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FUTURE PERSPECTIVES ON AI SKILLS DEVELOPMENT FOR ECONOMICS STUDENTS

МАЙБУТНІ ПЕРСПЕКТИВИ РОЗВИТКУ НАВИЧОК ШІ ДЛЯ СТУДЕНТІВ ЕКОНОМІЧНИХ ОСВІТНІХ НАПРЯМІВ

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The rapid development of artificial intelligence (AI) and its pervasive integration across all spheres of life, including economics, necessitate a re-evaluation of educational approaches and professional training. Economics students must not only possess a deep understanding of economic principles but also acquire AI skills to remain competitive in the labor market and effectively utilize these emerging technologies for solving economic challenges. This article aims to explore the future perspectives of AI skills development for economics students, identify key competencies that will be in demand, and offer recommendations for enhancing educational programs. The rapid development of artificial intelligence (AI) and its pervasive integration across all spheres of life, including economics, necessitate a re-evaluation of educational approaches and professional training. Economics students must not only possess a deep understanding of economic principles but also acquire AI skills to remain competitive in the labor market and effectively utilize these emerging technologies for solving economic challenges. This article aims to explore the future perspectives of AI skills development for economics students, identify key competencies that will be in demand, and offer recommendations for enhancing educational programs. The article employs a comprehensive set of research methods, including analysis of scientific literature, expert surveys, statistical data analysis, modeling, and forecasting. The study demonstrates that AI significantly influences the economic sphere by automating processes, creating new analytical and forecasting tools, and generating new forms of economic activity. Key AI skills necessary for future economists have been identified.

Keywords: artificial intelligence, economics education, future skills, competencies, technological progress.

Стрімкий розвиток штучного інтелекту (ШІ) та його проникнення в усі сфери життя, включаючи економіку, вимагають переосмислення підходів до освіти та підготовки фахівців. Студенти економічних спеціальностей повинні не лише володіти глибокими знаннями в галузі економіки, але й опановувати навички роботи з ШІ, щоб бути конкурентоспроможними на ринку праці та ефективно використовувати нові технології для вирішення економічних задач. Мета статті – це дослідження майбутніх перспектив розвитку навичок ШІ для студентів економічних освітніх напрямів, визначити ключові компетенції, які будуть затребувані в майбутньому, та запропонувати рекомендації щодо вдосконалення освітніх програм. Завдання дослідження: проаналізувати вплив ШІ на сферу економіки та зміни на ринку праці, визначити ключові навички та компетенції в галузі ШІ, необхідні для майбутніх економістів, дослідити існуючі та перспективні методи інтеграції ШІ в освітні програми з економіки, розробити рекомендації щодо вдосконалення навчальних програм та підготовки студентів до роботи з ШІ, визначити роль вищих навчальних закладів у розвитку екосистеми ШІ в Україні. В статті використано комплекс методів наукового дослідження, включаючи аналіз наукової літератури, опитування експертів, статистичний аналіз даних, моделювання та прогнозування. В статті показано, що ШІ суттєво впливає на економічну сферу, автоматизуючи процеси, створюючи нові інструменти аналізу та прогнозування, а також генеруючи нові види економічної діяльності. Визначено ключові навички в галузі ШІ, які будуть необхідні майбутнім економістам. Розвиток навичок ШІ для студентів економічних освітніх напрямів є важливим завданням для системи освіти. Необхідно модернізувати освітні програми, включаючи до них дисципліни, присвячені ШІ, та забезпечувати студентів практичним досвідом роботи з новими технологіями. Це допоможе підготувати висококваліфікованих фахівців, здатних ефективно використовувати ШІ для розвитку економіки та прийняття стратегічних рішень.

Ключові слова: штучний інтелект, економічна освіта, навички майбутнього, компетенції, технологічний прогрес.

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Formulation of the problem. The core problem this research addresses is the mismatch between the skills required for success in an AI-driven economy and the current capabilities of economics students. Traditional economics education, often focused on theoretical models and statistical analysis, may not adequately prepare students for the unique challenges and opportunities presented by AI. This problem manifests in several key areas. It is lack of AI literacy among economics students: many students lack a foundational understanding of AI concepts, technologies, and their potential applications in economic contexts. This limits their ability to effectively leverage AI for data analysis, forecasting, and decision-making. And inadequate preparedness for an AI-augmented workforce: as AI automates routine tasks and reshapes job roles, future economists need to be prepared to work alongside intelligent machines and adapt to new forms of collaboration and problem-solving.

Analysis of recent research and publications. Numerous scholars, including Celik [1], Chen [2], Devi [3], and Alam and Mohanty [4], have explored the multifaceted implications of artificial intelligence. Notably, Carpenter [5] posits that humanity will maintain control over these technologies, utilizing them to address global challenges. But this problem has not been solved and further research is a necessary component of the educational process for economic areas of education.

Formulation of the goals of the article (statement of the task). The purpose of the article is to explore the future prospects for the development of AI skills for students of economic educational fields, to identify key competencies that will be in demand in the future, and to offer recommendations for improving educational programs.

Presentation of the main research material. Navigating the Integration of AI in Education: Addressing Concerns and Empowering Students

The growing adoption of artificial intelligence (AI) in education necessitates a careful and considered approach to address ethical concerns, ensure responsible use, and provide clear guidelines for integration. Educators' reservations about recommending AI tools to students underscore the need for comprehensive support and professional development to foster confident and responsible AI utilization in pedagogical practices.

Recognizing students' existing engagement with AI for entertainment highlights the importance of adopting a student-centered approach to AI education. By leveraging students' interests and fostering their AI literacy, educators can empower them to become discerning users of AI, capable of critically evaluating information and utilizing these tools effectively and ethically.

This exploration provides valuable insights into the evolving landscape of AI in education, highlighting the increasing adoption of AI tools among educators, the potential benefits they offer, and the importance of addressing concerns and providing adequate support to ensure responsible and effective AI integration in the classroom.

Furthermore, the integration of AI in education extends beyond universities, with secondary schools and colleges also recognizing the need to equip students with AI literacy and practical skills. Collaboration between higher education institutions and these institutions is crucial to facilitate knowledge transfer, provide mentorship opportunities, and ensure that students at all levels are prepared for the challenges and opportunities of an AI-driven world. By fostering these partnerships and prioritizing a student-centered approach, we can empower future generations to navigate the complexities of AI and contribute meaningfully to society.

The study of the attitude of children and students to the use of machine intelligence in the field of education is also interesting, as children offered many ideas regarding the use of AI in education. Many recognize the help of the latest technologies in finding a variety of information and analyzing complex topics: it is fast and interesting. Also, children want to use artificial intelligence for self-testing, and some even to get useful tips for further work. Another popular goal is to use AI-based tools to find new ideas, role models (which adults often do too). At the same time, children insist that such an intelligent assistant is primarily needed for the generation of examples, and not for blind copying (although some of the respondents want to use it anyway) [6].

The integration of artificial intelligence (AI) in higher education is prompting diverse responses from institutions worldwide. While some express concerns about the potential impact of AI on academic integrity and learning processes, others are embracing its potential to enhance teaching and learning. The University of Jyväskylä in Finland exemplifies an institution that has taken a proactive approach to AI integration, allowing its use in educational

contexts while also developing guidelines for responsible implementation.

The university's stance reflects a recognition of the multifaceted nature of AI in education. As Associate Dean Wilma Luoma-aho highlights, AI tools offer numerous applications that can benefit students, such as personalized learning support, automated feedback, and enhanced access to information. Furthermore, the accessibility and ease of use of AI programs like ChatGPT make them potentially valuable resources for both students and educators.

However, the university also acknowledges the need for guidance and responsible implementation to mitigate potential risks. By developing clear instructions for using AI in educational settings, the University of Jyväskylä aims to foster ethical and effective AI integration, ensuring that these technologies are used to enhance, rather than undermine, the learning process.

This case study highlights the evolving landscape of AI in higher education and the diverse approaches institutions are taking to navigate its complexities. Further research is needed to explore the long-term impact of AI on teaching and learning, as well as to develop best practices for responsible AI integration in educational contexts.

Figure1 illustrates the potential career pathways for economics graduates who have acquired specialized skills in artificial intelligence (AI) during their university studies. By visualizing these potential trajectories, we can gain a deeper understanding of the diverse opportunities available to these graduates in an increasingly AI-driven world.

This visual representation highlights the various sectors and industries where economics graduates with AI expertise can contribute their skills, ranging from finance and technology to consulting and research. It also underscores the potential for these graduates to assume leadership roles in shaping the future of AI in economics and driving innovation across various domains.

The figure serves as a valuable tool for students, educators, and policymakers to understand the potential impact of AI education on career development and the broader economic landscape.

Professor Mikko Rencke considers this approach to be short-sighted. "If we ban the use of ChatGPT now, should we ban the search through Google or checking in Word," the associate professor wonders. Previously, the University of Helsinki created a course on artificial intelligence [7].

The rapid advancement of artificial intelligence (AI) has sparked both excitement and concern worldwide. While AI holds immense potential to address global challenges and drive innovation, experts have raised concerns about the potential risks and unforeseen consequences of unchecked AI development. This underscores the need for responsible AI development and governance to ensure alignment with human values and societal well-being.

Despite these concerns, substantial investments in AI research and development persist across the globe, with numerous universities and laboratories actively contributing to the advancement of this technology. The United States and China have emerged as leaders in AI research, demonstrating significant investment and achieving notable breakthroughs in the field. This suggests their potential to shape the future trajectory of AI technologies and their applications.

While the United Kingdom maintains its position among the top countries in AI research, the emergence of France and Canada in the top five indicates a dynamic and evolving global landscape of AI development. This highlights the increasing global competition and collaboration in the field, underscoring the need for international cooperation and shared responsibility in navigating the ethical and societal implications of AI.

To further understand the complexities of AI adoption and its impact on workforce dynamics, a quantitative analysis of student-to-employee ratios at institutions like the National University "Lviv Polytechnic" can provide valuable insights. This analysis, as presented in Table 1, can shed light on the potential implications of AI for higher education and workforce development.

The rapid advancement of artificial intelligence (AI) necessitates careful consideration of its ethical implications, including potential biases, workforce disruptions, and the broader impact on societal structures. To effectively harness the benefits of AI while mitigating potential risks, international collaboration and cooperation are essential to ensure responsible development and equitable access to AI technologies.

Y= 12	X_1^0 = 25268	X_2^0 = 2098
Y=13	X_1^1 = 28805	X_2^1 = 2186
Y=15	X_1^2 =33500	X_2^2 =2200

1period: change in the average number of students per employee per year:

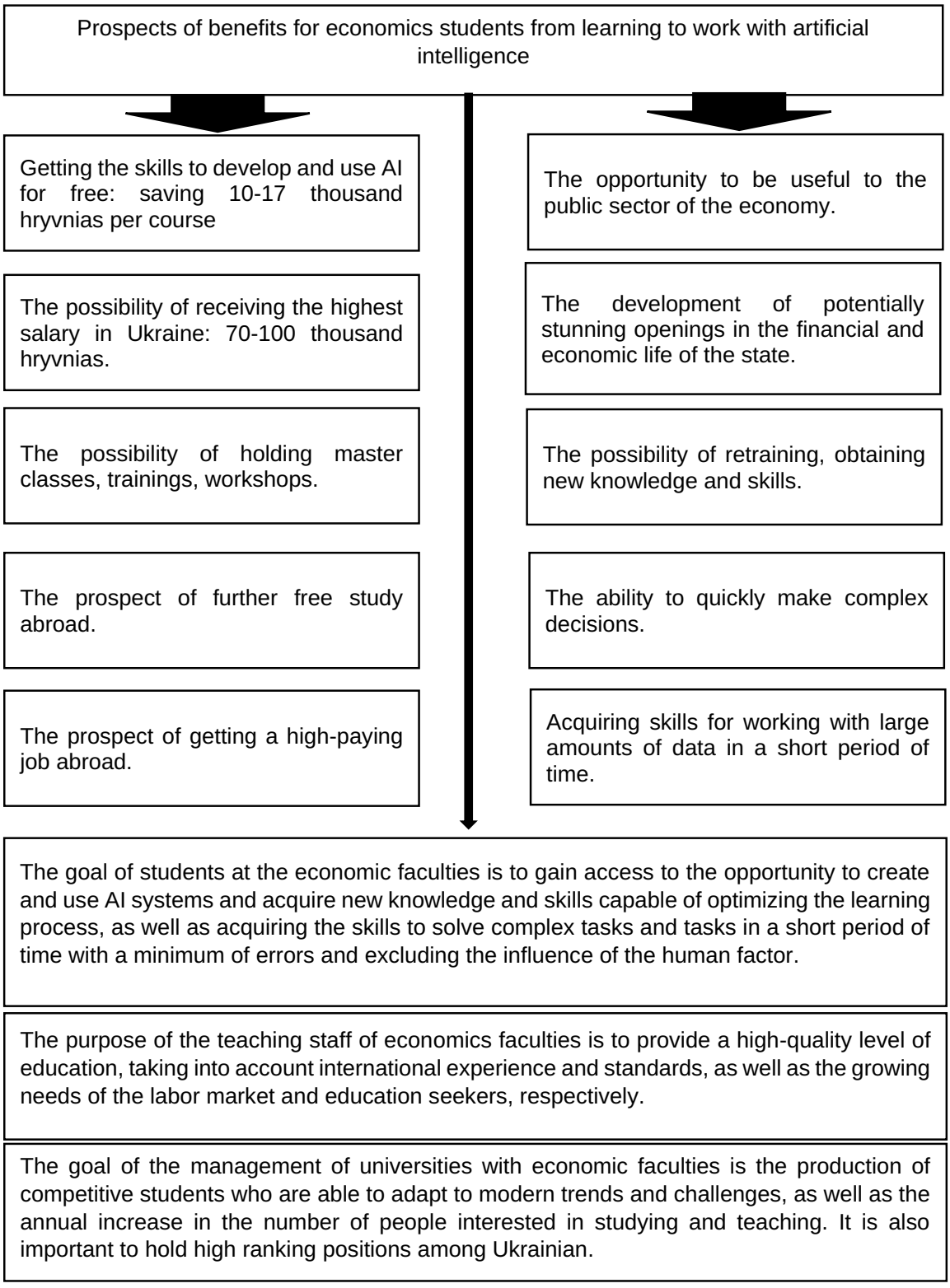

Figure 1. Developing AI Skills for Future Economists: Preparing Graduates for an AI-Driven World

Source: compiled by the author

Table 1

Dataset for Logarithmic Transformation in Multiplicative Model Analysis of Student-to-Employee Ratios at Lviv Polytechnic National University

Indicator	Year	Number of students	Number of employees	Average number of students per employee
1	2021	25268	2098	12
2	2022	28805	2186	13
3	2023	33500	2200	15

Source: compiled by the author

$$\Delta Y = \Delta Yx1 + \Delta Yx2 = \frac{x_1^1}{x_2^1} - \frac{x_0^1}{x_2^0} = 13\text{-}12 = 1$$

2 period: change in the average number of students per employee per year:

$$\Delta Y = \Delta Yx1 + \Delta Yx2 = \frac{x_1^2}{x_2^2} - \frac{x_1^1}{x_2^1} = 15\text{-}13 = 2$$

$$\Delta Y\, x_1 = \frac{\Delta x_1}{\Delta x_2} * \ln\left|\frac{x_2^1}{x_2^0}\right| = \frac{x_1^1}{x_2^1} - \frac{x_1^0}{x_2^0} * ln\left|\frac{x_2^1}{x_2^0}\right| =$$

$$= (28805\text{-}25268) / (2186\text{-}2098) = 40{,}2 * 1{,}9 = 76{,}4$$

$$\Delta Y\, x_1 = \frac{\Delta x_1}{\Delta x_2} * \ln\left|\frac{x_2^1}{x_2^0}\right| = \frac{x_1^1}{x_2^1} - \frac{x_1^0}{x_2^0} * ln\left|\frac{x_2^1}{x_2^0}\right| =$$

$$= (33500\text{-}28805) / (2200\text{-}2186) = 335{,}4 * 1{,}15 = 385{,}7$$

1 period of change in the impact of changes in the number of students:

$$\Delta Yx2 = \Delta Y - \Delta Yx2 = 1\text{-}76{,}4 = -75{,}4$$

2 period of change in the impact of changes in the number of students:

$$\Delta Yx2 = \Delta Y - \Delta Yx2 = 1\text{-}385{,}7 = -384{,}7$$

1 period /2 period $\begin{cases} \Delta Yx1 > \Delta Yx2 \\ \Delta Yx1 < \Delta Yx2 \end{cases}$

Preparing future generations for an AI-driven world requires significant investment in education and training to equip individuals with the necessary skills and knowledge to navigate this evolving landscape. The continued advancement of AI has the potential to profoundly impact economic growth, productivity, and societal well-being. Understanding and adapting to these changes will be crucial for individuals, businesses, and governments alike.

This exploration provides a glimpse into the dynamic and rapidly evolving landscape of AI development, highlighting the need for responsible AI governance, international collaboration, and a focus on education and workforce development to ensure that AI technologies are developed and utilized for the benefit of humanity.

An analysis of student-to-faculty ratios at Lviv Polytechnic National University, using a logarithmic method of factor analysis for multiplicative models, reveals a twofold dependence of teaching staff numbers on student enrollment. This observation has significant implications for both operational efficiency and strategic resource allocation within the institution.

Conclusions. This article has explored the evolving landscape of economics in the age of artificial intelligence (AI), emphasizing the growing need for economics students to develop AI-related skills and competencies. The analysis presented leads to the following key conclusions:

AI is transforming the economics profession. AI is rapidly changing how economists conduct research, analyze data, and make decisions. This necessitates a shift in economics education to ensure that students are equipped with the skills and knowledge to thrive in this new environment.

AI literacy is essential for future economists. Students need a foundational understanding of AI concepts, techniques, and applications to effectively leverage these tools in their future careers. This includes not only technical skills but also critical thinking and ethical reasoning abilities.

Economics curricula must adapt to integrate AI. Educational institutions need to proactively incorporate AI into their economics programs, offering specialized courses, integrating AI tools into existing courses, and providing opportunities for hands-on experience.

By embracing these conclusions, educational institutions and policymakers can empower future economists to navigate the complexities of an AI-driven world and contribute to a more informed, efficient, and equitable economic future.

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