

## **INTERNATIONAL PRACTICES OF EDUCATION PROVIDERS' DEVELOPMENT**

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### **WORLD TRENDS OF DOCTORAL EDUCATION AS A CONCEPTUAL BASIS FOR TRAINING THE DOCTORS OF PHILOSOPHY IN UKRAINE**

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#### **INTRODUCTION**

In the context of reforming the higher education system of Ukraine and implementation of its third cycle, the universities as the main centers of training for future doctors of philosophy are faced with the question of the need to develop a new model of training scientific, scientific and pedagogical staff, based on the best world traditions and practices.

As part of our research, we set out to analyze current trends in the development of doctoral education in Europe and in the world, based on which to define the conceptual foundations for PhD training in Ukraine.

A survey of foreign scientific sources and regulations showed that radical changes in doctoral training have taken place in Europe and in other regions of the world over the last fifteen years. These changes include broader access to doctoral programs (massification of doctoral education), the establishment of doctoral schools and the shifting away from the Apprenticeship model (institutionalization of doctoral education), the introduction of structured educational programs and a competence-based approach to learning outcomes (structuring and standardization of doctoral education), extension of provided qualifications and employment opportunities (professionalization of doctoral education), integration of project-based approach to doctoral training (projectification of doctoral education); increasing the mobility of PhDs (internationalization of doctoral education); development of information and communication technologies (informatization of educational and scientific process of PhD training), etc.

The increasing social demand for the training of higher education professionals and the systemic policy of the European Union aimed at developing the third level of higher education have become the prerequisites for qualitative changes in doctoral education.

## 1. Increasing social demand for higher education professionals and systemic policy of the European Union aimed at the development of the third level of higher education

The development of a knowledge society<sup>1,2</sup> and, consequently, a growing social demand for the training of highly qualified specialists has become the key factor that has led to transformational changes in PhD training. The Knowledge Society has resulted in the creation of jobs in both R&D sphere: project development and management, technology transfer, consulting, spin-offs<sup>3</sup>; and ICT area: e-government, e-commerce, e-banking, which are actively being replaced by PhD holders<sup>4</sup>. Thus, in today's context, doctoral education is becoming more than just training the next generation of researchers and is increasingly seen as a powerful tool for knowledge workers to meet the needs of the global labor market<sup>5</sup>.

In March 2000, the Lisbon Strategy set an ambitious goal for European countries to become the most competitive and dynamic knowledge-based economy capable of continuous growth and, in doing so, providing more and better jobs<sup>6</sup>. In this context, higher education is a major source of human capital creation and productivity gains at the expense of economic growth and a developed social sphere. An important role is given to the doctoral level of higher education, which becomes the plane of intersection between the European Higher Education Area and the European Research Area<sup>7</sup>, and has been called the European Doctoral Education Area<sup>8</sup>.

Increasing interest in PhD training began in 2003 when the European Union Association of Universities (EUA) launched the project "Doctoral Programmes for European Knowledge Society", the results of which were

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<sup>1</sup> Nerad M. Increase in PhD production and reform in doctoral education worldwide. *Higher Education Forum*. 2010. № 7. С. 69–84.

<sup>2</sup> Teichler U. The formative years of scholars. London: Portland Press Ltd. 2006

<sup>3</sup> Mars M., Bresonis K., Szelenyi K. Science and engineering doctoral student socialization, logics, and the national economic agenda: Alignment or disconnect? *Minerva*. 2014. № 52. С. 351–379.

<sup>4</sup> Transferable skills training for researchers: Supporting career development and research. Paris: OECD Publishing. URL: <https://doi.org/10.1787/9789264179721-en>

<sup>5</sup> Shin J. C., Postiglione Gerard A., Ho K. C. Challenges for doctoral education in East Asia: a global and comparative perspective. *Asia Pacific Education Review*. 2018. № 19. С. 141–155. URL: <https://doi.org/10.1007/s12564-018-9527-8>

<sup>6</sup> Lisbon European Council 23 and 24 march 2000: presidency conclusions. *European parliament*. URL: [http://www.europarl.europa.eu/summits/lis1\\_en.htm](http://www.europarl.europa.eu/summits/lis1_en.htm)

<sup>7</sup> Enders J. Border crossings: Research training, knowledge dissemination and the transformation of academic work. *Higher education*, 2005. 49(1/2), 119–133. URL: <https://doi.org/10.1007/s10734-004-2917-3>

<sup>8</sup> Таланова Ж. В. Підготовка фахівців найвищого освітнього рівня в умовах глобалізації: аналіз світового досвіду. Дис. ... д. пед. н.: 13.00.04. Київ, 2011. 478 с.

presented at a self-titled seminar<sup>9</sup> held in 2005 in Salzburg in the framework of the Bologna process. The ten PhD training principles formulated there, known as Salzburg Principles-I, formed the basis of the 2005 Bergen Communiqué of the Ministers of Education of European Countries and provided a strong impetus for radical doctoral reform. These documents emphasize that the key role of doctoral education is to enhance knowledge through original research. However, in view of the growing social demands of the knowledge society, it should focus on the preparation of PhDs in both academic and non-academic fields; ensure the development of structured doctoral programs; increase the role of supervisors; to extend the preparation period to 3-4 years; create the conditions for the formation of key skills needed by graduates in the labor market, as well as career development; to reach a critical mass of researchers through interdisciplinary, inter-institutional, cross-sectoral, regional and international cooperation<sup>10</sup>.

Given the growing focus on doctoral training in the EUA world, the Doctoral Education Council (EUA-CDE) was established in 2008, the primary objective of which is to strengthen the doctoral research capacity of European universities by developing talented early-stage researchers in a competitive and global environment.

The second step in the development of a general doctoral education framework was the development of a set of recommendations known as Salzburg II Recommendations<sup>11</sup>.

Adopted by the EUA Council in 2010, these recommendations, first, describe the achievements of European universities in the development of doctoral education in previous years; second, expand and refine the previous principles by considering them in three key areas: recommendations for the improvement of doctoral studies as a basis for conducting original research (creating a high-quality research environment by universities and providing early-stage researchers with institutional support for their professional and personal growth); recommendations to universities on improving the organization of the doctoral student preparation process (transparent admission policy based on previous experience and research potential;

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<sup>9</sup> Bologna Seminar Doctoral Programmes for the European Knowledge Society Salzburg, 3-5 February 2005. *European University Association*. URL: <https://eua.eu/downloads/publications/salzburg%20recommendations%202005.pdf>

<sup>10</sup> Комюніке конференції міністрів вищої освіти Європи, відповідальних за сферу вищої освіти «Загальноєвропейський простір вищої освіти – досягнення цілей» Берген, 19-20 травня 2005 р. *Законодавство України*. URL: [https://zakon.rada.gov.ua/laws/show/994\\_576](https://zakon.rada.gov.ua/laws/show/994_576)

<sup>11</sup> Salzburg II Recommendations. *European Universities' Achievements Since 2005 in Implementing the Salzburg Principles*. Brussels: EUA, 2010. 8 p. URL: <https://c3qa.iqaa.kz/en/project-documents/salzburg-principles>

increasing responsibility and professional development of supervisors; doctoral students' mastery of core skills and undertaking career development activities; reservations about applying the credit rating system for measuring PhD training research component; extension of internationalization opportunities; recommendations for external stakeholders (institutional autonomy of universities on the development of doctoral education, sustainability of financing and expansion of forms of material support of doctoral students, strengthening of cross-sectoral cooperation).

Subsequently, the European Commission developed a set of seven principles for innovative doctoral studies within the European Research Area, which were approved by the Council of Ministers of the EU in 2011<sup>12</sup>. The term "innovative doctorate" in this sense means striking a balance between conducting original research, creating knowledge for complex solution of social problems, and preparing doctors for extra-academic careers.

These seven principles include the following: orientation to conducting advanced research (representatives of the new generation of researchers need to be creative, with creative thinking, autonomous and capable of taking intellectual risks); creating an attractive innovation environment (doctoral students must have favorable working conditions to become independent researchers and have career opportunities); ensuring interdisciplinarity for mutual enrichment between disciplines; intensification of intersectoral cooperation (involvement of stakeholders in education and control processes, co-financing mechanisms for doctoral students training, technology transfer); further expansion of international cooperation (joint research, double degrees, mobility); general skills training (communication skills, teamwork, entrepreneurship, project management, ethics, standardization, etc.); quality assurance of the PhD preparation procedure (providing high quality of the research environment, transparent and accountable procedures for admission, supervision, doctorate and career development).

The following central document, adopted and published by EUA in 2015<sup>13</sup>, draws attention to new aspects of doctoral training that have not been addressed before, such as research ethics and research integrity, the value of informatization and globalization for doctoral research, etc.

The preparation and drafting of these documents were accompanied by the implementation of a number of projects and research carried out by both the

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<sup>12</sup> Exploration of the implementation of the Principles for Innovative Doctoral Training in Europe. Final Report European Commission, DG RTD Reference: ARES (2011) 932978. URL: <https://ris.utwente.nl/ws/portalfiles/portal/5141476>

<sup>13</sup> Doctoral Education – Taking Salzburg Forward. Implementation and New Challenges. Brussels: EUA, 2016. 8 p. URL: [https://www.eua-cde.org/downloads/publications/2016\\_euacde\\_doctoral-salzburg-implementation-new-challenges.pdf](https://www.eua-cde.org/downloads/publications/2016_euacde_doctoral-salzburg-implementation-new-challenges.pdf)

EUA and the European Council of Doctoral Candidates and Postdoctoral Researchers (EURODOC). In particular, in 2019 the EUA published an analytical report<sup>14</sup>, highlighting the achievements of European higher education institutions in the development of doctoral education, as well as its priorities, including sustainable funding, research ethics, internationalization of postgraduate training. The quality assurance of doctoral education features prominently in the report, its main indicators are: scientific reports of doctoral students (primarily, the number and quality of publications), the promptness of obtaining a scientific degree, the qualification of staff.

In pursuit of innovative and competitive national economies, governments in many countries are currently investing heavily in doctoral education, as the OECD-UNESCO joint report states that doctoral graduates become key players in knowledge production, dissemination and application; and in support of innovation<sup>15</sup>.

The powerful social demand for highly skilled knowledge professionals and the European Union's systemic policy aimed at building a tertiary level of higher education have led to a proliferation of doctoral training in the world.

Given that the knowledge economy provides for a critical mass of doctoral graduates, their number has rapidly increased. In 2016, the proportion of doctoral degree holders reached 1.0 % in the OECD countries among the population aged 25 to 65. According to UNESCO, the number of PhD recipients increased from 2000 to 2015 by 24 times in Malaysia, by 5.5 times in Mexico, by 3.5 times in Thailand, by 2.8 times in New Zealand, by 2.3 times in Australia, by 2.2 times in Norway, by 2.1 times in Canada, by 1.7 times in the USA, by 1.5 times in France and Portugal, by 1.4 times in Japan, by 1.3 times in Germany, by 1.1 times in Sweden. In 2015, most doctoral degrees were awarded by US universities (67,500), followed by Chinese universities, which trained 54.9 thousand doctors<sup>16</sup>.

As seen from the above data, the largest increase in the number of PhDs was reported by East Asian countries; they are followed by Australia, Norway, Canada, the USA, which have shown double growth, mainly due to the increase in foreign applicants. The increasing number of applicants seeking a doctoral degree is due to the fact that it opens up more opportunities for employment, including outside academia.

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<sup>14</sup> Doctoral Education in Europe Today: Approaches and Institutional Structures. Survey. / Hasgall A., Saenen B., Borrell-Damian L. Berlin: European University Association, 2019. 40 p. URL: <https://eua.eu/downloads/publications/online%20eua%20cde%20survey%2016.01.2019.pdf>

<sup>15</sup> Auriol L., Schaaper M., Felix, B. Mapping careers and mobility of doctorate holders: Draft guidelines, model questionnaire and indicators. 15.08.2013. URL: <http://dx.doi.org/10.1787/5k4dnq2h4n5c-en>

<sup>16</sup> Distribution of enrollment by level of tertiary education. 2017. URL: <http://data.uis.unesco.org/>

In the era of global technological advancement, doctoral graduates find many professional opportunities that allow them to use the knowledge and skills acquired during their doctoral studies. For example, among those who received their doctorate in America in 2015, 48.5 % were later employed in science, 32.4 % – in industry, 7.5 % – in management<sup>17</sup>.

Therefore, the reality is that a decreasing number of PhDs, whose preparation was traditionally research-oriented, go to university; more and more, their careers lie outside academia, so doctoral training should provide greater employment opportunities for graduates.

In this paradigm, the emphasis in doctoral education is gradually shifting from the preparation of a “PhD as a product”, assessing their contribution to the development of knowledge through conducting original research, to the preparation of a “PhD as a process”, that is, training that will provide them with the competencies necessary to become knowledge workers for the needs of the global labor market in the knowledge economy<sup>18</sup>.

A significant increase in the number of doctoral students and the demands of the labor market to widen the range of their knowledge and skills required a fundamental change in approaches to the organization and content of doctoral training.

## **2. Institutionalization, structuring, professionalization, and informatization of doctoral education**

Traditionally, there were two models of doctoral training: American and European. The American model, in addition to writing and presenting a dissertation, includes powerful coursework consisting of a series of specific courses where students have to gain knowledge in their field, acquire research skills, and then pass a qualifying exam<sup>19</sup>.

Unlike in the United States, in Europe, there was the so-called Apprenticeship model, which focused more on the individual control by the professor in the preparation of doctoral students who do not have a compulsory academic training, but have to pass several methodological seminars in accordance with their own needs or supervisor's recommendations, and participate in research projects to develop research skills. Therefore, most doctoral students prepare their dissertation through

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<sup>17</sup> Doctoral Recipients from U.S. Universities: 2015. US National Science Foundation. URL: <https://www.nsf.gov/statistics/2017/nsf17306/>

<sup>18</sup> Durette B., Fournier M., Lafon M. The core competencies of PhDs. *Studies in Higher Education*. 2016. Vol. 41. Iss. 8. Pp. 1–33

<sup>19</sup> Shin J.C., Postiglione G., Ho K.C. Challenges for doctoral education in East Asia: a global and comparative perspective. *Asia Pacific Education Review*. 2018. № 19. C. 141–155. URL: <https://doi.org/10.1007/s12564-018-9527-8>

self-education and self-development of the necessary skills without much supervision, since European and British traditions rely on the fact that a doctoral student is a researcher rather than a student.

However, these approaches have begun to undergo significant changes in relation to the Bologna processes. Modern doctoral education system is aimed at combining both models, i.e. it requires both coursework and intensive monitoring by the supervisor or group of supervisors. Although in some countries, such as Germany, both models of PhD training continue to operate in parallel.

As shown<sup>20</sup>, the first is an individual doctoral study, when a doctoral student must find a supervisor and conduct a research under his supervision, either at the university, industry, or research organization. The second way is through structured doctoral programs. Here, the mentoring team is responsible for advising doctoral students enrolled in the program, which includes specialized disciplines, multidisciplinary courses and seminars, teaching activities, studying soft skills and management, and provides additional academic achievement: participation in presentations and conferences, publications in peer-reviewed journals, the guidance of bachelor and master theses. The Doctorate Board is responsible for the preparation of the Doctors of Philosophy, and the training of doctoral students is increasingly implemented through specially created doctoral schools and similar structures, the emergence of which is due to the complication of the process of doctoral students' training, the need to ensure its transparency, openness, objectivity, as well as increasing the responsibility of the university for the quality of education provided.

According to the authors of the paper<sup>21</sup>, over the last decade, a significant number of higher education systems in Europe have shifted their doctoral training paradigms from the traditional so-called Humboldt model to the so-called professional model, which, on the one hand, focuses on the labor market and, on the other hand, mostly preserves traditional disciplinary approach. The authors argue that the new method of knowledge production requires the replacement of a disciplinary model by a hybrid model that crosses not only disciplinary but also organizational boundaries. The article states that the diversity of organizational and structural forms, as well as different criteria and validation procedures, will apparently determine the future of PhD students' training.

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<sup>20</sup> Muerza Marín M.-V. PhD training program activities from a global perspective. A comparison between two European Universities. In: *Innovative strategies for Higher Education in Spain*. Eindhoven, NL: Adaya Press, 2018. P. 123–130

<sup>21</sup> Enders J. Border crossings: Research training, knowledge dissemination and the transformation of academic work. *Higher Education*. 2005. 49. P. 119–133.

Along with the emergence of various organizational and structural forms of doctoral training, its increasing professionalization is observed.

The Knowledge Society is demanding more and more interdisciplinary knowledge from PhDs, since only specialized knowledge that formed the basis of traditional PhD training is insufficient so far. According to the authors of the paper<sup>22</sup>, doctoral training should provide a broader range of competences, as purely academic disciplines based on narrow knowledge are not sufficient to meet public needs. General competences are crucial in such new areas as entrepreneurship, social interaction and are no less in demand than research and teaching competences<sup>23</sup>.

As noted in the EUA report, when recruiting PhD-qualified staff, particular attention is paid to employers' creative capacity, so that the graduates could integrate knowledge from different disciplines to create new or improve existing solutions; as well as key skills such as communication, leadership, creativity, problem-solving, adaptation to change<sup>24</sup>.

This perspective requires significant changes in doctoral programs. In order to avoid subjectivism in the evaluation of doctoral student's achievements, there should also be a certain system of criteria, which will allow evaluating the knowledge and skills of the doctor of philosophy in the XXI century. American researchers<sup>25</sup> propose to solve this problem using a competence-based approach, since today's grading of graduate students is still carried out quite formally, mainly on the basis of submission and defense of the thesis.

In view of this, they offered ten categories of competences that are common to all PhDs regardless of their specialty, in particular: broad conceptual knowledge of the field, deep knowledge of their chosen scientific specialty, critical thinking, experimental skills, responsible research conducting, information skills, collaboration and teamwork, communication skills, leadership and management, survival skills. A similar study was

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<sup>22</sup> Austin A. E., McDaniels, M. Preparing the professoriate of the future: Graduate student socialization for faculty roles. In J.C. Smart (Ed.), *Higher education: Handbook of theory and research*. 2006. Vol. XXI. Pp. 397–456

<sup>23</sup> Shin J. C., Postiglione G., Ho K. C. Challenges for doctoral education in East Asia: a global and comparative perspective. *Asia Pacific Education Review*. 2018. No. 19. Pp. 141–155. URL: <https://doi.org/10.1007/s12564-018-9527-8>

<sup>24</sup> Borrell-Damián L. Collaborative Doctoral Education: University-Industry Partnerships for Enhancing Knowledge Exchange. DOC-CAREERS Project. *European University Association*. 09.06.2008. URL: <https://eua.eu/resources/publications/649:collaborative-doctoral-education-university-industry-partnerships-for-enhancing-knowledge-exchange.html>

<sup>25</sup> Verderame M., Freedman V., Kozlowski L. Competency-based assessment for the training of PhD students and early-career scientists. *ELIFE*. 2018. Vol. 7. No. e34801. URL: <https://doi.org/10.7554/eLife.34801.001>

conducted by authors<sup>26</sup> who have developed their own PhD competencies framework that can serve as a basis for developing a doctoral program by formulating the objective and expected results of the training. The proposed approach is the foundation for the systematic monitoring and evaluation of doctoral students' development, as well as for identifying weaknesses that need improvement.

It should be borne in mind that doctoral training is a complex process that cannot be reduced to a simple list of competences or skills. According to the French scientists, in this case, they are a means of communication (common language) between holders of doctoral diplomas and employers to evaluate the experience gained, and can also serve as a tool for further analysis to match the results of doctoral training and the needs of the labor market<sup>27</sup>.

Another important area of doctoral education professionalization is the inclusion in its Career development activity program. A survey conducted among the US PhD students regarding their prospects for future work showed that 55.2 % of respondents did not decide on their career goals<sup>28</sup>, which indicates that graduates are not well aware of their capabilities. The authors of the study conclude that Career development activity must be incorporated into the official curriculum. A similar view is expressed in papers<sup>29, 30</sup> that, during their studies, PhD students should reconsider the ways they are promoting themselves and critically evaluate success rates, that is, have a career development program that provides career training, Guidance and Mentoring, starting with early stages of preparation.

A powerful career development strategy is developed, for example, at the University of Wisconsin-Madison, which includes, in addition to the development of professional competences, such innovative elements as Career coaching, Individual Career Development Plan and Personal Career SWOT-analysis<sup>31</sup>.

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<sup>26</sup> Byars-Winston A., Gutierrez B., Topp S., Carnes M. Integrating Theory and Practice to Increase Scientific Workforce Diversity: A Framework for Career Development in Graduate Research Training. *CBE—Life Sciences Education*. 2011. Vol. 10. Pp. 357–367.

<sup>27</sup> Durette B., Fournier M., Lafon M. The core competencies of PhDs. *Studies in Higher Education*. 2016. Vol. 41. Iss. 8. Pp. 1–33

<sup>28</sup> Kenneth D., Gibbs J., Kimberly A. What Do I Want to Be with My PhD? The Roles of Personal Values and Structural Dynamics in Shaping the Career Interests of Recent Biomedical Science PhD Graduates. *CBE—Life Sciences Education*. 2013. Vol. 12. Pp. 711–723

<sup>29</sup> Jackson D., Michelson G., Factors influencing the employment of Australian PhD graduates. *Studies in Higher Education*. 2015. Vol. 40. Iss.9. URL: <https://doi.org/10.1080/03075079.2014.899344>

<sup>30</sup> Woodson T., Harsh M., Foley R. Non-Academic Careers for STS Graduate Students: Hopping of the Tenure Track. *Minerva*. 2018. Vol. 56. Iss. 4. Pp. 529–535. URL: <https://doi.org/10.1007/s11024-018-9360-6>

<sup>31</sup> Byars-Winston A., Gutierrez B., Topp S., Carnes M. Integrating Theory and Practice to Increase Scientific Workforce Diversity: A Framework for Career Development in Graduate Research Training. *CBE—Life Sciences Education*. 2011. Vol. 10. Pp. 357–367.

Information and communication technologies have a great influence on the preparation of a competitive PhD. Modern world education systems are undergoing tremendous transformations related to the development of ICT. In particular, the examples of the use of Blended Learning as one of the most effective ways of combining the traditional formal personalized model of education with modern, non-formal, multimedia education are widely covered in foreign literature<sup>32</sup>.

The use of this method of teaching is quite convenient and effective as it allows students to express their thoughts and ask questions without restriction while meeting their different learning needs and styles. ICT forms include both face-to-face learning and Learning Management systems, consultations, support from other departments, monitoring, evaluation, etc.<sup>33</sup>

The authors of the article<sup>34</sup> give an example of the use of such a method of teaching as Immersive Learning, which is realized with the help of a developed interactive web-based tool that allows doctoral students to work in interaction and take on different roles: teacher, assessor, student, and enables the teacher to quantify, analyze the contribution of each PhD student and observe common aspects of studying through information technology.

The work<sup>35</sup> reveals the role of Massively Multiplayer Online Games (MMOG) with many users as a medium (tool) for the development of 21st-century skills such as leadership. The point is that in-game skills can help PhD students become more emotionally intelligent in real life and in the workplace. And MMOG leaders with high level of emotional intelligence can become leaders of transformations that inspire team members and enhance their cohesion and efficiency.

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<sup>32</sup> Vranes A., Markovic L. Implementation of Blended Learning at the PhD Level of Study on the Example of the Faculty of Philology (University of Belgrade). *INTED2015: 9th International Technology, Education and Development Conference, Madrid. INTED Proceedings*. 2015. P. 5086–5092.

<sup>33</sup> Nkhukhu-Orlando E. Technological Changes at the University of Botswana: Academics and Blended Learning. 14th European Conference on E-Learning (ECEL), Univ Hertfordshire, Hatfield, ENGLAND, OCT 29-30, 2015. *Proceedings of the 14th European Conference on E-Learning (Ecel 2015)*. 2015. P. 730–736.

<sup>34</sup> Ly S., Morin D. Immersive Learning: Using a Web-Based Learning Tool in a PhD Course to Enhance the Learning Experience. *Journal of Information Technology Education-Research*. 2017. Vol. 16. P. 227–246.

<sup>35</sup> Mysirlaki S., Paraskeva F. Training Emotionally Intelligent Leaders: The Case of Massively Multiplayer Online Games. 9th European Conference on Games-Based Learning (ECGBL), Nord Trondelag Univ Coll, Steinkjer, Norway. Oct 08-09, 2015. *Proceedings of the 9th European Conference on Games Based Learning (ECGBL 2015)*. 2015. P. 687–699.

In<sup>36</sup> the focus is on the emergence of digital (smart) classrooms and the desire of teachers to use as many different digital tools as possible in classrooms, including the application of electronic boards and textbooks.

The author of<sup>37</sup> is talking about using online communities like #ECRchat on Twitter as one of the effective career planning activities. Similar communities are a discussion platform where graduate students communicate with their peer mentors about their future careers, which enables them to address their own needs in this direction.

The paper<sup>38</sup> demonstrates how a fully-fledged electronic thesis preparation and defense system is introduced at an Australian university. All the necessary documents (patents, articles, etc.), as well as the dissertation itself (which immediately goes to the university's online depository and becomes available to all interested persons), are submitted solely in electronic form. The quality of the submitted materials is guaranteed by the electronic signature of the key scientists in the developed special form. There are also electronic forms for monitoring and reporting of doctoral students on the results of their studies and thesis work. Thus, a complete rejection of paper documents was demonstrated, which significantly saves time, human and material resources, as well as facilitates the process of studying and defending the thesis.

Thus, as stated above, information and communication technologies have become an integral part of all the components of the multifaceted process of PhD training, which have greatly improved its quality and effectiveness. Another vector for the development of doctoral training is the application of project technologies and the enhancement of interdisciplinary, cross-sectoral collaboration as well as regional and international cooperation.

### **3. Enhancing interdisciplinary, cross-sectoral cooperation and regional and international cooperation**

As it is noted in the work<sup>39</sup>, in recent decades a new agreement has been formed between the authorities and the universities, the essence of which is that in exchange for public funding, scientists and universities must address the needs of economy and society. In this case, according to the authors'

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<sup>36</sup> Vranes A., Markovic L. Implementation of Blended Learning at the PhD Level of Study on the Example of the Faculty of Philology (University of Belgrade). INTED2015: 9th International Technology, Education and Development Conference, Madrid. *INTED Proceedings*. 2015. P. 5086–5092.

<sup>37</sup> Ferguson H., Wheat K. Early career academic mentoring using Twitter: the case of #ECRchat. *Journal of Higher Education Policy and Management*. 2015. Vol. 37. No. 1. P. 3–10.

<sup>38</sup> Gasson S. Supporting quality timely PhD completions: delivering research outcomes. *Quality in Higher Education*. 2015. Vol. 21. No. 1. SI. P. 79–88.

<sup>39</sup> Martin B., Etzkovitz H. The Origin and Evolution of the University System. *SPRU Electronic Working Paper Series*. 2000. 59 (December)

definition<sup>40</sup>, the university acts as an institutional foundation and integrator of regional ecosystem, which, having powerful human resources, can serve as a means of solving regional problems/needs.

The stated role (mission) of higher education institutions is usually interpreted in the literature through such metaphors as social commitment, knowledge/technology transfer, third mission, entrepreneurial activity, social indemnity, etc. However, universities, for the most part, turn out to be unprepared for such social challenges. The university community opposes such a vision of doctoral training, which leads to a debate in the academic environment, especially in the humanities. Currently, less than half of lecturers are involved in commercially or socially-oriented research, indicating that university scholars are mostly not ready to work in professional fields<sup>41</sup>.

However, the policy in Europe is becoming increasingly focused on enhancing synergies between the academic and manufacturing sectors<sup>42</sup>. Similar trends are observed in other regions of the world, including Australia<sup>43</sup> and the USA<sup>44</sup>, although in America this process started a little earlier. Based on the report entitled “Reforming Higher Education of Scientists and Engineers”, prepared by the National Academy of Sciences back in 1995, the Committee on Science, Technology and Public Policy (COSEPUP) has proposed a modified PhD training model that emphasizes intensive, research-based experience while gaining additional experience to suit the increasingly diverse labor market. The National Science Foundation (NSF) subsequently established the Integrative Learning and Research Program (IGERT) to facilitate the interdisciplinary training of doctoral students<sup>45</sup>.

In recent years, many European universities have reorganized their doctoral programs and, overall, Europe is becoming a world leader in doctoral education reform, including in the area of expanding university-industry

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<sup>40</sup> Celuch K., BourdeauB., KhayumM., TownsendL. The role of the university in accelerated learning and innovation as a regional ecosystem integrator. *Journal of Research in Innovative Teaching&Learning*. 2017. Vol. 10. Iss. 1. P. 34–47. URL: <https://doi.org/10.1108/JRIT-10-2016-0009>

<sup>41</sup> Shin J. C., Postiglione G, Ho K. Challenges for doctoral education in East Asia: a global and comparative perspective. *Asia Pacific Education Review*. 2018. № 19. C. 141–155. URL:<https://doi.org/10.1007/s12564-018-9527-8>

<sup>42</sup> Koch C. Bologna seminar on doctoral programmes for the European knowledge society. *European University Association*. 2005. URL: [http://new.eua.be/eua/jsp/en/upload/Salzburg\\_Report\\_final.1129817011146.pdf](http://new.eua.be/eua/jsp/en/upload/Salzburg_Report_final.1129817011146.pdf)

<sup>43</sup> Neumann R., Tan. K. From PhD to initial employment: the doctorate in a knowledge economy. *Studies in Higher Education*. 2011. No. 36(5). Pp. 601–614.

<sup>44</sup> Kehm B.M. 2006. Doctoral education in Europe and North America: a comparative analysis. *Wenner Gren International Series*. 2006. No. 83. Pp. 67–68.

<sup>45</sup> Martin P., Umberger B. Trends in interdisciplinary and integrative graduate training: An NSF IGERT example. *QUEST*. 2003. Vol. 55. Iss. 1. Pp. 86–94.

partnership as one way of enhancing the employment opportunities of doctoral students<sup>46</sup>.

Doctoral training is increasingly seen as part of an agreement on cooperation between enterprises, the state and universities, which are parts of the famous “triple helix” H. Etzkowitz. The “university-power-production” triple helix is a model that demonstrates the mechanism for developing a knowledge-based economy, focusing on expanding the role of knowledge in society and giving the university a central role as the generator of innovations in this process<sup>47</sup>.

In this interaction, a doctoral student can act in three positions: as a leading producer of knowledge in joint research projects; as an important channel of knowledge transfer from university to business and as a link between government, university and business<sup>48</sup>.

This has contributed to the emergence of numerous interdisciplinary programs with a focus on innovation and entrepreneurship, as well as an increase in the number of doctoral students in STEM. The OSER data show that in most countries, their numbers have grown up by over 60 %<sup>49</sup>.

At present, there is no single model of collaborative PhD training. These may be the initiatives of large, medium and small businesses, university management, public-private partnership structures<sup>50</sup>.

Some examples of such forms of training were described in our work<sup>51</sup>. For instance, Centers for Doctoral Training and Doctoral Training Partnerships were established in the UK; in Australia – Technology Network Universities’ Industry Doctoral Training Center, aimed at training PhD students in collaboration with manufacturing industry. New industry-oriented

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<sup>46</sup> Borrell-Damián L. Collaborative Doctoral Education: University-Industry Partnerships for Enhancing Knowledge Exchange. DOC-CAREERS Project. *European University Association*. 09.06.2008. URL: <https://eua.eu/resources/publications/649:collaborative-doctoral-education-university-industry-partnerships-for-enhancing-knowledge-exchange.html>

<sup>47</sup> Etzkowitz H., Leydesdorff L. The dynamics of innovation: from National Systems and «Mode 2» to a Triple Helix of university-industry-government relations. *Research Policy*. 2000. No. 29. Pp. 109–123.

<sup>48</sup> Thune T. The Training of «Triple Helix Workers»? Doctoral Students in University–Industry–Government Collaborations. *Minerva*. 2010. No. 48. Pp.: 463–483. URL: <https://doi.org/10.1007/s11024-010-9158-7>

<sup>49</sup> Shin J. C., Postiglione Gerard A., Ho K. C. Challenges for doctoral education in East Asia: a global and comparative perspective. *Asia Pacific Education Review*. 2018. No. 19. Pp. 141–155. URL: <https://doi.org/10.1007/s12564-018-9527-8>

<sup>50</sup> Thune T. The Training of «Triple Helix Workers»? Doctoral Students in University–Industry–Government Collaborations. *Minerva*. 2010. No. 48. Pp.: 463–483. URL: <https://doi.org/10.1007/s11024-010-9158-7>

<sup>51</sup> Meniailo V. I. Professionalisation and projectification of the doctoral education in the world. *Научен вектор на Балканите* (България). 2019. Т. 3. № 2(4). P. 53–54.

programs benefit from financial and other input from industry partners<sup>52</sup>. The essence of the program is that PhD students spend a lot of time working in the workplace of the partner company, conducting research in its most important areas for four years.

In Norway, an Industrial-PhD training program has been introduced since 2008, under which companies should seek a three-year period support for an employee seeking to qualify<sup>53</sup>.

In Spain, one can earn an Industrial Doctorate degree in addition to an academic PhD. To do this, one should work in a commercial company, private or public sector; participate in industrial research or experimental projects of the company; the project in which the candidate is involved must be relevant to the topic of the thesis<sup>54</sup>.

The interesting experience of the joint training of doctoral students is gained at the British Middlesex University. PhD students, who are also employees, conduct their work-based research in the form of projects that are implemented in a real work environment and are part of the so-called work-based learning (WBL) process, which can be implemented as part of doctoral training on an individual trajectory. Training, in this case, means acquiring the knowledge and skills that are desirable for the job<sup>55</sup>. According to the authors of this article, such programs are very useful for PhD students, because they provide the latter with broad personal benefits: a deeper understanding of production issues, developing self-confidence, improving personal status, acquiring the necessary knowledge and skills directly in the workplace, the availability of professional benefits, obtaining professional experience, support from the employer, a clear vision of the goal.

Universities thus ensure the integration of entrepreneurial activity with education and research; this is their third mission<sup>56</sup>. Employers, in their turn, actively interact with both higher education institutions and their employees-

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<sup>52</sup> Cuthbert D., Molla T. PhD crisis discourse: a critical approach to the framing of the problem and some Australian solutions. *Higher Education*. 2015. Vol. 69. No. 1. Pp. 33–53.

<sup>53</sup> Schlegel J., Keitsch M. Bridging the gap between professional practice and academic research – the industrial PhD. *Design education: collaboration and cross-disciplinary*. 2016. Pp. 198–203

<sup>54</sup> Muerza-Marín M.V. PhD training program activities from a global perspective. A comparison between two European Universities. In: *Innovative strategies for Higher Education in Spain*. Eindhoven, NL: Adaya Press, 2018. P. 123–130.

<sup>55</sup> Carol C., Abukari A. The impact of work-based research projects at postgraduate level. *Journal of Work-Applied Management*. 2015. Vol. 7. No. 1. Pp. 3–14. URL: <https://doi.org/10.1108/JWAM-10-2015-006>

<sup>56</sup> Etzkowitz H., Webster A., Gebhardt C., Cantisano T. The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm. *Research Policy*. 2000. No. 29. Pp. 313–330.

doctoral students by participating in joint processes of program design, implementation and evaluation, and the WBL projects developed as a result of such training have a positive impact on the processes and products of the company itself.

Thus, in such an interaction, a doctoral student's thesis is a real project with clear objectives and concrete results, which is realized within a certain period. In this case, they say about the projectification of doctoral training, which may also act as an effective mechanism for funding doctoral programs by appropriate agencies<sup>57</sup>.

The paper<sup>58</sup> describes a methodology for such cooperative education at the Technical University of Madrid in Spain, which combines PBL with engineering higher education. In the process of training professional contacts with external agents (project clients) are established. Students (masters, doctoral students) are involved in this structure to solve real problems while working together on a project. During this process, they are enriched by external knowledge gained from direct interaction with project participants that enables them to generate new knowledge. Participation in projects with real content that meets real needs gives students the opportunity to get in touch with external agents to solve real problems in the manufacturing sector, as well as gain early professional experience. From an educational point of view, working on a project provides the development of such skills that are important for the future professional activity such as teamwork, communication, leadership, commitment and motivation, openness, creativity, result orientation, ability to adapt and innovate, solve problems, etc.

In today's globalized world, internationalization is equally important for the quality of doctoral training. Of all levels of education, doctoral education is the most internationalized, as the proportion of foreign students at the doctoral level is significantly higher compared to the first and second levels of higher education. It is shown<sup>59</sup> that a large proportion of foreign doctoral students (over 30 % of their total) study in the most developed countries of the world, such as the USA, the UK, Canada, Australia, France, Germany, Sweden, and China is the most powerful donor of foreign doctoral students.

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<sup>57</sup> Torka M. Projectification of Doctoral Training? How Research Fields Respond to a New Funding Regime. *Minerva*. 2018. Vol. 56. Iss: 1.SI. Pp. 59–83

<sup>58</sup> De Los Rios I., Rodriguez F., Perez C. Promoting Professional Project Management Skills in Engineering Higher Education: Project-Based Learning (PBL) Strategy. *International Journal of Engineering Education*. 2015. Vol. 31. No. 1(B). Pp. 184–198.

<sup>59</sup> Shin J. C., Postiglione G., Ho K. C. Challenges for doctoral education in East Asia: a global and comparative perspective. *Asia Pacific Education Review*. 2018. No. 19. Pp. 141–155. URL: <https://doi.org/10.1007/s12564-018-9527-8>

In particular, it is reported<sup>60</sup> of the more than 1 million international students enrolled in US universities, about 35 % of which are Chinese, including 128.320 thousand PhD students.

A key factor affecting the number of foreign doctoral students is the ability of universities to offer training in English, as well as the availability of joint educational and scientific programs and short- and long-term internship programs. For example, the paper<sup>61</sup> presents a transnational PhD program, developed on the basis of a joint agreement between Humboldt University of Berlin and King's College London, which aims at considering the differences between the two systems in the admission procedure, the status of an enrolled doctoral student, the features of scientific guidance and studying, as well as the defense of the thesis and awarding of a scientific degree.

The University of California has developed a PhD internship program in Life Sciences that provides both structured learning and hands-on experience. Participation in such programs increases students' confidence in research and decision-making and provides them with career development skills<sup>62</sup>.

The article<sup>63</sup> presents an internship program for geographers, developed jointly by the Economic Research Council and the Scottish Government, which enables doctoral students to be trained in both academia and government, contributing to a better transfer of knowledge between these fields.

The results of the survey conducted by the authors of the work<sup>64</sup> showed that the main motives of PhD students to study abroad are related to the study of new theories and methodologies, the development of professional networks, improvement of scientific CVs, gaining intercultural experience.

EU policy promotes mobility as an important component of modern doctoral education. It is expected that trips to EU-funded seminars, conferences, and research internships abroad will allow doctoral students to develop collaborative projects, create international research networks, gain

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<sup>60</sup> Institute of International Education. *Open doors*. 27, November 2017, URL: <https://www.iie.org/opendoors>

<sup>61</sup> Deicke, W., Moes J., Siemens J. Collision and Coalescence – German and British Cultures in Doctoral Education. *Emerging Directions in Doctoral Education. Ser: Innovations in Higher Education Teaching and Learning*. 2016. V. 6. P. 149–169.

<sup>62</sup> Schnoes A., Caliendo A., Morand J. Internship Experiences Contribute to Confident Career Decision Making for Doctoral Students in the Life Sciences. *Cbe-Life Sciences Education* 2018. v. 17. No. 1. Ar. 16

<sup>63</sup> Reid L. A., McCormick A. Knowledge Transfer at the Research-Policy Interface: The Geography Postgraduates' Experiences of Collaborative Studentships. *Journal of Geography in Higher Education*. 2010. Vol. 34. No. 4. P. 529–539. Ar. PII 929275864

<sup>64</sup> Delicado A. 'Home Is Where the Heart Is': The Experiences of Expatriate PhD Students and Returnees. *International Student Connectedness and Identity*. 2017. Vol. 6. P. 151–165.

experience in both research organizations and other sectors, which is necessary for future intellectual workers in a competitive global economy<sup>65</sup>.

The problem of entering international scientific cooperation, which is the very essence of scientific activity in the world, is especially relevant for the countries of Eastern Europe, which survived the communist and post-communist times when local studies conducted by a narrow circle of colleagues prevailed and were uncompetitive on the European and world stage.

According to the Polish researcher M. Kwiek, in the post-Soviet countries, the main reference point for a long time was the national science, the results of which were unknown to the broad international community – for structural, ideological and financial reasons. Modern European integration processes in these countries lead to a fundamental increase in the role of cosmopolitan attitudes that are natural for the world of science, especially for the younger generation of researchers who should participate fully in the world science, namely, publish articles in international journals with high impact factor and attract the widest range of external funding, i.e. to receive research grants<sup>66</sup>.

Therefore, as stated by the Ministers of Education of European countries during their regular meeting in Yerevan in 2015, due to the reforms implemented under the Bologna Process, high rate of student mobility within the EHEA is currently observed; training programs provide graduates with the knowledge, skills, and competences necessary for working in the European labor market; educational institutions are becoming increasingly involved in the international context, and scholars are successfully collaborating within joint educational and research programs<sup>67</sup>.

## CONCLUSIONS

Thus, this review highlights the current state and major vectors of doctoral training in foreign countries, which are associated with a significant increase in the number of doctoral students; search for new models of organization and structuring of their training; expanding the range of knowledge, skills, and competences to increase employment opportunities for graduates; using project, information and communication technologies of training; enhancing interdisciplinary, cross-sectoral, regional and international cooperation.

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<sup>65</sup> Walakira L., Wright S. 'I'm like a snail carrying my entire house with me': doctoral fellows' experiences of a mobile life. *Learning and Teaching*. 2018. V. 11. No. 2. P. 51–68.

<sup>66</sup> Університет в епоху перемін: інституції і академічні кадри в умовах зростаючої конкуренції / М. Квієк; Пер. з польської Р. Скакун К.: Таксон, 2018. 474 с.

<sup>67</sup> Єреванське комюніке: спільна заява Міністрів освіти європейських країн. Єреван, 14-15 травня 2015 р. *Незалежний центр європейської вищої освіти*. URL: [http://www.euroeducation.org.ua/sites/default/files/documents/2016/05/24/yerevanske\\_komyunike\\_2015.pdf](http://www.euroeducation.org.ua/sites/default/files/documents/2016/05/24/yerevanske_komyunike_2015.pdf)

The analysis of foreign scientific sources and normative-legal documents of the European Union, adopted in the framework of the Bologna process, allowed us to formulate the basic conceptual foundations of training of future doctors of philosophy for implementation into the national higher education system.

1. Future PhDs are trained in accordance with a structured program that includes theoretical training, hands-on training, original research and scientific output, as well as qualified scientific guidance, research counseling (mentoring) and institutional support from a higher education institution.

2. The results of the PhD training are determined on the basis of a competence-based approach and include both the research and innovation competences required for work in the chosen field of research and a broad range of general competences, including those that can only be gained through practical experience.

3. The preparation of PhDs contains cosmopolitan attitudes, that is, orientates the graduate students to an international format in future professional activity, manifested primarily in their ability to obtain grants for the implementation of research and/or innovative projects; to participate in international academic mobility programs; publish research results in high-ranking international journals included in scientometric databases; to carry out other forms of international cooperation.

4. The basis for the practical training of PhD students is the formation of their project culture, as well as the acquisition of experience of interdisciplinary, cross-sectoral and regional cooperation, which is realized through the development and implementation of innovative projects aimed at solving real problems/needs of the region.

5. PhD training includes professional development activities of postgraduates related to the creation and promotion of their own scientific brand, building a network of professional contacts; developing an individual career development plan, etc.

6. The training of PhD students is conducted in the conditions of high-quality innovative educational and research environment, which involves the use of active forms and methods of teaching aimed at the development of creativity and innovative activity of graduate students; proper information and communication support for the educational and scientific process; and is characterized by a critical mass of researchers and research, which creates the conditions for productive research and innovation activities, thereby enhancing the graduate students' intrinsic motivation and forming a value-based attitude towards the profession.

## SUMMARY

The article is devoted to the analysis of current trends in the development of doctoral training in Europe and the world, as well as to determining on its basis the conceptual foundations of the training of doctors of philosophy in Ukraine. This task is set due to the fact that a European model of training of scientific, scientific and pedagogical staff has recently been introduced in Ukraine, which requires the national system of higher education to search for and implement the best world practices for doctoral education development. According to the analysis of scientific and regulatory sources, doctoral training in the world is currently experiencing powerful transformational changes related to the increasing social demand for highly skilled intellectual professionals in the knowledge society. These changes are related to the processes of institutionalization, structuring, standardization and professionalization of doctoral education; wider use of Project-based learning and information and communication technologies, as well as enhanced interdisciplinary, cross-sectoral collaboration, regional and international cooperation. The considered theoretical and practical aspects of doctoral training in Europe and in the world have enabled us to formulate the main principles of the concept of doctors of philosophy training in Ukraine.

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