combination of instruments of partnership interaction and competitive analysis allows making dynamic assessment of the current state. In addition, it becomes possible to predict qualitative changes with regard to the active position of HEI in relation to its strategic competitiveness.

A conceptual model of the process of management of competitive-integrative benchmarking is represented by functional diagrams, which decompose this process, i. e., by the model of functional decomposition (FD-model) of benchmarking process, based on which the hierarchies of interrelated functions are constructed. The diagram of functional decomposition is a tree-type graph that shows splitting of functions and processes of high-level management into constituent parts. The model allows for building

a hierarchy of FD-charts, making it possible to schedule processes to the desired level of detail.

The process of management of a project of competitive-integrative benchmarking begins with the presentation of a system as a whole – one functional unit (Fig. 1) with interface arcs that stretch beyond the boundaries of this area.

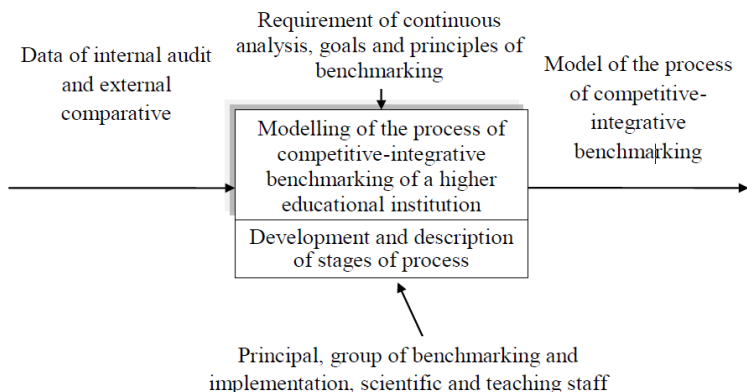


Fig. 1. Contextual diagram of modeling of management of project of competitive-integrative benchmarking of higher education institution

In the process of decomposition, the functional unit that shows the system as a whole in contextual diagram is subject to detailing on the diagram. This diagram contains functional units, reflecting the principal sub-functions of the functional unit of context diagram, and is a subsidiary of it. Each of sub-functions of the subsidiary diagram should be subsequently detailed by means of similar decomposition of the correspondent functional unit. The structural-functional model of the process of management of project of competitive-integrative benchmarking is shown in Fig. 2.

Although the units of the conceptual model of the process of management of competitive-integrative benchmarking go sequentially, some units may be executed in parallel. Obvious advantage of functional models is implementation of the structural approach to design of the process of management of competitive-integrative benchmarking according to the “top-down” principle, when every functional unit may be decomposed into a number of sub-functions.

The constructed conceptual model of the process of management of a project of competitive-integrative benchmarking has practical importance for:

- top management of a higher educational institution;
- functional and linear heads of subdivisions of HEI (departments, faculties, and functional departments).

Conceptual model of management of a project of competitive-integrative benchmarking is implemented with the use of the calculation-analytical instruments, developed in the research. It is adapted to application in marketing practices of Ukrainian universities and allows ranking alternative strategic solu-

tions regarding the ways, forms and methods of partnership and interaction. Such calculation-analytical instruments provide for the possibility to promptly produce tactical approaches to the approval and coordination of actions, aimed at provision of competitiveness of a higher educational institution [12].

Conceptual model substantially complements the theoretical description of existing marketing instruments. It increases efficiency and competitiveness of HEIs and their products. It is implemented in practice as a methodological basis for creation of a system of interaction between market subject.

Institutional formulating of the paradigm of management of a project of competitive-integrative benchmarking goes with the help of its separation into a new business strategy. It is based on cooperation and interaction with other HEIs. The purpose of the paradigm is a beneficial partnership information sharing. It improves individual educational processes and enhances competitiveness of HEI in general. The process of competitive benchmarking for integration involves passing the stages of planning, search, analysis, adaptation and coordination.

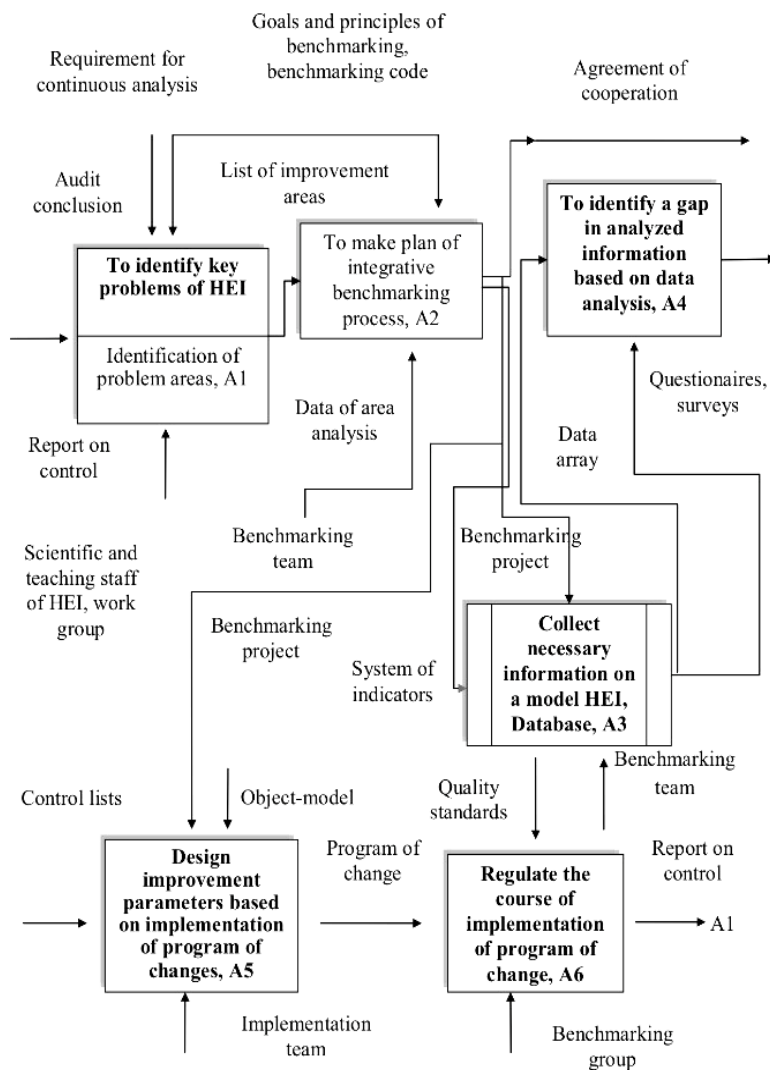


Fig. 2. Splitting contextual diagram of modeling of process of management of project of competitive-integrative benchmarking into six levels

As a result of an analysis, it is taken as a reference standard for the procedure of collection and analysis of information. New strategies of competitive behavior are formed based on the obtained data. This is provided by formulation of relationships with benchmarking partners.

At levels A1 (Identification of the key problems of HEI) and A2 (Drafting the plan of integrative benchmarking process), cluster analysis of K-mean by 4P-subsystems of benchmarking management of best universities is used:

- personnel management (People);
- partnership relations (Partnership);
- processes management (Processes);
- educational services (Products).

At A3 and A4 levels, by the methods of cluster analysis “Join tree clustering”, the HEI-model is determined by each of 4P-benchmarking subsystems [13].

At A5 level, by methods of factor analysis, the degree of influence of individual indicators on the level of development of each of the 4P-subsystems of benchmarking is determined. At A6 level, by methods of discriminant analysis, the diagnosis of the degree of implementation of design changes by each of 4P-benchmarking subsystems is determined.

Thus, the proposed totality of methods of management of a project of competitive-integrative benchmarking is a mechanism of cooperation and exchange of information about standard processes by making a comparison with universities-partners. Competitive-integrative benchmarking is carried out by formulating of a cooperation agreement with HEI-standards with the use of formal mechanisms of interaction in the process of implementing a reference model comparison (partnership agreement, unions, and alliances).

The cyclic nature of competitive-integrative benchmarking as a management process that leads to a change in the content of HEI activities is manifested in the mechanism of continuous construction of benchmarking process. It starts with an audit of the activities of HEI and ends with control and adjustment of results of reference-model comparison. Subsequently, there comes about a transition to a new improvement cycle (“wheel of competitive benchmarking integration”). This provides a consistent increase in competitiveness of a HEI.

5. Visualization of construction of a system of management of project of competitive-integrative benchmarking of higher education institutions

The process of construction of project management system for competitive-integrative benchmarking, using Kyiv National University of Technologies and Design (KNUTD, Ukraine) as an example, looks as follows. At the first stage, with the help of clustering analysis by the K-mean method, we performed clustering of 4P-subsystems of benchmarking management of best universities [13]:

- personnel management (People);
- partnership relations (Partnership);
- processes management (Processes);
- educational services (Products).

The performed cluster analysis of 14 HEI of Ukraine enabled us to distinguish three clusters: the 1st is with the maximum level of development, the 2nd – with medium one; the 3rd – with minimum one (Fig. 3).

According to results of performed clustering by each of 4P-subsystems of benchmarking management of HEI, the composition of each cluster is given in Table 1.

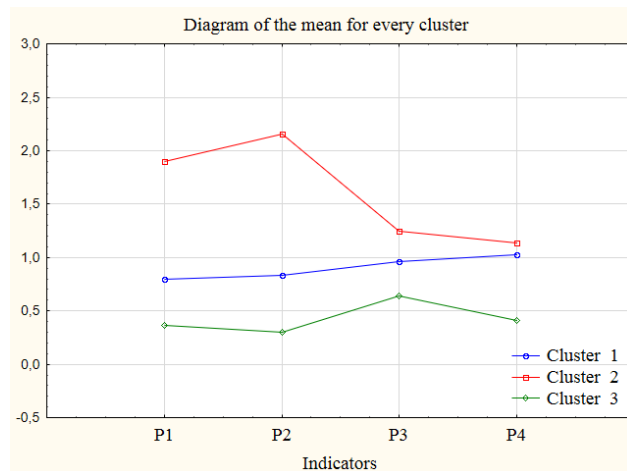


Fig. 3. Diagram of K-14 mean of higher educational institutions of Ukraine by 4P-subsystems (Listing of Statistica 10 software)

Table 1

Clustering of HEI by 4P-subsystems of project of competitive-integrative benchmarking

Sub-systems	1 cluster	2 cluster	3 cluster
1P – People	Taras Shevchenko National University of Kyiv; SNEI «Kyiv National Economic University named after V. Hetman»	KNUTD; National University of «Kyiv-Mohyla Academy», NAU	KNTEU; KNLU; UEL «KROK»; OIUHD «Ukraine»; KMU; European University; IUF; UMK; UNT
2P – Partnership	KNLU; National University of «Kyiv-Mohyla Academy»	UEL «KROK»; OIUHD «Ukraine»; European University; KMU; IUF; UMK; UNT	KNUTD; SHEI KNEU named after V. Hetman; KNTEU; NAU
3P – Processes	NAU	SHEI KNEU named after V. Hetman; KNUTD; KNUSH; UEL «KROK»; OIUHD «Ukraine»; KMU; European University; IUF; UMK	KNUTD; KNLU; National University of «Kyiv-Mohyla Academy»; UNT
4P – Products	KNUSH	SHEI KNEU named after V. Hetman; KNUTD; HA; National University of «Kyiv-Mohyla Academy»	SHEI KNEU named after V. Hetman; KNLU; UEL «KROK»; OIUHD «Ukraine»; KMU; European University; IUF; UMK; UNT

At the next stage, by the methods of cluster analysis “Join-tree clustering”, we identified HEI-models for each of the subsystems of 4P benchmarking. The fragment of performed analysis “Join-tree clustering” is the constructed dendrogram by 1-P subsystem “Personnel management (People)”, (Fig. 4).

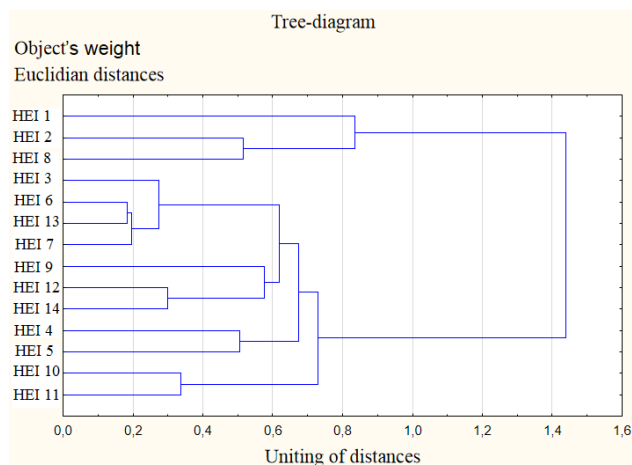


Fig. 4. Dendrogram of development level of 14 higher educational institutions of Ukraine by 1P sub-system “People” (fragment) – listing of Statistica 10 software: HEI1 – Taras Shevchenko National University of Kyiv; HEI 2 – SHEI “Kyiv National Economic University named after V. Hetman”; HEI 3 – Kyiv National University of Trade and Economics; HEI 4 – Kyiv National Linguistic University; HEI5 – Kyiv National University of Technologies and Design; HEI6 – National Aviation University; HEI7 – National University of “Kyiv-Mohyla Academy”; HEI8 – University of Economics and Law “KROK; HEI9 – HEI “Open International University of Human Development “Ukraine”; HEI10 – European University; HEI11 – Kyiv International University; HEI12 – International University of Finance; HEI13 – University of Modern Knowledge; HEI14 – University of New Technologies

According to results of performed analysis, the dendrogram (Fig. 4) shows that in the 1st benchmarking system, models are HEI1 – Taras Shevchenko National University of Kyiv; HEI 2 – SHEI “Kyiv National Economic University named after V.Hetman”. In subsystem 2P (Partnership), models are: KNLU and National University of Kyiv-Mohyla Academy”. In subsystem 3P (Processes), model is NAU. In subsystem 4P (Products), model is Taras Shevchenko National University of Kyiv.

By methods of factor analysis, we determined the degree of influence of certain performance indicators of HEI on the development level of each 4P-subsystem of benchmarking.

Thus, for the first subsystem “Personnel management (People)”, results of performed analysis showed (Fig. 5), the dependent variable (1P) depends on the following indicators:

- number of scientific and teaching staff (X₁);
- number of Doctors of Sciences (X₂);
- number of professors (X₃);
- number of Candidates of Sciences (X₄);
- number of Associate Professors (X₅).

The action of this group accounts for 84.4578 % of dispersion.

All the indicators have a stimulatory effect on the magnitude 1P of HEI-models. The resulting dependency of multi-factor impact on magnitude 1P – People of HEI standards (T. Shevchenko National University of Kyiv and Kyiv National Economic University named after V. Hetman) takes the following form:

$$1P = \frac{1}{8,44578} \times (0,9509943x_1 + 0,980496x_2 + 0,935084x_3 + 0,975112x_4 + 0,729383x_5). \tag{1}$$

Factor of loading (turnover) (Data 1P) Extraction (main components) (Indicated loadings >,700000)	
Indicators	Factor 1
X1	-0,950943
X2	-0,980496
X3	-0,935084
X4	-0,975112
X5	-0,729383
Explanation of indicators	4,222891
Factor loading	0,844578

Fig. 5. Results of factor analysis of impact of individual indicators on magnitude 1P – People of HEI-models (listing of Statistica 10 software)

For the second 2P subsystem – Partnership, results of performed analysis showed that the dependent variable (2P) depends on the following indicators:

- transparency index (X₆);
- number of grants (X₇);
- patents (X₈);
- licensing and economic agreements, other paid services (X₉);
- volume of funding SRW (X₁₀).

These indicators on the listing are highlighted in red (Fig. 6). Indicators: number of publications in Scopus (H11), number of citations in Scopus (X), Hirsh index (H13) have no effect on magnitude 2P, since they are not highlighted in red in the listing. The action of indicators X₆–X₁₀ accounts for 48.3505 % of the total dispersion.

Factor of loading (turnover) (Data 2P) Extraction (main components) (Indicated loadings >,700000)	
Indicators	Factor 1
X6	0,860119
X7	0,723303
X8	0,713402
X9	0,856833
X10	0,913730
X11	0,383714
X12	0,508283
X13	0,348530
Explanation of indicators	3,868041
Factor loading	0,483505

Fig. 6. Results of factor analysis of impact of individual indicators on magnitude 2P – Partnership (listing of Statistica 10 software)

Indicators X₆–X₁₀ have a stimulatory effect on magnitude 2P of HEI-standards. The resulting dependency of multifactor impact on magnitude 2P – Partnership – of HEI-models (Kyiv National Linguistic University; National University of “Kyiv-Mohyla Academy”) takes the following form:

$$2P = \frac{1}{4,83505} \times (0,860119x_6 + 0,723303x_7 + 0,713402x_8 + 0,856833x_9 + 0,913730x_{10}). \tag{2}$$

For the third 3P subsystem (Processes), results of performed analysis showed that the dependent variable (3P) depends on the following indicators:

- cost of fixed assets (X₁₄);
- number of Bachelors who completed degree (X₁₅);
- number of Masters who completed degree (X₁₆);
- number of students, enrolled to Bachelor's program (X₁₉);
- number of students, enrolled to Master's degree (X₂₀).

These indicators are highlighted in red on the listing (Fig. 7). Indicators, such as number of completed doctoral theses (X₁₇), number of completed dissertations for degree of candidate of sciences (X₁₈), number of enrolled post-graduate students (X₂₁) do not have any influence on magnitude 3P because they are not highlighted in red in the listing. That is, the action of indicators X₁₄-X₁₆; X₁₉-X₂₀ accounts for 54.5749 % of the total dispersion.

Factor of loading (turnover) (Data 3P) Extraction (main components) (Indicated loadings >,700000)	
Indicators	Factor 1
X14	0,927853
X15	0,568464
X16	0,975572
X17	0,348058
X18	0,593712
X19	0,809199
X20	0,956318
X21	0,432671
Explanation of indicators	4,365995
Factor loading	0,545749

Fig. 7. Results of factor analysis of impact of individual indicators on magnitude 3P – Processes (listing of Statistica 10 software)

Indicators X₁₄ – X₁₆; X₁₉ – X₂₀ have a stimulatory effect on magnitude 3P of HEI-model. The resulting dependency of multi-factor impact on magnitude 3P – Partnership – of HEI-model (National Aviation University) takes the following form:

$$3P = \frac{1}{4,365995} \times (0,927853x_{14} + 0,568464x_{15} + 0,975572x_{19} + 0,956318x_{20}). \quad (3)$$

For the fourth 4P subsystem – services (Products) – results of performed analysis showed (Fig. 8) that the dependent variable (4P) depends on the following indicators:

- number of specialties of Bachelor's programs (X₂₂);
- licensed volumes in Bachelor's programs (X₂₅);
- number of specialties under international agreements (X₂₈).

These indicators are highlighted in red in the listing. Indicators: number of specialties in Master's programs (X₂₃), licensed volumes in Master's programs (X₂₄), number of scientific-research themes (X₂₆), number of themes under economic agreement (X₂₇) have no impact on magnitude 4P, because they are not highlighted in red in the listing. The action of indicators X₂₂, X₂₅, X₂₈ accounts for 50.7616 % of the total variance.

Indicators X₂₂, X₂₅, X₂₈ have a stimulatory effect on magnitude 4P of HEI-model. The resulting dependency of multi-factor impact on magnitude 4P – Products – of HEI-model (Taras Shevchenko National University of Kyiv) takes the following form:

$$4P = \frac{1}{3,553311} \times (0,85125x_{22} + 0,871697x_{25} + 0,775653x_{28}). \quad (4)$$

Factor of loading (turnover) (Data 4P) Extraction (main components) (Indicated loadings >,700000)	
Indicators	Factor 1
X22	-0,851251
X23	-0,633043
X24	-0,629551
X25	-0,871697
X26	-0,620516
X27	-0,533922
X28	-0,775653
Explanation of indicators	3,553311
Factor loading	0,507616

Fig. 8. Results of factor analysis of impact of individual indicators on magnitude 4P – Products (listing of Statistica 10 software)

Regulation of the course of execution of the program of changes was carried out by methods of discriminant analysis. Discriminant analysis–diagnosis of degree of implementation of project changes has been conducted on each of 4P-subsystems of benchmarking (Fig. 9).

Functions of classification; Groupings:cluster (Data 4P)			
Indicators	G_1:1 p=,14286	G_2:2 p=,28571	G_3:3 p=,57143
	X22	0,478	-0,04486
X23	-0,243	0,01341	0,00897
X24	0,006	0,00147	-0,00041
X25	0,096	0,00529	-0,00489
X26	-0,121	0,00228	0,00851
X27	-0,046	0,00799	0,00999
X28	-2,389	-0,40593	0,16538
Constant	-141,927	-5,74840	-1,68730

Fig. 9. Results of discriminant analysis of subsystem 4P – Products – listing of Statistica 10 software (fragment)

Results of discriminant analysis of all 4P sub-systems of benchmarking are shown in Table 2.

Thus, obtained results of discriminant analysis of all 4P sub-systems of the project of competitive-integrative benchmarking reveal the horizons of opportunities for further research. The inclusion of a new object (HEI), which did not get to the samples, is carried out based of conformity of 4P subsystems of benchmarking to discriminant equations. This approach will make it possible promptly and timely to diagnose the degree of implementation of the design changes of a new HEI by all 4P sub-systems.

Table 2

Diagnosis of degree of implementation of design changes of HEI by 4P subsystems of project of competitive-integrative benchmarking

Identification by sub-systems	Equations of discriminant analysis	Conditional designations of indicators
Design changes in sub-system 1P occur if $Y_{1=\max\{Y_{1,i}\}}$	$Y_{1,1} = 18343,4 + 238,9x_1 +$ $+31172,4x_2 + 23917,7x_3 +$ $+638,8x_4 + 313,2x_5$	number of scientific and teaching staff (X_1); number of Doctors of Sciences (X_2); number of professors (X_3); number of Candidates of Sciences (X_4); number of Associate Professors (X_5)
	$Y_{1,2} = 16343,4 + 208,9x_1 +$ $+20172,4x_2 + 19917,7x_3 +$ $+548,8x_4 + 353,2x_5$	
	$Y_{1,3} = 11650,9 + 180x_1 +$ $+16861,1x_2 + 16772,7x_3 +$ $+669,4x_4 + 460,9x_5$	
Design changes in sub-system 2P occur if $Y_{2=\max\{Y_{2,i}\}}$	$Y_{2,1} = 161,787 + 0,237x_6 -$ $-0,187x_7 + 36,721x_8 -$ $-8,419x_9 + 13,333x_{10}$	transparency index (X_6); number of grants (X_7); patents (X_8); licensing and economic agreement other paid services (X_9); volumes of funding of SRW (X_{10})
	$Y_{2,2} = 93,9699 + 0,007914x_6 -$ $-0,005863x_7 + 0,810249x_8 -$ $-0,202059x_9 + 9,13x_{10}$	
	$Y_{2,3} = 124,337 + 0,202x_6 -$ $-0,153x_7 + 28,627x_8 -$ $-6,597x_9 + 5,32x_{10}$	
Design changes in sub-system 3P occur if $Y_{3=\max\{Y_{3,i}\}}$	$Y_{3,1} = 16722,4 - 0,5x_{14} +$ $+0,2x_{15} - 1,6x_{16} +$ $+0,50x_{19} - 0,9x_{20}$	cost of fixed assets (X_{14}); number of Bachelors who completed degrees (X_{15}); number of Masters who completed degree (X_{16}); number of students, enrolled to Bachelor's programs (X_{19}); number of students, enrolled to Master's programs (X_{20})
	$Y_{3,2} = 1091,60 + 0,15x_{14} -$ $-0,07x_{15} + 0,42x_{16} -$ $-0,14x_{19} + 0,69x_{20}$	
	$Y_{3,3} = 1417,88 + 0,18x_{14} -$ $-0,09x_{15} + 0,49x_{16} -$ $-0,16x_{19} + 1,03x_{20}$	
Design changes in sub-system 4P occur if $Y_{4=\max\{Y_{4,i}\}}$	$Y_{4,1} = -141,927 + 0,478x_{22} -$ $-0,096x_{25} - 2,389x_{28}$	number of specialities of Bachelor's programs (X_{22}); licensed volumes in Bachelor's programs (X_{25}); number of specialities under international agreements (X_{28})
	$Y_{4,2} = -5,7484 - 0,04486x_{22} -$ $-0,00529x_{25} - 0,40593x_{28}$	
	$Y_{4,3} = -1,6873 - 0,00826x_{22} -$ $-0,00489x_{25} - 0,16538x_{28}$	

7. Discussion of results of conducting competitive-integrative benchmarking

Combination of methodological tools of cluster, discriminant and factor analysis enables us to formulate a new vision of management of a project of competitive-integrative benchmarking in a dynamic perspective, as well as to assess the current state of analyzed HEIs. It is also possible to predict the qualitative picture in prospect taking into account the active position of HEI in relation to the change of its strategic position. Results of comparative critical SWOT-analysis allow us to estimate the degree of achieving the indicators of a model (Table 3).

A comparative SWOT-critical analysis of the achieved strategic positions successfully complements the performed analysis. Their joint use provides an opportunity to assess both the situation in the system of higher education in general, and the position of the studied HEIs.

Achieved strategic positions are assessed based on definition of the priority and the degree of satisfaction of consumer needs. According to this comparison, the target values for each characteristic are produced. For each position, the achieved (for the analyzed university – KNUVD) or current (for HEI-model) are entered into Table 3. If a quantitative value cannot be determined, a 10-point expert evaluation is used (1 – a minimum possible value of a characteristic; 10 – a maximum possible value of a characteristic).

Table 3

Results of implementation of project of competitive-integrative benchmarking of examined higher educational institutions

HEI	Unit of measurement									
	Number of specialities	Demand in specialities	Effectiveness of using main assets	Effectiveness of using classrooms and laboratories	Possibility of simultaneous studying in two specialities, abroad	Availability of international grants	Internal advertising that influences rating of HEI	Availability of rating assessment system	Number of staff with scientific degree	Specific weight of certified international educational programs
H_j^{norm}	0;2	0;2	0;1	0;1	0;1	0	0	0;1	0;13	0;06
W_j^{norm}	0;198	0;03	0;099	0;113	0;065	0;066	0;108	0;119	0;13	0;073
Taras Shevchenko KNU	8	8	4	7	10	9	5	9	6	9
SHEI V.Hetman KNEU	5	7	5	5	9	5	9	8	4	8
KNLU	1	9	6	6	8	3	7	5	9	8
NAU	3	9	5	7	6	4	7	4	8	10
NU of «Kyiv-Mohyla Academy»	5	10	7	9	5	5	8	5	10	5
L_j	88	172	376	195	280	63	357	78	282	105
L_j^{norm}	0;044	0;09	0;188	0;098	0;140	0;032	0;179	0;039	0;14	0;052

To determine the priority characteristic in benchmarking process, coefficient L_j is used. This coefficient shows the importance of change in the J-the characteristic, based of its current values in University-models. Characteristics, for which current quantitative values are known, are given by 10-point scale, shown in Table 3. Target values are determined based of the data and priority parameters. Target values describe the improvement of characteristics that the management tries to achieve.

As a result of implementation of the project of competitive-integrative benchmarking of KNU, the following characteristics received high priority:

- demand in specialities, popularity in labour market;
- effectiveness of using fixed assets (classrooms, laboratories);
- possibility of simultaneous training in 2 specialities, abroad;
- availability of international grants.

Matrix diagrams, created in the process of four-staged structuring of quality function, make it possible to formalize the search among the concepts of different levels of the system. With the gradual transition, the indicator “customer’s voice” systematically falls to designing educational services that are popular in the market; then to correspondent educational process and to instructions of the control over the educational system; subsequently – to implementation of educational process and obtaining of an international certificate of quality of educational programs.

8. Conclusions

1. Research into essence of benchmarking as a marketing tool for provision of competitiveness of HEI allowed us to

reveal its fundamentally new content for the conditions of globalization. Benchmarking of HEI is a systematic process that consists in the study of the methods of providing competitive educational services by leading Ukrainian and foreign universities. Its goal is to replicate best foreign and national practices and to improve own services and the way of operation.

2. The main regularities of management of projects of competitive-integrative benchmarking include adaptation of assessments of determining of qualitative characteristics in the provision of educational services by the European and American standards to Ukrainian realities. The main functions include the search and synthesis of new methods and techniques of competitive-integrative benchmarking, which are used in modern management and marketing of services.

3. Proposed tools of management of projects of competitive-integrative benchmarking of HEI imply conducting a competitive analysis of HEI by four proposed functional marketing 4P subsystems:

- People (personnel management);
- Partnership;
- Processes;
- Products (educational services).

Determining of a HEI-model in each subsystem. Development of proposals on improvement and borrowing experience by each subsystem.

4. Selection of main competitive strategies of striving of HEI for the ideal is made by identifying design changes of HEI by 4P subsystems of benchmarking using the instruments of discriminant analysis.

5. Conceptual model of management of a project of competitive-integrative benchmarking of HEI is based on marketing interaction. Its aim is to adapt best practices through identifying the model organizations based on partnership and cooperation.

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