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Using the Model of Benchmarking of Educational Services in a Socially Responsible Education-Innovation Cluster during the Covid-19 Pandemic

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Purpose of the study is to substantiate the feasibility of using the model of benchmarking of educational services in the socially responsible educational-innovative cluster in the context of Covid-19 pandemic. Specifically, the authors focus on justify a "nuclear" approach to the cluster formation. The process-oriented benchmarking model was used to apply best practices of providing higher educational service in the context of Covid-19 pandemic. The method of factor analysis was used to determine the impact of each of the 4P subsystems of benchmarking. Using the method of benchmarking makes it possible to develop a final competitive product in the context of the Covid-19 pandemic - an educational service for all industry and territorial stakeholders. In the light of Covid-19 pandemic, the formation of socially responsible educational-innovative clusters in Ukraine is one of the most promising and effective trends to modernize the provision of educational service. The uniqueness of the educational service is created by strengthening and synergizing the competitive advantages and competencies of all participants in the educational cluster: teachers, students, employers, research staff, the local community.

Keywords: educational-innovation cluster, benchmarking, social responsibility, covid-19

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INTRODUCTION

One of the priority tasks of socio-economic development of Ukraine is the transition to a knowledge-intensive economy, which is able not only to generate knowledge related to the researches and development, but also to disseminate and commercialize it. (Danko et. al, 2020). Some scientists (Almuqayteeyb, 2021; Zotov et. al, 2021) offer effective models of commercialization of scientific results of educational organizations, aimed at the development of entrepreneurial functions of the university. This function is implemented by such organizations as research institutes, universities, laboratories, research and production units of companies and small innovative companies (Etzkowitz, 2003; Vasiliev, 2021). In the context of the Covid-19 pandemic, some researchers (He & Lloyd, 2020; Andarwulan et. al., 2021) have proposed models for the modification and marketing adaptation of higher education. From the point of view of (Wilson et. al, 2020; Sitanggang et. al, 2021) such marketing adaptation of higher education management system to the changing conditions of the external environment should ensure stable operation and competitiveness of universities in the market of educational services, stimulate the development of science and education. However, the proposed models (Chesbrough, 2020; Umar et. al, 2021) of stimulating the economic equilibrium between scientific development, educational services, and innovative technologies in entrepreneurship, in our view, are difficult to use in the context of the Covid-19 pandemic. Some researchers (Watermeyer et. al., 2020; Hindun et. al., 2021) suggest that the role of universities in the contemporary society in the context of the Covid-19 pandemic undergoes many changes: it goes beyond the usual boundaries of two "missions" - educational and scientific. Under these conditions, a "third mission" assumes a great importance: the involvement of universities into the society life, the life of local community, the use of the social responsibility model in educational activities (Macgilchrist et. al., 2020; Umar et. al., 2021).

In this context, it is considered from the perspective of social involvement of educational organizations into socio-economic processes (Neupane et. al., 2020). Universities become business entities, taking responsibility for internal processes related to the creation of comfortable living conditions for employees and students in the light of the Covid-19 pandemic, for the formation of a socially responsible environment in the region (Aguinis et. al., 2020). One of the most effective forms of implementing the basic principles of social responsibility of universities is the formation of educational and innovative clusters (Angelova, 2020). Some researchers (Prokopenko & Berezhna, 2020) believe that the use of the mechanism of formation and implementation of educational-innovative cluster, will solve the problems on social responsibility of higher education in the conditions of pandemic Covid-19. The use of the educational services benchmarking model, according to (Ganushchak-Yefimenko et. al., 2017) in the educational cluster will: first, take into account the best practices of advanced international universities; second, apply this model of social responsibility (Ganushchak-Yefimenko et. al., 2018) in the context of the Covid-19 pandemic.

METHOD

Fundamental hypotheses of the research

Modern realities of the Covid-19 pandemic require the development of new approaches to the use of educational clusters in Ukraine in order to increase the level of social responsibility of Ukrainian higher education institutions. We have substantiated the main hypotheses for the formation of socially responsible educational-innovative clusters in the context of the Covid-19 pandemic:

Hypothesis 1. The formation of socially responsible education and innovation clusters in Ukraine in the context of Covid-19 pandemic should be based on the use of joint programs of effective knowledge transfer mechanism into the related industries, expansion of joint programs between the universities to unite the resources; reduction of dependence on government funding by expanding partnerships with industrial enterprises.

Hypothesis 2. The foundation of an association of educational institutions of different levels; competing and interacting suppliers of the specialized products (goods, services); infrastructure; research institutions localized on the same territory will make it possible to develop an end product – a high-quality educational service, the uniqueness of which is created due to strengthening and synergy of the competitive advantages of cluster participants in the context of the Covid-19 pandemic.

Using benchmarking method

Benchmarking methodology was used to build a socially responsible education-innovation cluster in the context of the Covid-19 pandemic. Benchmarking is the process of identifying, studying and adapting the best practices and experiences of other organizations to improve your own activity (Burquel, 2010). The review has shown that competitive-integrative benchmarking makes it possible to solve the problems of improving the quality of service provision in the context of globalization (OECD, 2019; Pop et. al., 2020). Its specific features consist in the fact that the rejection of competition in favor of cooperation becomes a driving force for the provision of competitive higher education services. A process-oriented benchmarking tools (Hanushchak–Efimenko, 2017, 2018) were used to apply the best practices in the provision of higher education service in the context of the Covid-19 pandemic. It is based on the justification of the benchmarking strategy by means of comparing the competitive advantages according to 4P-systems of benchmarking related to the provision of competitive educational services of the world's best universities: 1) Human Resources (People) 2) Partnerships (Partnership) 3) Process Management (Processes) 4) Educational Services (Products).

Data selection

The following data were used for the analysis: integral indicators: localization (Kloc), specialization (Kspec), social responsibility (Kresp); quality factors of educational services (products) (Kqual), social protection of personnel (Kstaf), economic performance transparency of institutions of the industry-specific complex (Kcompl),

social and ecological role in the region (Kter), economy of scale (Kscal); indices of social responsibility (aspects of GRI - The Global Reporting Initiative). The official reporting data of statistical information of the website ukrstat.gov.ua, survey findings of teachers and students were used to calculate the indices of localization, specialization of institutions of higher and secondary special education.

Methodology for calculating the indexes of the components of education and innovation cluster benchmarking

The developed methodology includes three sections: 1) to analyze the level of specialization; 2) to monitor the economic condition of the complex; 3) to analyze the level of social responsibility. The sequence of calculation is presented in table 1.

Table 1
System of calculations for the indicators of localization, specialization, social responsibility for benchmarking subsystems

For The Economic Sector		For The Educational Sector	
Localization index K_{loc}	Specialization index K_{spec}	Localization index K_{loc}	Specialization index K_{spec}
According to the number of enterprises / number of technological processes (production volume), (*N*) – subsystem *Processes*		According to the number of educational institutions / number of specialties (licensed volume), (*E*) – subsystem *Processes*	
$K^{N}_{loc} = \frac{N_{ir}}{N_{r}} \div \frac{N_{ic}}{N_{c}}$	$K^{N}_{spec} = \frac{N_{ir}}{N_{ic}} \div \frac{N_{r}}{N_{c}}$	$K^{E}_{loc} = \frac{E_{ir}}{E_{r}} \div \frac{E_{ic}}{E_{c}}$	$K^{N}_{spec} = \frac{E_{ir}}{E_{ic}} \div \frac{E_{r}}{E_{c}}$
According to the number of employees (*Sf*) – subsystem *People*		According to the number of scientific and pedagogical employees (*St*) – subsystem *People*	
$K^{Sf}_{loc} = \frac{Sf_{ir}}{Sf_{r}} \div \frac{Sf_{ic}}{Sf_{c}}$	$K^{Sf}_{spec} = \frac{Sf_{ir}}{Sf_{ic}} \div \frac{Sf_{r}}{Sf_{c}}$	$K^{St}_{loc} = \frac{St_{ir}}{St_{r}} \div \frac{St_{ic}}{St_{c}}$	$K^{St}_{spec} = \frac{St_{ir}}{St_{ic}} \div \frac{St_{r}}{St_{c}}$
In terms of personnel involved in the production of specialized products (*Prod*) – subsystem *Products*		According to the number of educational programs (*Prog*) – subsystem *Products*	
$K^{Prod}_{loc} = \frac{Sf_{ir}}{Prod_{r}} \div \frac{Sf_{ic}}{Prod_{c}}$	$K^{Sf}_{Prod} = \frac{Sf_{ir}}{Sf_{r}} \div \frac{Prod_{r}}{Prod_{c}}$	$K^{Prog}_{loc} = \frac{St_{ir}}{Prog_{r}} \div \frac{St_{ic}}{Prog_{c}}$	$K^{Prog}_{spec} = \frac{St_{ir}}{St_{r}} \div \frac{Prog_{r}}{Prog_{c}}$
On the social responsibility of the company (K^{En}_{resp}) – subsystem *Partnership*		On the social responsibility of the university (K^{Ed}_{resp}) – subsystem *Partnership*	
$K^{En}_{resp} = \sqrt[5]{K^{En}_{qual} \times K^{En}_{staf} \times K^{En}_{compl} \times K^{En}_{ter} \times K^{En}_{scal}}$		$K^{Ed}_{resp} = \sqrt[5]{K^{Ed}_{qual} \times K^{Ed}_{staf} \times K^{Ed}_{compl} \times K^{Ed}_{ter} \times K^{Ed}_{scal}}$	

where i is the sector under consideration (educational program) c is the corresponding value for the country; r is the corresponding value for the region

The index evaluation criteria are as follows: less than 0.2 - weak degree of specialization (localization, responsibility); (0,2-0,4) - average; (0,4-0,6) - high; (0,5-0,6) - high; over 0,6 - very high; more than 1 - deep - branch of specialization.

We suggest using these indices in relation to a particular branch of the economy and educational services according to the available indices in the statistical record. Prospective cluster participants are classified at the next stage by means of cluster analysis in order to allocate cluster members by levels of participation in the activity of educational-innovative cluster. Further, the method of factor analysis is used to determine the degree of influence of each of the 4P benchmarking subsystems on the possibility to develop and operate a socially responsible education and innovation cluster in the context of the Covid-19 pandemic of. These tools make it possible to find out the content of each of the factors, its dispersion, direction of operation (stimulating / dis-stimulating), the value of operation. This lets us make reasonable managerial decisions on the cluster structure (partners) and the content of organizational measures in the context of the Covid-19 pandemic. The weighting of the contribution of each cluster participant in the activity of the educational-innovative cluster is determined at the last stage, by means of the Ishikawa diagram and the dendogram calculated on its basis.

Problem Solution

Organizational aspects of creating a socially responsible education and innovation cluster in the context of the Covid-19 pandemic

The methodology was approved using the example of educational-innovation cluster of light industry in Kiev (Ukraine). In 2015 there was an educational, innovation and investment cluster of light industry. Members of the cluster are Kyiv National University of Technology and Design (KNUTD), Cherkasy State Business College, Kyiv City State Administration, light industry enterprises of Kyiv, (Ukraine). The main purpose of the cluster is to promote the modernization and competitiveness of light industry of Kyiv region through the rational use of industrial, resource and scientific and educational potential. It is relevant and important today for the light industry, which has taken a hit worldwide in providing the population with personal protective equipment (masks, gloves) on a large scale in the context of Covid-19 pandemic.

The main determinants of light industry operation in the light of Covid-19 pandemic are as follows:

1. There are 64 light industry enterprises operating in Kyiv, the total number of industrial enterprises is 768. That is their number makes approximately 10% of the industrial potential capacity of Kyiv. But along with this light industry enterprises give 20% of revenues to the city budget of Kyiv.

2. Light industry is connected with many related industries and serves the entire economic complex of the country. Pandemic conditions have put forward new requirements for the quality and range of output products.

4. The deteriorating situation requires accelerated and qualitative modernization of the light industry and its infrastructure using cluster approaches, an extensive application of the best world and domestic achievements in the field of engineering and production technology, including nanotechnologies and nanoproducts.

5. The use of scientific capability of educational institutions of the cluster will make it possible to implement the most relevant scientific developments in the context of the Covid-19 pandemic in the practical activities of enterprises.

6. The state policy in the scientific sphere in the light of Covid-19 pandemic should create conditions for encouragement of active participation of business in financing the innovative scientific developments and their implementation.

The entire period of the educational-innovation cluster operation (its life cycle) can be divided into the following stages: 1) conception, 2) formation, 3) operation, and 4) further transformation. The tasks performed at the first two stages are inseparably associated with one another, therefore, a common algorithm of actions is developed for them. The process of origin and formation of the educational services cluster represents an enormous organizational and analytical work. At this stage, a system of agreed stages in the technology of its formation was implemented. It can become a practical guide in drawing up projects and programs of its formation. The representatives of public authorities were the initial initiators of the innovative economic system formation. In order to activate the process of cluster formation, they united concerned representatives of the "business - education - science" chain into the Initiative Group with the help of the cluster policy tool "Technological Platform". This group took further measures to develop an educational cluster: developed the concept of creating a cluster; attracted investment; selected cluster participants (actors); organized supervisory bodies: Coordinating Council, coordinating bodies; developed a scheme of interaction within the cluster; developed a model of cluster operation; legal, methodological basis for its existence. The conventional "nuclear" approach to cluster formation implies that one or more leading enterprises, which produce target goods or services, become its "core".The task of educational institutions in the cluster is as follows: to ensure continuous and multilevel training of personnel in various industries; to ensure compliance of educational institutions with the demands of the state, society, enterprises, private consumers of educational services; to establish conditions for the implementation of research projects in education, industry; to increase opportunities for the citizens to obtain the desired level of education, profession, qualification in accordance with the needs of the region; to establish strong and long-term relations with the authorities to solve problems in the field of education, science and other activities; to attract additional funding for the educational process; to equip laboratories and workshops necessary for research practice and experimentation; to provide opportunities for the students to undertake an internship and for the graduates to be employed at the enterprises - cluster members with modern technology and equipment.

Assessment of the correlation between the level of development of 4P sub-systems benchmarking of socially responsible education and innovation cluster

The cluster participants were selected at the stage "Formation" using the method of cluster analysis. Prospective cluster participants were classified using the indices of localization, specialization, social responsibility behind the subsystems of benchmarking (Table 1). The results of the cluster analysis are shown in Figure 1.

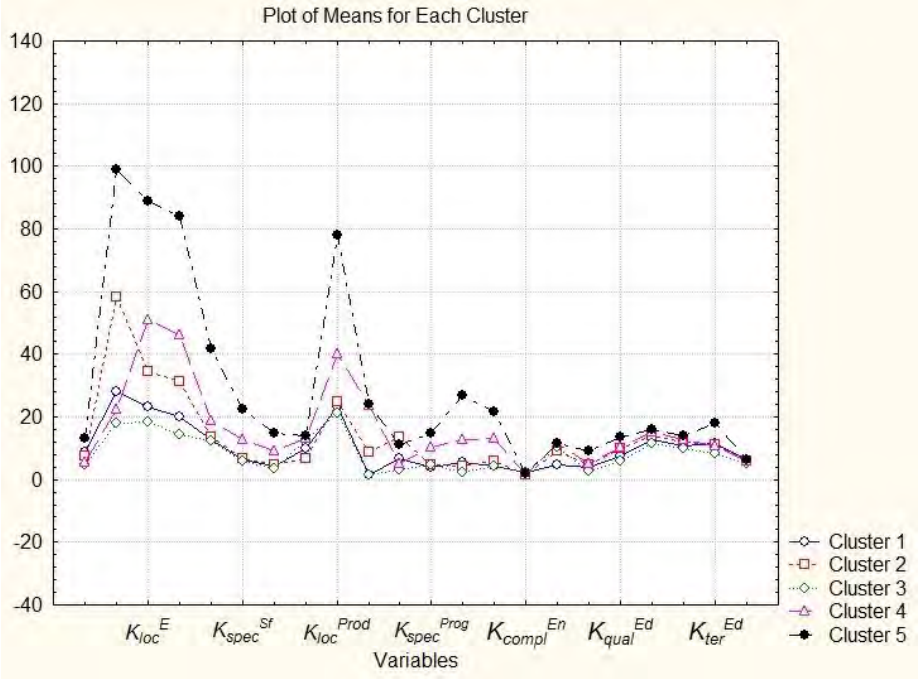

Figure 1
Graph of K-averages of prospective part icipants (Statistica 10 program listing)

5 clusters were obtained as a result of the cluster analysis. The ranking of 5 clusters of prospective participants was carried out by taring the average value of the indices: Cluster 3 < 0.2; Cluster 1: 0.2-0.4; Cluster 2: 0.4-0.6; Cluster 4 > 0.6; Cluster 5: > 1. The obtained values of the indices show that the members of the educational-innovation cluster can be the participants with the value of the calculated indices greater than or about the average, i.e. clusters 1; 2; 4, 5. Cluster 5 (the highest level of development) included one prospective member - Kyiv National University of Technology and Design (in fact - the core of the cluster). Cluster 4 (developmental level above average) included 10 prospective participants. Members of cluster 4 refer to Level II "PARTNERS" and provide the performance of the main functions of educational-innovation cluster: organization of educational process, scientific activity, professional internships. These are sectoral scientific institutes, innovation centers, research and testing centers, sectoral business structures, specialized secondary educational institutions, schools and lyceums. Members of cluster 2 refer to level III "BUSINESS CLIMATE" and carry out accompanying, marketing, advertising activities of the cluster, ensure optimal operation of its subsystems. These are press services, advertising, PR-agencies, mass media, enterprises implementing outsourcing services, legal, accounting agencies, banks, insurance and credit institutions. Organizations of the IV level "Basic" perform basic organizational functions of education and innovation cluster - the level of development is about average. These are organizations that bear responsibility for

coordination (licensing, certification), control of socially responsible activity: sectoral ministries, departments, employment centers, associations, trade union organizations, local communities, etc. The level of development of competitive advantages of members of educational-innovative cluster by 4P benchmarking subsystems in the context of Covid-19 pandemic was determined by means of factor analysis. The first factor includes indices reflecting the achieved results of partners in the "People" subsystem. This factor has the greatest influence on the operation of the structure of the education-innovation cluster (35.79% of the variance) in the context of the Covid-19 pandemic. Its value specifies the main competitive advantages of cluster members - highly professional personnel, the effective use of which will make it possible to bring a competitive product to the market in the light of the pandemic. All indices that fall into the first factor have a stimulating effect on the process.

The equation of dependence of the value of *1P* - People on stimulating indicators has the following form:

$$1_P = \frac{1}{5{,}975532} \times (0{,}762131 K_{loc}^{Sf} + 0{,}835977 K_{spec}^{Sf} + 0{,}785626 K_{loc}^{St} + 0{,}808133 K_{spec}^{St}) \quad (1)$$

The data of equation (1) indicate that the level of employee's qualification, both in the organizations providing relevant highly specialized educational services, and the competence of employees of the enterprises-partners of the industry have the greatest importance for the effective operation of the educational-innovative cluster.

The second factor "Processes" includes indicators reflecting the level of specialization and concentration of exclusively the processes of providing educational services. Besides, all the indicators have a stimulating effect on the value of *2P*. The variance of the second factor is equal to 21.05%. The equation of dependence of the value of 2P - Processes on the indicators, which reflect the technology of processes, has the following form:

$$2_P = \frac{1}{2{,}311518} \times (0{,}933468 K_{loc}^{E} + 0{,}930138 K_{spec}^{E}) \quad (2)$$

The third factor "Products" includes indicators reflecting the share of specialized products that meet epidemiological requirements and the level of specialization and concentration of educational and professional programs. Besides, all indicators have a stimulating effect on the value of 3P. The variance value of the third factor is equal to 18.96%. The obtained equation of dependence of the value of *3P* - Products on the indicators reflecting the quality and quantity of the specialized product (services and products) has the following form:

$$3_P = \frac{1}{1{,}971958} \times (0{,}772671 K_{\text{spec}}^{\text{Prod}} + 0{,}725345 K_{\text{loc}}^{\text{Prog}} + 0{,}787517 K_{\text{spec}}^{\text{Prog}}) \quad (3)$$

The fourth factor "Partnership" includes indicators reflecting the level of social responsibility of all partners of the educational-innovative cluster. Besides, all indicators have a stimulating effect on the value of 4P. The dispersion value of the fourth factor is

equal to 17.73%. The obtained equation of dependence of the value of *4P* - Partnership on the indicators reflecting the level of social responsibility of the process participants has the following form:

$$4_P = \frac{1}{1{,}699906} \times (0{,}808133K_{\text{qual}}^{En} + 0{,}775942K_{\text{staf}}^{En} + 0{,}208361K_{\text{ter}}^{En} + 0{,}678323K_{\text{qual}}^{Ed} + 0{,}839770K_{\text{staf}}^{Ed}) \quad (4)$$

Equation (4) shows that the greatest influence on the level of social responsibility is brought by the indicators of social protection of personnel of educational and business organizations; quality of educational services (products), which meet epidemiological requirements.

FINDINGS

The obtained cluster and factor models have been tested for significance and the presence of autocorrelation. The results of the cluster analysis are confirmed by the calculated dendogram of development level of prospective partners by the degree of their involvement in the education and innovation cluster (Figure 2).

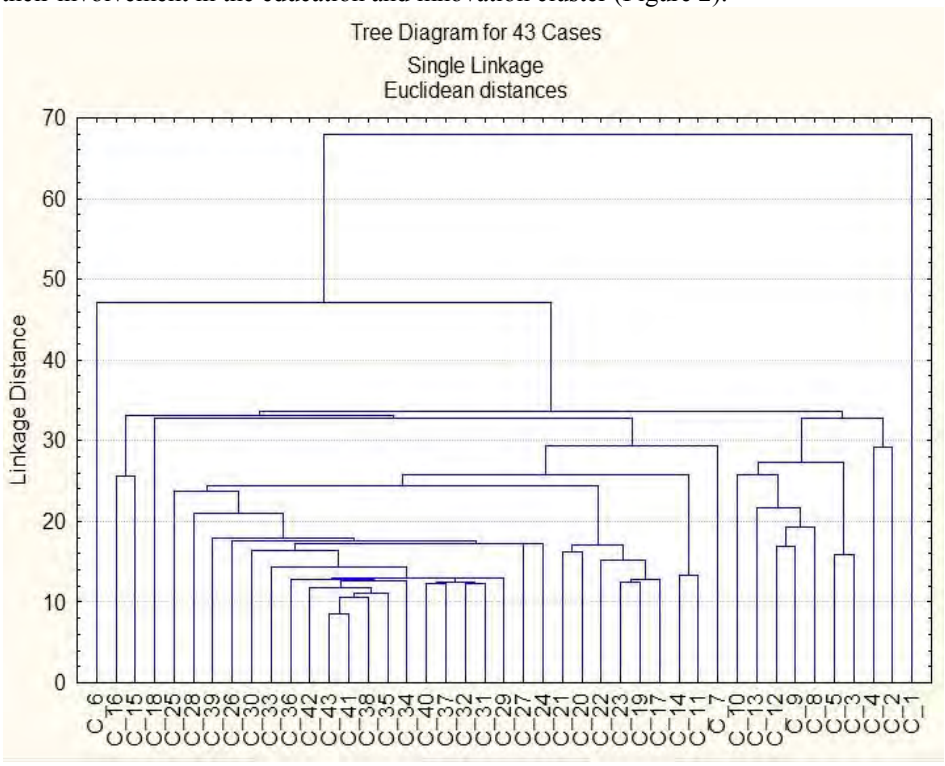

Figure 2
Dendogram of the development level of prospective partners related to their involvement in education and innovation cluster (Statistica 10 program listing)

Manufacturing technology of functional adaptive clothing for seriously ill patients with viral disease COVID-19, rehabilitation and adaptive clothing for bed-ridden patients on artificial ventilation, mobile patients receiving non-invasive therapy. C_2 Public Joint Stock Company "Chinbar", C_7 Private Production Enterprise "Kaman", C_16 Company "Fur Factory "ATN" developed and introduced into production a range of innovative textile materials with antimicrobial and therapeutic properties for use in products for the disabled population, the principles of their reasonable choice in clothing packages for further rebranding. These partner enterprises provided opportunities to use production sites for internships for teachers and students, making it possible to reduce the level of epidemiological situation, increased the level of social protection of personnel in the context of the Covid-19 pandemic. The quality and comprehensiveness of the educational-innovative cluster membership was further assessed using the Ishikawa diagram (Fig.3).

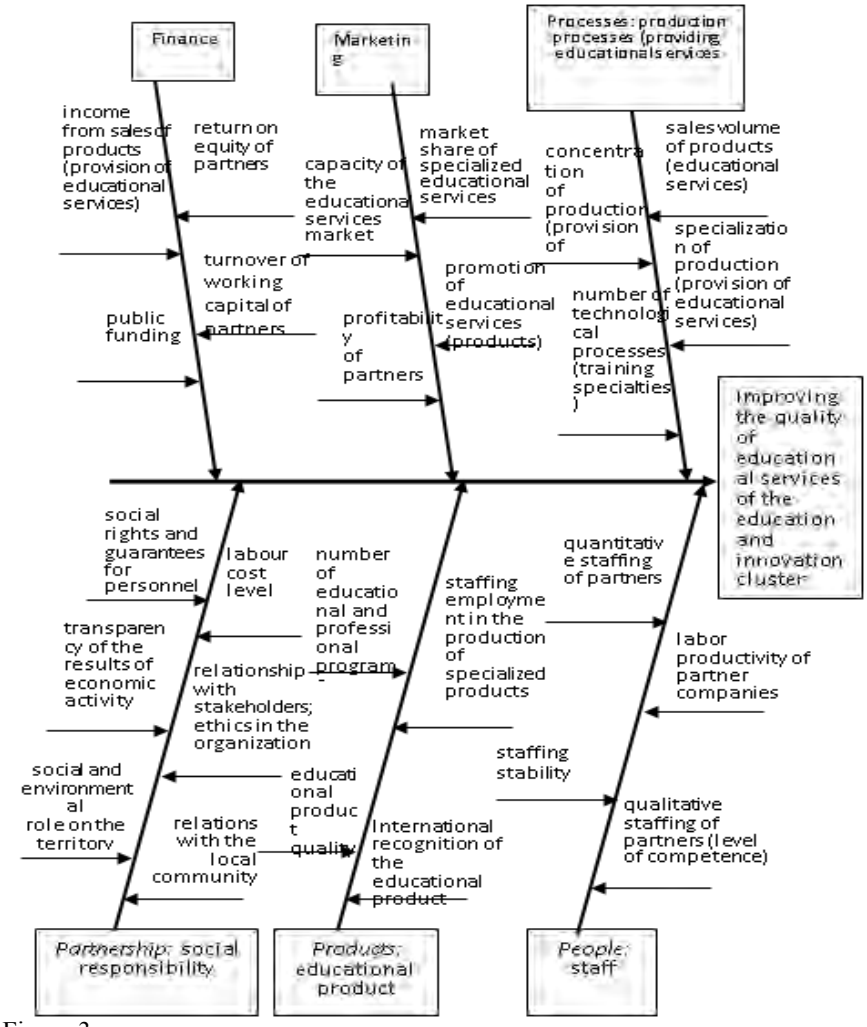

Figure 3
Ishikawa diagram to identify the problems of quality management of education and innovation cluster

Dendogram of weighting indices of functional involvement of individual members of educational-innovative cluster represents a practical application of Ishikawa diagram (Figure 4).

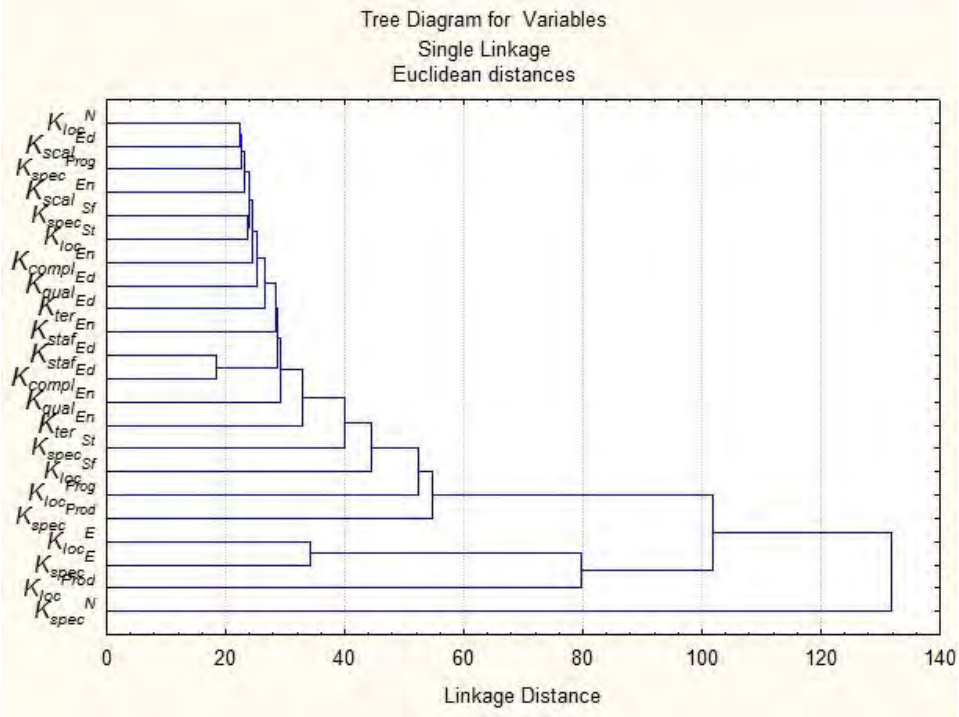

Figure 4
Dendogram to determine the trends of quality management of education and innovation cluster (Ishikawa diagram) Statistica 10 program listing

DISCUSSION

Dendogram of the development level of prospective partners related to their involvement in education and innovation cluster (Fig.2) confirms the probability to implement Hypothesis 2 about cooperation of educational institutions of different levels (OECD, 2019), competing and interacting business partners, infrastructure, research institutes localized within one territory in order to develop the final product - educational service (Pop et. al., 2020), uniqueness of which is created due to strengthening and synergy of competitive advantages of cluster participants in the context of Covid-19 pandemic. The data in Fig.2 certify the results obtained earlier by means of the cluster analysis. Namely: the cluster members have the greatest impact on the cluster performance: C_1 Kyiv National University of Technology and Design, C_6 Cherkassy State Business College, which ensure high quality, level of specialization and concentration of educational services. C_15 Ukrainian Italian joint venture LLC "RIF-1", C_18 LLC Research and Development company "MIDA", C_4 LLC "Research and Development enterprise" Gidrostil "implement joint research and development work on creating designs.

The Ishikawa diagram (Figure 3) helps to identify the main factors that have the greatest contribution to the cluster operation, suggests preventive or corrective measures of negative effects. The Ishikawa diagram is constructed taking into account the following principles: 1) identification and collection of all factors and reasons affecting the final result in any way; 2) classification of factors into semantic and causal blocks; 3) ranking of these factors within each block; 4) analysis of the picture obtained; 5) "releasing" of factors that cannot be affected; 6) ignoring unimportant and non-critical factors. The analysis of the Ishikawa diagram made it possible to identify the main problems hindering the effectiveness of educational services in the context of the Covid-19 pandemic. The review results of the constructed Ishikawa diagram approve the effective implementation of Hypothesis 1 about the possibility to create socially responsible educational and innovative clusters in Ukraine in the context of the Covid-19 pandemic as an effective mechanism of knowledge transfer to the related industries, to expand joint programs between universities to unite the resources to work in the light of the pandemic; to reduce dependence on governmental funding by expanding partnerships with industrial enterprises in order to develop highly competitive products adapted to epidemiological requirements.

CONCLUSION

The conducted research approved the feasibility of using a benchmarking model of educational services in the socially responsible educational-innovative cluster in the context of the Covid-19 pandemic. A comprehensive combination of several economic-mathematical and abstract-logical methods was used to substantiate 2 hypotheses suggested: factor analysis; cluster analysis; process-oriented benchmarking; Ishikawa diagram. The research methodology was divided into five stages: 1) defining the objectives of the study; 2) critical review of the literature resources and definition of hypotheses of the given research; 3) selection of appropriate methods and data acquisition; 4) data processing using selected mathematical and statistical tools; 5) interpretation of results and hypothesis testing. The logic of constructing organizational aspects related to the formation of a socially responsible educational-innovative cluster in the context of Covid-19 pandemic made it possible to detect the following: the stages of its life cycle; expediency of using the conventional "nuclear" approach to cluster formation in the context of Covid-19 pandemic; using process-oriented benchmarking to substantiate development strategies by comparing the competitive advantages by 4P-systems; specific features of their implementation in the light of Covid-19 pandemic. The subsystems of process-oriented benchmarking are: 1) process management (Processes) 2) personnel management (People) 3) educational services (Products) 4) partnerships (Partnership).

Organizational aspects of creating a socially responsible education-innovation cluster in a particular industry in the context of the Covid-19 pandemic include three components: 1. Analysis of the industry specialization level. 2. Monitoring of the economic state of the industry. 3. Analysis of the level of social responsibility of the industry enterprises. The cluster analysis of expediency to include prospective partners into the educational-innovative cluster was carried out on the basis of calculations of the index value of 4P-

subsystems of benchmarking. The decision to include each partner in the education and innovation cluster was made by taring the integral indices of the development level of 4P-subsystems of benchmarking. The results of factor analysis showed, and Ishikawa diagram confirmed the validity of the trends for effective provision of educational services in the educational-innovative cluster in the context of Covid-19 pandemic. As a result, both hypotheses of the research process were confirmed.

The main concepts of the research can be put into practice in the following ways.

In the context of Covid-19 pandemic, the formation of socially responsible educational-innovative clusters in Ukraine is one of the most promising and effective trends to reform and modernize higher education in Ukraine on the basis of dual practice-oriented education.

Application of joint programs of educational services as an effective mechanism of knowledge transfer into the related industries, expansion of joint programs between universities to unite the resources will reduce dependence on governmental funding by means of expansion of partnerships with industrial enterprises, which is especially relevant in the light of pandemic Covid-19.

Cooperation of educational institutions of different levels, competing and interacting suppliers, research organizations, localized within one territory, makes it possible to develop a final product - a competitive educational service, uniqueness of which is created due to strengthening and synergy of competitive advantages of cluster participants in the context of Covid-19 pandemic.

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