UDC 330.342
JEL: O15
DOI: https://doi.org/10.32983/2222-4459-2024-11-117-124

HUMAN CAPITAL AS A FACTOR IN ENSURING INNOVATIVE DEVELOPMENT

©2024 MALYARETS L. M., LEBEDIEV S. S.

UDC 330.342
JEL: O15

Malyarets L. M., Lebediev S. S. Human Capital as a Factor in Ensuring Innovative Development

The article compares both static and dynamic theories of economic growth, highlights the basic provisions of the theory of endogenous growth and shows the decisive role of innovation as a trigger for technological shifts that subsequently lead to economic and social changes. Particular attention is paid to the study of the influence of human capital on the creation of conditions for the emergence of innovations with their subsequent implementation in technological processes. The leading factor determining the very possibility of innovative development is the sufficient quality of human potential at the level of an individual, at the level of staff of the enterprise, and at the level of the country in general. Therefore, ensuring sustainable economic growth is directly related to the issue of providing quality education, the level of which should meet modern needs. In turn, this requires the use of innovative learning technologies in the educational process, which would contribute to the development of not only Hard Skills, but also Soft Skills. It is the analysis of such educational technologies that is the key issue of the presented article. The study was carried out within the framework of teaching mathematical disciplines to applicants for higher education in the field of economics and management. The characteristics of the methods that contribute to the development of Soft Skills of the general direction are provided, also the presentation of the authors' own methodology, based on the conception of Design Thinking is presented. According to this methodology, the development of skills in the use of mathematical apparatus was carried out in the process of teamwork on the project of building a mathematical model of a real economic process or phenomenon (from the collection and analysis of statistical data up to forecasting with use of the obtained model). All stages of application of this methodology and the objectives facing the team at each of the stages are described in detail. The effectiveness of the development of Soft Skills was evaluated by the acquired level of Hard Skills in the application of mathematical methods in the study of economic processes and phenomena.
Keywords: *theory of endogenous growth, knowledge economy, innovations, human potential, Soft Skills, Hard Skills, Design Thinking.*
Bibl.: *29.*

Malyarets Lyudmyla M. *– D. Sc. (Economics), Professor, Head of the Department of Economic and Mathematical Modeling, Simon Kuznets Kharkiv National University of Economics (9a Nauky Ave., Kharkiv, 61166, Ukraine)*
E-mail: *malyarets@ukr.net*
ORCID: *https://orcid.org/0000-0002-1684-9805*
Researcher ID: *https://www.webofscience.com/wos/author/record/T-9858-2018*
Scopus Author ID: *https://www.scopus.com/authid/detail.uri?authorId=57189248374*

Lebediev Stepan S. *– Senior Lecturer of the Department of Economic and Mathematical Modeling, Simon Kuznets Kharkiv National University of Economics (9a Nauky Ave., Kharkiv, 61166, Ukraine)*
E-mail: *stepan.lebedev@hneu.net*
ORCID: *https://orcid.org/0000-0001-9617-7481*
Scopus Author ID: *https://www.scopus.com/authid/detail.uri?authorId=58677849900*

УДК 330.342
JEL: O15

Малярець Л. М., Лебедєв С. С. Людський капітал як фактор забезпечення інноваційного розвитку

У роботі проводиться порівняння статичних і динамічних теорій економічного зростання, висвітлюються базові положення теорії ендогенного зростання, а саме – показано визначальну роль інновацій як тригера технологічних зрушень, що в подальшому приводять до економічних і суспільних змін. Особливу увагу приділено дослідженню впливу людського капіталу на створення умов для появи інновацій з подальшою їх реалізацією в технологічних процесах. Провідним фактором, що визначає саму можливість інноваційного розвитку, є достатня якість людського потенціалу як на рівні окремої людини, так і на рівні персоналу підприємства, і на рівні країни загалом. Отже, забезпечення сталого економічного зростання безпосередньо пов'язано з питанням щодо забезпечення якісної освіти, рівень якої повинен відповідати сучасним потребам. Своєю чергою, це вимагає застосування в освітньому процесі інноваційних технологій навчання, які б сприяли розвитку в людини не лише Hard Skills, але й Soft Skills. Саме аналіз таких освітніх технологій і є ключовим питанням даної роботи. Дослідження проводилося в рамках викладання дисциплін математичного спрямування здобувачам вищої освіти в галузі економіки та менеджменту. Наведено характеристики методик, які сприяють розвитку Soft Skills загального спрямування, а також представлено власну методику, в основу якої покладено концепцію Design Thinking. Згідно з цією методикою відпрацювання навичок використання математичного апарату здійснювалося в процесі командної роботи над проєктом побудови математичної моделі реального економічного процесу або явища (від збору й аналізу статистичних даних до прогнозування за допомогою отриманої моделі). Детально описано всі етапи застосування цієї методики та задачі, що постають перед командою на кожному з цих етапів. Ефективність розвитку Soft Skills оцінювалась за рівнем надбання Hard Skills щодо застосування математичних методів у дослідження економічних процесів і явищ.
Ключові слова: *теорія ендогенного зростання, економіка знань, інновації, людський потенціал, Soft Skills, Hard Skills, Design Thinking.*
Бібл.: *29.*

Малярець Людмила Михайлівна *– доктор економічних наук, професор, завідувачка кафедри економіко-математичного моделювання, Харківський національний економічний університет імені Семена Кузнеця (просп. Науки, 9а, Харків, 61166, Україна)*
E-mail: *malyarets@ukr.net*
ORCID: *https://orcid.org/0000-0002-1684-9805*
Researcher ID: *https://www.webofscience.com/wos/author/record/T-9858-2018*
Scopus Author ID: *https://www.scopus.com/authid/detail.uri?authorId=57189248374*

Лебедев Степан Сергович *– старший викладач кафедри економіко-математичного моделювання, Харківський національний економічний університет імені Семена Кузнеця (просп. Науки, 9а, Харків, 61166, Україна)*
E-mail: *stepan.lebedev@hneu.net*
ORCID: *https://orcid.org/0000-0001-9617-7481*
Scopus Author ID: *https://www.scopus.com/authid/detail.uri?authorId=58677849900*

The theory of endogenous growth [1–3] is a reflection of modern scientific thought about determining the nature of socioeconomic processes capable of ensuring the sustainable development of a firm, a particular branch of production, and the country as a whole. Neoclassical growth models that are characterized by the idea of declining returns on capital, have proven to be unable to explain long-term economic growth, while the endogenous theory believes that the existence of business cycles is associated with «swarms» of innovations. In this context, innovations be considered as the causes of the transition of economic and social systems from one state to another under the influence of radical changes that are caused by innovations. In economic dynamics, innovations play the role of a catalyst that changes the structure of markets, the dynamics of supply and demand, and also stimulates the emergence of new patterns of behavior. That is, according to the endogenous theory, the reasons for sustainable growth are internal (endogenous) factors of the system itself, which are considered to be the technological transformation of production, the implementation of innovative technologies, the intellectualization of labor and, as a result, which is of global importance, the formation of the knowledge economy. In turn, technological changes are considered not as a spontaneous phenomenon, but as a result of balanced managerial decisions regarding investments that are aimed at maximizing profits. The main conclusions of the theory of endogenous growth are that the growth rate is determined by the stock of human capital, and integration processes in the world labor market are able to increase the rate of this growth [4]. Thus, there is a global intellectualization of the economic system and the issues related to the development of human resources [5], i. e. to the identification of factors contributing to the development of human potential and its further capitalization, are of special relevance.

LITERATURE SURVEY

According to the theory of endogenous growth, in the modern era, defined as the knowledge economy, human potential is considered to be a factor that can ensure sustainable economic development both at the macro and micro levels [6–8, and others]. Not so long ago we were talking about the Third Industrial Revolution, which manifested itself in the introduction of computers to automate production processes, now the time has come for the Fourth Industrial Revolution, or Industry 4.0, where the current state of production is viewed as the synchronization of computers with processes in each area of business. In these conditions, the issue of developing a State investment policy to ensure innovative development in the context of Industry 4.0 [9] and improving the State policy on investments in education becomes relevant [10; 11].

One of the main conclusions to be considered is that the possibilities of creating innovations and their further implementation in all spheres of human activity directly depend on the level of development of human potential. It is human potential with its subsequent transformation into human capital that is taken as the basis for the development of the knowledge economy [12–14, and others]. At this, the subject of the consideration is both the human potential of an individual and the human potential, embodied in the staff of the enterprise, as well as the human potential of the country in general. Therefore, the issue of ensuring the effective development of human potential appears to be of great importance in modern economic science. It should be underlined that according to the endogenous theory of growth, investments in human capital and technology support the continuous growth of the economy, since intellectual capital is not limited to the decreasing returns that are inherent in physical capital. Comparison of the impact of investments in human capital and investments in fixed capital on their contribution to economic growth proved the higher efficiency of investments in human development [15]. Furthermore, the growth of human potential affects economic growth both directly (due to the improvement of mental qualities of a person and the state of his/her health) and indirectly as a result of the introduction of innovative technologies, the increase in the efficiency of research and development, as well as the use of the results of scientific developments in production activities [16]. Increasing expenditure on research and development (R&D) is especially important for the development of poor regions. It should be emphasized that these costs are an endogenous factor that accelerates the economic growth of the particular region, without affecting the growth of any other region [17; 18].

The theoretical substantiation of the role of human capital in the cycles of economic development was laid down in the works of Schultz and Becker. They argued that investment in education and training increases human productivity, which in turn is the basis of overall economic growth. Later, this conception was spawned by the contributions of Romer, Lucas, Aghion and Howitt, who argued that human capital does not just contribute to economic development, but is its driving force precisely because of its ability to ensure the creation of innovations and their implementation in all spheres of human life. In this sense, investments in education are considered as a policy to stimulate innovative development [19]. Interest in the socioeconomic aspects of education led to the formation of two theoretical directions [20]. According to one of them, investments in education are considered as a contribution to the development of the country's human potential in order to ensure its sustainable development, and according to the other – as a contribution to the development of the personal potential of each individual, as a way to fight poverty, to ensure competitiveness in the labor market.

Recognition of the leading role of intellectual capital and human potential in ensuring sustainable growth of the economy leads to the need to revise the very understanding of the content of education and, accordingly, to the formation of approaches, the application of which would ensure the quality of education that meets modern requirements. Therefore, the innovative development of the economy requires innovative shifts in the field of education at all its levels. In particular, among the Sustainable Development Goals [21] adapted for Ukraine (2015–2030), quality education is defined as Goal 4, which consists of seven tasks and has eleven indicators to measure.

However, even a high level of professional knowledge that a person acquires at the beginning of labor activity appears insufficient in modern conditions. Since knowledge quickly becomes obsolete, it becomes necessary to form the ability to assimilate new knowledge, to update it throughout life [22]. Consequently, the requirements for the direction of vocational education are changing, education is ceasing to be formal. In addition to professional knowledge and skills (Hard Skills) that will be needed by a person in the future activities, it is necessary to form skills that are defined as soft or flexible skills (Soft Skills) and are considered universal [23], which includes the ability to learn throughout life (LifeLong Learning), perceive new information and generate new ideas on one's own. Hard skills are professional knowledge that a person acquires through formal education or work experience, soft skills on the contrary refer to personal qualities, along with interpersonal skills, determining the ability to effectively communicate between people, collaborate and interact with others. It is the presence of soft skills in a person of modern society that is considered an important factor that can provide both personal and professional growth. According to the theory of endogenous growth, a person must be open to innovations, have the ability to both implement and generate them.

THE AIM AND OBJECTIVES OF RESEARCH

As already shown, the formation of soft skills is one of the important tasks of modern education in general and higher education in particular. Unlike hard skills, which can be quantified, soft skills only have qualitative characteristics. Therefore, it is necessary not only to develop special methods for the development of soft skills in higher education applicants, but also to form criteria for measuring them. This article proposes to solve these problems on the example of studying mathematical disciplines in the training of specialists in the field of economics and management.

MATERIALS AND METHODS

At Simon Kuznets Kharkiv National University of Economics (hereafter referred to as Simon Kuznets KhNUE), when studying mathematical disciplines taught by the Department of Economic and Mathematical Modeling, most attention is paid to the formation of not only hard skills, but also soft skills in higher education applicants. According to the educational and professional programs concerning all applicants for higher education, the study of the following mathematical disciplines is provided for future economists and managers: higher mathematics (or for some specialties – applied mathematics), probability theory and mathematical statistics, operations research, econometrics. Each of the disciplines is studied during one semester, and for specialties such as IT management, higher mathematics is taught for two semesters. The organization of classes is carried out according to the work program (technological map). For the past three years, classes have been held online using the Zoom software. To ensure the quality of education, each teacher has his own page on the Personal Learning System (PLS) website on the Moodle platform. All lectures and practical classes are recorded, and the student can view them when there is such a need. Communication with Zoom allows you to use all the methods of intensifying learning that are used to acquire soft skills.

The development of soft skills in higher education applicants in the field of economics and management in the process of studying mathematical disciplines may seem like a difficult task, since mathematics is traditionally associated with analytical and technical skills. The acquisition of soft skills is considered a very

important component of the training of specialists, therefore, at Simon Kuznets KhNUE, the development of soft skills is singled out as a separate discipline, but it is taught for masters [24], while the study of mathematics begins in the first semester. Soft skills play an important role in the successful assimilation of fundamental knowledge of mathematics, since in many professions the formation of mathematical competence involves the use of applied aspects of mathematics, that is, the implementation of mathematical calculations, the construction of mathematical models of processes and phenomena is not the ultimate goal, but only a means of their research. Therefore, in the process of studying mathematical disciplines, it is important not only to memorize the algorithm for solving a particular problem, but to perceive the very «philosophy» of its application, the peculiarities of each step of the process of solving a problem. Thus, it is necessary to develop critical thinking and creativity. Also, such soft skills will contribute to the further application of mathematical knowledge in professional activities. Among the general strategies that have been used to develop soft skills in the process of learning mathematics, the following should be highlighted.

Teamwork and cooperation. During practical and laboratory classes, instead of individual work on solving problems, students created groups of 3–5 people to work on a complex task or project, and then discussed the presentation of the results with the participation of the entire academic group. This can be viewed as a way of fostering development of soft skills such as the ability to cooperate, communicate and work in a team, also evolve creativity and critical thinking and, further on, there is an opportunity to try yourself as a leader, as well as to feel responsible for the decisions made.

Perseverance in solving a problem, accompanied by creativity. Mathematics is a convenient platform for training the ability to solve a problem. So, for instance, the direction of Problem-Solving and Data Analysis [25] is formed, when in the process of searching for a solution, the student analyzes and rejects those data that are alien in properties relative to other objects of the sample population, builds a model, and then draws conclusions based on this model. However, it is important that students do not use ready-made algorithms, but look for their own approach to solving the problem. It is advisable to use this technique when solving real economic problems using, for instance, multidimensional statistics.

Emotional intelligence and stress management. For non-technical higher education applicants, mathematics can be a cause of anxiety and even stress. Developing emotional intelligence will help students better manage their emotions and adapt to challenging tasks. At this, it is advisable to hold collective discussions after completing difficult tasks or tests, in which students could express their thoughts and experiences. This may include elements of reflection, i. e., it is necessary to determine what emotions the student experienced during the work and how he coped with them. This also includes the study of the elements of time management, since the ability to properly plan your time, or self-organization, helps to cope with the task on time and, thereby, get rid of stress. The development of emotional intelligence is especially important for a manager, as he works with people who often need his or her support.

Creativity and innovative thinking. Despite the fact that the teaching of mathematical disciplines involves the consideration of a certain set of standard algorithms for solving problems, mathematics provides opportunities for a creative approach in the process of solving problems. For example, even the simplest problems of Probability Theory can be solved in three ways, and multi-criteria optimization problems considered in the study of operations research involve the analysis of possible criteria and the determination of their hierarchy. Solving such problems contributes to the development of creative thinking in students. In addition to lectures, practical and laboratory classes according to the technological map of the academic discipline, it is envisaged to perform an independent creative task. Complex tasks can be offered as a topic for an independent creative task, as well as when working in small groups with the subsequent presentation of the results and their discussion with the participation of all students of the academic group. When choosing a topic for an independent creative task, it is necessary to take into account the range of interests of the student. As a rule, such a task at the first stage involves the selection and processing of statistical data, also the choice of a method by which its solution will be carried out. It should also be noted that solving complex problems contributes to the development of students' critical attitude to their knowledge, and assessing their own gaps in knowledge and eliminating them lays the foundations for the implementation of the LifeLong Learning conception.

Adaptability and flexibility. As in the study of other disciplines, the process of studying mathematical disciplines involves working on mistakes, and this requires a person to change own attitude to what initially was considered correct, to adapt to new information. So, it is a way of training flexibility thinking. In order to accustom the student to work on mistakes, when evaluating homework, a point-cumulative evaluation system is used, according to which all types of tasks provided for by the technological map are subject to evaluation. Two grades are used: a higher score of 4

or 2 (depending on whether the test or exam is a form of final control) or 0.1 points. If a student has received 0.1 points, it means that a mistake was made in the work. The student has the opportunity to correct this mistake and receive a full score for the work. However, such an attempt is singular and this fosters a responsible attitude in students to work on mistakes. Also, the development of flexibility and adaptability is facilitated by working in small groups on a joint project. For this purpose, it is also advisable to use feedback and reflection, the peculiarities of the application of which in the process of studying mathematical disciplines have already been discussed above.

FINDINGS AND DISCUSSION

Along with traditional methods, the list of which is provided above, the Department of Economic and Mathematical Modeling of Simon Kuznets KhNUE has developed its own methods [26; 27], the theoretical basis of which is Design Thinking. By the way, Design Thinking is the tool that allows you to create innovations in any field [28], including in the educational process. In the general case, Design Thinking or Design-based Research is considered as a method of creating non-standard projects, products and services. This method is aimed at solving specific problems, based on the interests of a potential consumer, which means direction towards human-centricity. So, Design Thinking focuses on empathy, creativity and critical thinking to create innovative solutions, on the use of a variety of creative strategies for project management. In addition, the application of this methodology in the educational process involves teamwork, which also contributes to the development of agility and emotional intelligence.

As part of the implementation of the Design Thinking methodology in the educational process, it is planned to conduct a business game, based on the solution of a complex problem using the totality of knowledge and skills that students obtain when studying the discipline according to which the game is held. Work on the project is carried out in small groups (3–4 groups within the academic group), which are combined according to the preferences of the students themselves. Each small group chooses a direction of research either among those proposed by the teacher, or finds its own direction that corresponds to the topics of the discipline. Despite the fact that the last four years of training is carried out on-line, thanks to the use of the LMS Moodle platform, communication takes place in real time both between team members and within the academic group that helps to synchronize the process.

The game consists of five consecutive stages. At the *empathy* stage, students determine the topic on which they should develop their own project. They select statistical data and determine the criteria that this project must meet. At the stage of *analysis and synthesis*, students analyze the information received, clarify the criteria and create a scale by which they will assess the level of achievement of the goal. The stage of *idea generation* involves direct work on the project. During this stage, students determine what mathematical apparatus they will use, and apply it to process statistical data. At the stage of *building a prototype*, students present their project (a mathematical model of a certain process or phenomenon). The model must be tested using statistical data that were not used in its construction. Discussion of projects takes place with the entire academic group. The *generalization* stage involves summing up the results and receiving feedback. The teacher acts as a facilitator, that is, helping students to work together effectively, but not directly managing the game itself even at the stage of generalization.

As can be seen from the results of the study, when teaching mathematical disciplines at the Department of Economic and Mathematical Modeling, a number of methods are used that are aimed at developing soft skills both universally valid and those that will be necessary for students in their further professional activities. The question of assessing the level of soft skills remains open. Since direct assessment is possible only on qualitative scales, indirect assessment is carried out through the hard skills level. The development of such soft skills as creativity, critical thinking is considered so important in the formation of professional knowledge and skills of future economists and managers that during the final control of knowledge, in addition to the tasks of the diagnostic and stereotypical levels, which require only the use of ready-made algorithms, heuristic-level tasks were added to the exam ticket. This is a problem of economic content with real data, the solution of which involves the choice and substantiation of the research method, as well as the search and verification of alternative options. Comparison of the performance of students in whose teaching interactive technologies were used with the success of those for whom the teaching of mathematical disciplines was carried out according to traditional teaching methods, indicates the effectiveness of interactive methods in increasing the level of assimilation of professional knowledge. Students in such groups were more active during classes, and during the final control they provided more complete and reasonable answers to heuristic tasks, demonstrating a clear understanding of the material, creativity, independence, constructive skills, and received better results. For example, during the final control in the discipline of Probability Theory and Mathematical Statistics, the average score in such

groups was 34.2 points against 29.8 points in groups with traditional teaching methods (the maximum score for the exam is 40 points). Also, students of such groups showed better results when conducting intermediate control in the form of tests and colloquia. On average, the results were 9–12% better than those of students in groups where training was carried out according to traditional methods. If we compare the results of the current year of study with the previous one, it should be noted that academic performance within the academic group cannot be considered distributed according to a unimodal law that is close to normal (which was observed three or four years ago). Instead, there is a division of students into two groups, some of which have the opportunity to attend classes and complete tasks in a timely manner, while the other does not have such an opportunity. Therefore, the law of distribution becomes bimodal. It is clear that the performance of students of the second group is lower for objective reasons. Therefore, when analyzing the impact of the development of soft skills on the effectiveness of hard skills acquisition, only the learning outcomes of those students who regularly attended classes were taken into account.

CONCLUSIONS

Experience of the Department of Economic and Mathematical Modeling of Simon Kuznets KhNUE says that the use of general methods of soft skills development in the process of studying mathematical disciplines contributes to greater success in the acquisition of knowledge and skills, which will later become the basis of hard skills of future economists and managers. Especially effective were our own interactive technologies for activating the educational process, the theoretical basis of which is Design Thinking. It is thanks to soft skills that the student comes to a deeper understanding of mathematical methods, to an understanding of their essence. The use of these general methods contributes not only to the development of such soft skills, which are important life skills of every person and which will further contribute to the success of a person in any field of his activity, but also indirectly contributes to the development of hard skills. Therefore, the use of innovative technologies in the educational process contributes to ensuring such a level of human development that meets the modern requirements of the knowledge economy.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest in connection with the current research, including financial, personal, authorial, or any other that could affect the research and results presented in this article. ■

BIBLIOGRAPHY

1. Fine B. Endogenous growth theory: a critical assessment. *Cambridge Journal of Economics*. 2000. Vol. 24. Iss. 2. P. 245–265. URL: https://www.jstor.org/stable/23600721
2. Onyimadu C. O. An overview of endogenous growth models: Theory and critique. *International Journal of Physical and Social Sciences*. Vol. 5. Iss. 3. P. 498–514. DOI: http://dx.doi.org/10.2139/ssrn.2685545
3. Chandra R. Endogenous Growth in Historical Perspective: From Adam Smith to Paul Romer. Palgrave Macmillan, 2022. DOI: https://doi.org/10.1007/978-3-030-83761-7
4. Romer P. M. Endogenous technological change. *Journal of Political Economy*. 1990. Vol. 98. No. 5. Part 2: The Problem of Development : A Conference of the Institute for the Study of Free Enterprise Systems. (Oct., 1990). P. 71–102. URL: http://www.jstor.org/stable/2937632
5. Глобальна економіка XXI століття: людський вимір : монографія / Д. Г. Лук'яненко, А. М. Поручник, А. М. Колот та ін. Київ : КНЕУ, 2008. 420 с.
6. Liening A. Growth Theory and Endogenous Human Capital Development: A Contribution to the Theory of Complex Systems. *Theoretical Economics Letters*. 2013. Vol. 3. P. 96–104. DOI: 10.4236/tel.2013.32016
7. Cinnirella F., Streb J. The role of human capital and innovation in economic development: evidence from post-Malthusian Prussia. *Journal of Economic Growth*. 2017. Vol. 22. P. 193–227. DOI: https://doi.org/10.1007/s10887-017-9141-3
8. Gruzina Y., Firsova I., Strielkowski W. Dynamics of human capital development in economic development cycles. *Economies*. 2021. Vol. 9. Iss. 2. Art. 67. DOI: https://doi.org/10.3390/economies9020067
9. Honchar M., Grybyk I., Honchar S. et al. State regulation of investments in innovative development of industry to strengthen financial security in the context of Industry 4.0. *Financial and Credit Activities: Problems of Theory and Practice*. 2024. No. 1. P. 397–391. DOI:https://doi.org/10.55643/fcaptp.1.54.2024.4273
10. Andersson F., Konrad K. A. Human capital investment and globalization in extortionary states. *Journal of Public Economics*. 2003. Vol. 87. Iss. 7–8. P. 1539–1555. DOI: https://doi.org/10.1016/S0047-2727(01)00201-8
11. Reimagining Human Capital in the Fourth Industrial Revolution. International Labour Organization. URL: https://www.ilo.org/meetings-and-events/reimagining-human-capital-fourth-industrial-revolution
12. Altiner A., Toktas Y. Relationship between Human Capital and Economic Growth: An Application to Developing Countries. *Eurasian Journal of Economics and Finance*. 2017. Vol. 5. Iss. 3. P. 87–98. DOI: 10.15604/ejef.2017.05.03.007
13. Цимбал Л. І. Людський потенціал як основа розвитку економіки знань. *Проблеми і перспективи*

економіки та управління. 2021. № 4. С. 23–29. URL: http://ppeu.stu.cn.ua/article/view/97535
14. Abdulla K. New evidence on the role of human capital in economic development. *Applied Economics*. 2022. Vol. 55. Iss. 10. P. 1062–1073. DOI: https://doi.org/10.1080/00036846.2022.2095348
15. Guo Q. W., Lv B. Y., Zhang D. Y. Fiscal expenditure structure and economic growth. *Economic Theory and Economic Management*. 2003. Vol. 11. P. 5–12.
16. Su Y. Nonlinear Effect of Human Capital on Economic Growth. *American Journal of Theoretical and Applied Business*. 2021. Vol. 7. Iss. 4. P. 137–145. DOI: https://doi.org/10.11648/j.ajtab.20210704.19
17. Chou Y. K. The Australian Growth Experience, 1960–2000: Human Capital, R&D or Steady-State Growth? *The Australian Economic Review*. 2003. Vol. 36. Iss. 4. P. 397–414. DOI: https://doi.org/10.1111/j.1467-8462.2003.00297.x
18. Sarwar A., Khan M. A., Sarwar Z., Khan W. Financial development, human capital and its impact on economic growth of emerging countries. *Asian Journal of Economics and Banking*. 2021. Vol. 5. Iss. 1. P. 86–100. DOI: https://doi.org/10.1108/AJEB-06-2020-0015
19. Okoye K., Nganji J. T., Escamilla J. et al. Impact of global government investment on education and research development: A comparative analysis and demystifying the science, technology, innovation, and education conundrum. *Global Transitions*. 2022. Vol. 4. P. 11–27. DOI: https://doi.org/10.1016/j.glt.2022.10.001
20. Leoni S. A Historical Review of the Role of Education: From Human Capital to Human Capabilities. *Review of Political Economy*. 2023. P. 1–18. DOI: https://doi.org/10.1080/09538259.2023.2245233
21. Цілі сталого розвитку: Україна. Національна доа повідь. 2017. URL: https://www.kmu.gov.ua/storage/app/sites/1/natsionalna-dopovid-csr-Ukrainy.pdf
22. Guliyeva A., Aliyeva T., Rzayeva U., Huseynova R. Lifelong education as a challenge of digital era. *Turkish Journal of Computer and Mathematics Education*. 2021. Vol. 12. No. 6. P. 1282–1289. DOI: https://doi.org/10.17762/turcomat.v12i6.2468
23. Cvetanović D., Despotović D., Cvetanović S. Education and skills as components of human capital. *Knowledge – International Journal*. 2018. Vol. 23. Iss. 1. P. 25–31. URL: https://journals.indexcopernicus.com/search/article?articleId=2301808
24. Розвиток Soft Skills. Робоча програма навчальч ної дисципліни для здобувачів всіх спеціальностей першого (бакалаврського) рівня / укл. Котельникова Ю. М. Харків : ХНЕУ ім. С. Кузнеця, 2023. 10 с. URL: http://repository.hneu.edu.ua/handle/123456789/31567
25. What are the most effective problem-solving skills for data analysis? URL: https://www.linkedin.com/advice/3/what-most-effective-problem-solving-skills-data-analysis-oumvf
26. Lebedev S. S. Digital transformation of society: business management by human potential development. Transformation of the Economy, Finance and Management in a Pandemic: The Development of Digital Technologies : Collective monograph. Poland : Publishing House "Baltija Publishing". P. 225–241. DOI: https://doi.org/10.30525/978-9934-26-108-4-15
27. Lebedeva I., Norik L., Lebedev S. Development of human potential: Design thinking as a way of improving professional competencies of economists. *Development Management*. 2022. Vol. 20. No 1. P. 43–52. DOI: 10.57111/devt.20(1).2022.43-52
28. Chasanidou D., Gasparini A. A., Lee E. Design Thinking Methods and Tools for Innovation. In: Marcus, A. (eds) *Design, User Experience, and Usability: Design Discourse. Lecture Notes in Computer Science* (LNISA). 2015. Vol. 9186. P. 12–23. DOI: https://doi.org/10.1007/978-3-319-20886-2_2
29. Lebedeva I., Norik L., Lebedev S. Digital resources as a way to increase the motivation of economic specialties students in studies of mathematics. *Educational Challenges*. 2022. Vol. 27. Iss. 2. P. 105–121. DOI: https://doi.org/10.34142/2709-7986.2022.27.2.08

REFERENCES

Abdulla, K. "New evidence on the role of human capital in economic development". *Applied Economics*, vol. 55, no. 10 (2022): 1062-1073. DOI: https://doi.org/10.1080/00036846.2022.2095348

Altiner, A., and Toktas, Y. "Relationship between Human Capital and Economic Growth: An Application to Developing Countries". *Eurasian Journal of Economics and Finance*, vol. 5, no. 3 (2017): 87-98. DOI: 10.15604/ejef.2017.05.03.007

Andersson, F., and Konrad, K. A. "Human capital investment and globalization in extortionary states". *Journal of Public Economics*, vol. 87, no. 7-8 (2003): 1539-1555. DOI: https://doi.org/10.1016/S0047-2727(01)00201-8

Chandra, R. *Endogenous Growth in Historical Perspective: From Adam Smith to Paul Romer*. Palgrave Macmillan, 2022. DOI: https://doi.org/10.1007/978-3-030-83761-7

Chasanidou, D., Gasparini, A. A., and Lee, E. "Design Thinking Methods and Tools for Innovation". In *Design, User Experience, and Usability: Design Discourse*. Lecture Notes in Computer Science (LNISA), 12-23. 2015. DOI: https://doi.org/10.1007/978-3-319-20886-2_2

Chou, Y. K. "The Australian Growth Experience, 1960-2000: Human Capital, R&D or Steady-State Growth?" *The Australian Economic Review*, vol. 36, no. 4 (2003): 397-414. DOI: https://doi.org/10.1111/j.1467-8462.2003.00297.x

Cinnirella, F., and Streb, J. "The role of human capital and innovation in economic development: evidence

from post-Malthusian Prussia". *Journal of Economic Growth*, vol. 22 (2017): 193-227. DOI: https://doi.org/10.1007/s10887-017-9141-3

Cvetanovic, D., Despotovic, D., and Cvetanovic, S. "Education and skills as components of human capital". *Knowledge – International Journal*, vol. 23, iss. 1 (2018): 25-31. https://journals.indexcopernicus.com/search/article?articleId=2301808

Fine, V. "Endogenous growth theory: a critical assessment". *Cambridge Journal of Economics*, vol. 24. iss. 2 (2000): 245-265. https://www.jstor.org/stable/23600721

Gruzina, Y., Firsova, I., and Strielkowski, W. "Dynamics of human capital development in economic development cycles". *Economies*,art. 67, vol. 9, no. 2 (2021). DOI: https://doi.org/10.3390/economies9020067

Guliyeva, A. et al. "Lifelong education as a challenge of digital era". *Turkish Journal of Computer and Mathematics Education*, vol. 12, no. 6 (2021): 1282-1289. DOI: https://doi.org/10.17762/turcomat.v12i6.2468

Guo, Q. W., Lv, B. Y., and Zhang, D. Y. "Fiscal expenditure structure and economic growth". *Economic Theory and Economic Management*, vol. 11 (2003): 5-12.

Honchar, M. et al. "State regulation of investments in innovative development of industry to strengthen financial security in the context of Industry 4.0". *Financial and Credit Activities: Problems of Theory and Practice*, no. 1 (2024): 397-391. DOI:https://doi.org/10.55643/fcaptp.1.54.2024.4273

Lebedev, S. S. "Digital transformation of society: business management by human potential development". In *Transformation of the Economy, Finance and Management in a Pandemic: The Development of Digital Technologies*, 225-241. Poland: Publishing House "Baltija Publishing". DOI: https://doi.org/10.30525/978-9934-26-108-4-15

Lebedeva, I., Norik, L., and Lebedev, S. "Development of human potential: Design thinking as a way of improving professional competencies of economists". *Development Management*, vol. 20, no. 1 (2022): 43-52. DOI: 10.57111/devt.20(1).2022.43-52

Lebedeva, I., Norik, L., and Lebedev, S. "Digital resources as a way to increase the motivation of economic specialties students in studies of mathematics". *Educational Challenges*, vol. 27, no. 2 (2022): 105-121. DOI: https://doi.org/10.34142/2709-7986.2022.27.2.08

Leoni, S. "A Historical Review of the Role of Education: From Human Capital to Human Capabilities". *Review of Political Economy* (2023): 1-18. DOI: https://doi.org/10.1080/09538259.2023.2245233

Liening, A. "Growth Theory and Endogenous Human Capital Development: A Contribution to the Theory of Complex Systems". *Theoretical Economics Letters*, vol. 3 (2013): 96-104. DOI: 10.4236/tel.2013.32016

Lukianenko, D. H. et al. *Hlobalna ekonomika XXI stolittia: liudskyi vymir* [The Global Economy of the 21st Century: The Human Dimension]. Kyiv: KNEU, 2008.

Okoye, K. et al. "Impact of global government investment on education and research development: A comparative analysis and demystifying the science, technology, innovation, and education conundrum". *Global Transitions*, vol. 4 (2022): 11-27. DOI: https://doi.org/10.1016/j.glt.2022.10.001

Onyimadu, C. O. "An overview of endogenous growth models: Theory and critique". *International Journal of Physical and Social Sciences*, vol. 5, no. 3: 498-514. DOI: http://dx.doi.org/10.2139/ssrn.2685545

"Reimagining Human Capital in the Fourth Industrial Revolution". *International Labour Organization*. https://www.ilo.org/meetings-and-events/reimagining-human-capital-fourth-industrial-revolution

"Rozvytok Soft Skills. Robocha prohrama navchalnoi dystsypliny dlia zdobuvachiv vsikh spetsialnostei pershoho (bakalavrskoho) rivnia" [Development of Soft Skills. The Working Program of the Academic Discipline for Applicants of all Specialties of the First (Bachelor) Level]. Kharkiv : KhNEU im. S. Kuznetsia, 2023. http://repository.hneu.edu.ua/handle/123456789/31567

Romer, P. M. "Endogenous technological change". *Journal of Political Economy*. 1990. http://www.jstor.org/stable/2937632

Sarwar, A. et al. "Financial development, human capital and its impact on economic growth of emerging countries". *Asian Journal of Economics and Banking*, vol. 5, no. 1 (2021): 86-100. DOI: https://doi.org/10.1108/AJEB-06-2020-0015

Su, Y. "Nonlinear Effect of Human Capital on Economic Growth". *American Journal of Theoretical and Applied Business*, vol. 7, no. 4 (2021): 137-145. DOI: https://doi.org/10.11648/j.ajtab.20210704.19

"Tsili staloho rozvytku: Ukraina. Natsionalna dopovid" [Goals of Sustainable Development: Ukraine. National Report]. https://www.kmu.gov.ua/storage/app/sites/1/natsionalna-dopovid-csr-Ukrainy.pdf

Tsymbal, L. I. "Liudskyi potentsial yak osnova rozvytku ekonomiky znan" [Human Capital as Foundation Development Knowledge Economy]. *Problemy i perspektyvy ekonomiky ta upravlinnia*, no. 4 (2021): 23-29. http://ppeu.stu.cn.ua/article/view/97535

"What are the most effective problem-solving skills for data analysis?" https://www.linkedin.com/advice/3/what-most-effective-problem-solving-skills-data-analysis-oumvf