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ENHANCING ECONOMIC EDUCATION: THE CRITICAL ROLE DISCIPLINE «DATA ANALYTICS» AND «DATA SCIENCE» IN CURRICULUM DEVELOPMENT

ПОКРАЩЕННЯ ЕКОНОМІЧНОЇ ОСВІТИ: КРИТИЧНА РОЛЬ ДИСЦИПЛІН «АНАЛІТИКА ДАНИХ» ТА «НАУКА ПРО ДАНІ» ПРИ РОЗРОБЦІ НАВЧАЛЬНИХ ПРОГРАМ

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The article compellingly argues for the integration of "Data Analytics" and "Data Science" into the curricula of economic specialties, emphasizing how pivotal these disciplines are in enhancing economic planning and decision-making. With the advent of data science and artificial intelligence, there are transformative impacts on various sectors, particularly in economics and finance, where these tools can provide significant strategic advantages to professionals and policymakers. The article defines the essential skills required in the modern workforce and discusses the broad implications of integrating these subjects in educational programs, which are projected to influence the economy a large positively. Furthermore, the research addresses the evolving labor market trends, highlighting the growing demand for digital skills across all sectors, with a notable emphasis on the manufacturing industry. The impact of digitalization on the labor market is thoroughly analyzed, reinforcing the necessity for economic students to gain proficiency in "Data Analytics" and "Data Science." Specific skills that students should acquire through these courses are identified, ensuring they are well-equipped for the challenges of the digital economy. Additionally, the article outlines the distinct advantages that graduates with expertise in "Data Analytics" hold, positioning them favorably in the competitive job market. This comprehensive study not only substantiates the need for these disciplines but also charts a path forward for curriculum development to better prepare students for future economic challenges.

Keywords: Data Analytics, Data Science, Economic Planning, Digital Skills, Labor Market Trends, Curriculum Integration, Decision-Making, Digital Economy.

Стаття доводить необхідність інтеграції дисциплін «Аналітика даних» та «Наука про дані» у навчальні програми економічних спеціальностей, підкреслюючи, наскільки важливими є ці дисципліни для покращення економічного планування та прийняття рішень в динамічному цифровому середовищі. З розвитком цифрових технологій і появою науки про дані та штучного інтелекту, відбулась швидка цифровізація практично всіх сфер, різні сектори, особливо фінансовий, зазнають трансформаційних впливів, і розуміння «Науки про дані» та аналітики даних може надати значні стратегічні переваги фахівцям та політикам при розумінні економічних процесів, їх прогнозуванні та прийнятті рішень. У статті визначено основні навички, необхідні для сучасної робочої сили та дискутуються про наслідки інтеграції цих предметів у освітні програми, і як це може позитивно вплинути на економіку України в цілому. Крім того, дослідження висвітлює тенденції розвитку ринку праці, підкреслюючи зростаючий попит на цифрові навички у всіх секторах, з особливим акцентом

на виробничу сферу. Ринок праці потребує фахівців які розуміються на цифрових технологіях та можуть їх ефективно застосовувати. Проаналізовано вплив цифровізації на ринок праці, підтверджуючи необхідність для студентів економічних спеціальностей набувати компетенції в «Аналітиці даних» та «Науці про дані». Визначено конкретні навички, які студенти повинні засвоїти через ці курси, забезпечуючи їхню готовність до викликів сучасної цифрової економіки та швидкого відновлення економіки України на інноваційних засадах. Також стаття окреслює переваги випускників з експертизою в «Аналітиці даних», що вигідно позиціонує їх на конкурентному ринку праці. Це комплексне дослідження не лише обґрунтовує необхідність цих дисциплін, але й прокладає шлях для розвитку навчальних програм з метою кращої підготовки студентів до майбутніх економічних викликів та роботи у динамічному цифровому середовищі.

Ключові слова: Аналітика даних, Наука про дані, Економічне планування, Цифрові навички, Тенденції ринку праці, Інтеграція навчальних програм, Прийняття рішень, Цифрова економіка.

General problem statement and its connection with scientific and practical objectives.

Transformational recovery is needed for rapid economic and social development in Ukraine. Reforming society and education is the highest priority for sustainable economic development based on digital innovation. Artificial intelligence and data science are key factors in such a transformation, which has the potential to change lifestyles and create new opportunities for Ukraine's economic breakthrough. The use of data science and artificial intelligence in economics and finance can significantly improve economic planning and provide decision-making advantages for professionals and policymakers.

Most enterprises note that digitization and big data will contribute to business transformation. More and more enterprises are incorporating big data, cloud computing and AI into their operations. In the next five years, more than 75% of companies plan to implement these technologies in their daily activities.

Companies predict that by 2027, 44% of workers' essential skills will be replaced as technology advances faster than companies can develop and expand their reskilling programs. Given the trends towards digitization of enterprises, analytical thinking will be the highest priority in the skills of the future workforce in the next 5 years. The second priority for workforce development is fostering creative thinking, which will target 8% of skills development initiatives [1].

Therefore, the development of students' cognitive skills is the most important task. The development of these skills makes it possible to increase the ability of employees to adapt to the unstable labor market and constant changes in technology. According to the World Economic Forum, the top 10 skills for the workforce are: 1. analytical thinking; 2. creative thinking; 3. Resilience, flexibility and agility;

4. Motivation and self-awareness; 5. Curiosity and lifelong learning; 6. Technological literacy; 7. Dependability and attention to detail; 8. Empathy and active listening; 9. Leadership and social influence; 10. Quality control. Most of these skills (7 out of 10) can be developed by implementing a course for students of economic specialties "Data Analytics" using special programs for data analysis and visualization (Power BI, Tableau, Alteryx).

Reasoning and decision-making are currently the least automated tasks in the workplace. Technological literacy is also a key skill, as is curiosity and lifelong learning.

Six out of 10 workers will need training by 2027, but only 50% of workers today have access to adequate on-the-job training opportunities. Since the need to use artificial intelligence and big data is growing every day, by 2027 the demand for them is predicted to increase by 60%. AI and big data will be a priority for 42% of companies in employee training in the next 5 years [2]. Therefore, on the basis of universities, it is possible to open training courses in "Data Analytics" and "Data Science" for employees of enterprises in various fields, taking into account the specifics of analytics in each field.

Broad development of the teaching of these disciplines will have a positive impact on the economy as a whole. The modern economy, as well as public administration, are characterized by a significant amount of big data, so it is not always possible to use classical methods. Today, the economy of Ukraine needs specialists who have knowledge in these areas and know how to apply Data Science and Data Analytics methods. The development and implementation of this interdisciplinary course provides knowledge and skills in working with mathematical, statistical and computational aspects of digital data processing and understanding how to make decisions in economic and management issues based on data analysis and modeling [3].

Analysis of recent research and publications concerning discussion, approaches to solution of the problem mentioned, which the author uses as the basis. Research on the implementation of digital technologies in education was carried out by foreign scholars such as Areepattamannil, S., Christoph, G., Goldhammer, F., Helsper, E. J., Leung, L., Coşkunserçe O., Weston, T. J., and others. To support the development of digitalization in Ukraine, the Digital Agenda of Ukraine 2020 and the Concept for the Development of the Digital Economy and Society of Ukraine for 2018–2020 were developed. Additionally, international economic and consulting organizations are actively researching the impact of digital skills on the labor market and future economic development: World Economic Forum, OECD, Deloitte, McKinsey, and others.

Unresolved points of the general problem studied in the article. It is important to note that despite the significant amount of scientific work on the importance of developing digital skills among students, the topic of comprehensive research into the specifics of digital learning for students of economic specialties and the development of necessary digital skills, followed by the refinement of university curricula, remains insufficiently explored and requires additional attention for the rapid innovative recovery of Ukraine's economy.

Formulation of the article's purposes (objectives setting). The aim of this article is to investigate the key requirements for digital skills in economic specialties in the labor market and to demonstrate the necessity of incorporating disciplines such as 'Data Science' and 'Data Analysis' into the curricula of students.

The main research material mentioning justification of the scientific results obtained. Business analytics is a process by which companies use data created in the course of their activities or publicly available data (statistical, macroeconomic) to solve business problems, control key indicators, identify opportunities and development potential, improve customer service, acceptance of justification of management decisions.

As companies increasingly digitize their operations, business intelligence is becoming more important and effective than ever before. Combining advanced data analytics and artificial intelligence with integrated workflows motivates organizations to implement smarter, faster and more accurate data-driven solutions. Also, intelligent decision-making systems based on

predictive modeling and intelligent data analysis are increasingly used.

Proving the importance of implementing the disciplines "Data Science" and "Data Analytics" can be done on the main analysis of labor market trends. It is widely known that digitization and artificial intelligence are key factors of change in almost all spheres of life. Demand for digital skills is increasing for workers in all fields, but especially in manufacturing (Figure 1).

Remote working, continuous training and skills development will be key in the coming years to ensure a fair future of work. The main predicted changes in the labor market are:

1. AI increases productivity unevenly. The greatest gains in productivity and innovation are expected in high-income countries. Productivity growth is expected in knowledge-intensive industries, including IT and digital communications, financial and professional services, and others.

2. The number of digital jobs will continue to grow. By 2030, the number of digital jobs worldwide is expected to grow to approximately 92 million. In most cases, these will be highly paid positions. Digital workplaces can provide an inflow of currency to Ukraine, due to the possibility of remote work from Ukraine. Global digital workplaces provide an opportunity to tap talent around the world, expanding the talent pool available to employers and providing avenues for economic growth for Ukraine.

3. The unemployment rate may increase. Those workers who do not acquire the digital skills they need in their jobs may find themselves out of a job or in low-paying jobs.

4. Skills will become even more important. 23% of jobs will change over the next five years, forcing millions of people to move from jobs that are shrinking to jobs that are growing [4].

Digital skills are very important for students of the speciality "072 "Finance, banking, insurance and stock market". Since finance and insurance are the industries that require the largest amount of data and developed digital skills (Figure 2).

In an era where data drives decision-making, it is critical to be knowledgeable and navigate the intersection of economics and data science. By implementing special disciplines, students can achieve a deep understanding of economic principles, while improving practical skills of data analysis and their modulation, forecasting. To teach students to overcome real economic problems with the help of the latest tools and methods, to be independent and well-founded when making decisions [5].

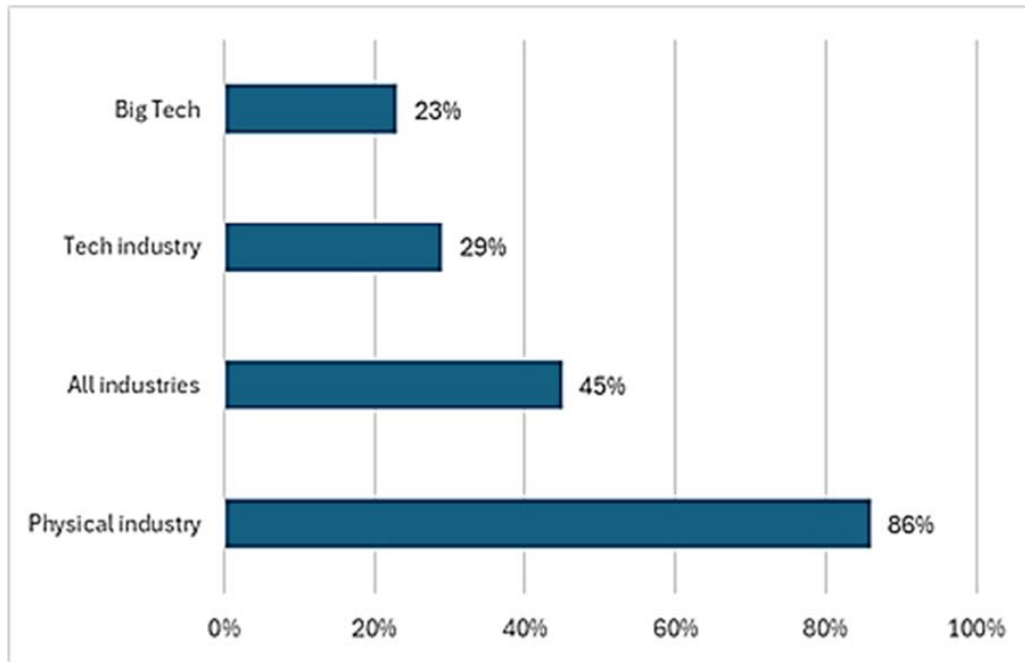


Figure 1. Growth in job(%) postings requesting digital skills from 2017 and the Sep. 2023 [11]

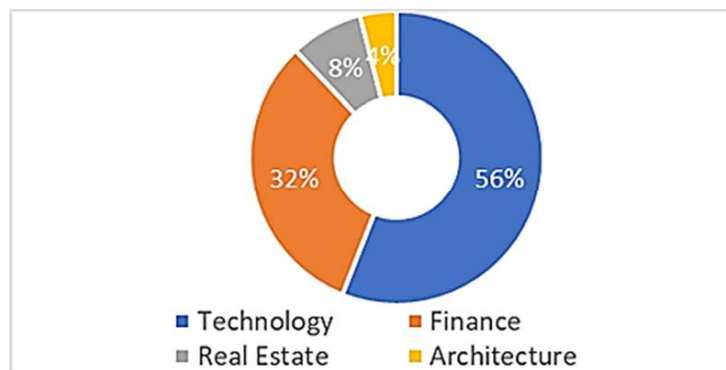


Figure 2. The most Data Intensive Industries [10]

If a student has an economics major and has developed digital skills, there is a greater opportunity to find a job in the manufacturing sector. Economists have even more advantages here, as they know the specifics of the industry and can implement better technological solutions with a deep understanding of economic processes (Figure 3).

The main skills that must be developed by students in the process of studying the discipline "Data analytics" are:

- Ability to visualize data and correctly interpret it. Tableau software can be used to develop this skill.
- Development of analytical thinking with the development of logical thinking, critical thinking, communication through discussion with other problem solving possibilities, the ability

to research, select, clean data, solve business problems.

- Development of mathematical and statistical skills, consolidation in practice of the theory that students studied in the disciplines "Econometrics" and "Statistics". Ability to organize and interpret numerical data, forecast and model. These skills can be developed by studying the Alteryx program.

- Data Science can help in combining classical economic theories with the latest analytical methods. This can lead to a deeper understanding of economic processes and improvement of economic forecasting models.

Also, for future professional development, it is advisable to teach students basic programming skills (Python, R and SQL) and an understanding of machine learning concepts.

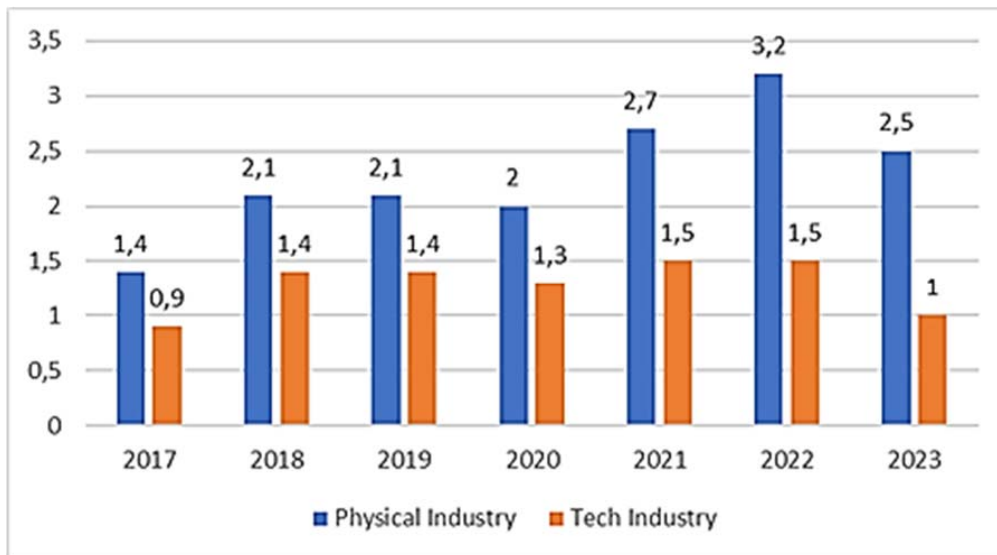


Figure 3. Total job postings demanding digital skills by industry, mln [11]

Learning predictive modeling helps companies avoid problems before they arise. Data mining identifies patterns, generating key insights. The growing importance of big data makes data mining an important component of any modern business [9].

Graduates with economics or public administration education with knowledge of data analytics will have significant advantages in the labor market:

1. More opportunities to make the right informed decisions based on data analysis. An experienced data scientist is likely to become a trusted advisor and strategic partner to an organization's senior management. Will be able to improve decision-making processes throughout the organization by measuring, tracking and recording performance indicators and other information.

2. Determine next steps based on trends, which in turn help define goals and strategy that will help improve organizational performance, better engage customers, and ultimately increase profitability. Integrate and effectively combine internal big data sources and publicly available aggregated variables created by national and international statistical authorities. By providing a higher level of detail, there is a powerful potential for revealing economic relationships that are often not obvious when variables are aggregated across many products, individuals or time periods.

3. Identification of development opportunities for the enterprise based on the analysis.

Economists need to know how models might actually work, and focus not only on predictions,

but also on modeling inferences, that is, on understanding model parameters.

One of the best software for business intelligence and analytics is Alteryx. Which has a special offer for educational institutions and students - SparkED. The program includes a free Alteryx Designer license, self-study, certification opportunities, and more. SparkED empowers educators to implement data analytics in their courses for many areas of study and provides syllabus and course materials.

It's also a good idea to include learning Tableau for interactive data visualization. This product includes machine learning, statistics, natural language and intelligent data preparation, which are more useful to enhance human creativity in analysis. During their studies, students should be able to obtain professional certificates that will increase their value in the labor market.

Now in Ukraine, the process of studying Data science for economists is at an early stage. Leading universities are gradually introducing new courses and programs for studying Data science in the economy, but this phenomenon has not yet acquired a mass character and needs greater implementation [6]. We conducted a survey of students of the Educational and Scientific Institute of Management, Economics and Nature Management of V. I. Vernadsky Taurida National University (50 students took part in the survey). 82% of respondents consider data analysis and visualization skills important in their speciality. 56% of students surveyed believe certifications in data analysis and visualization can significantly boost their resumes. 90% of students currently do not use specialized

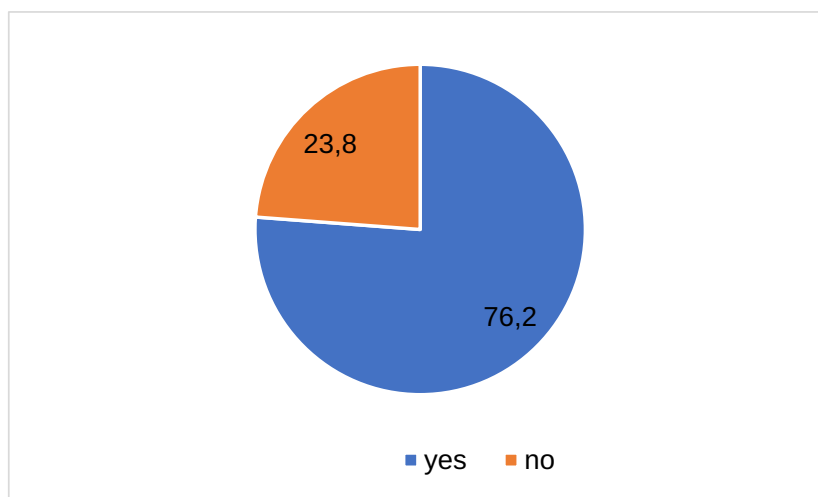


Figure 4. Do you think it is worth introducing a separate course for students on data analysis and visualization? (%)
[own research, based on surveys of students in economic specialties]

programs for data analysis and visualization in their coursework, calculations, bachelor's, master's works (excluding Excel). 52% of respondents believe that basic knowledge of Python or R is important for their career. One in five said that once a week they face difficulties, lack of knowledge or specialized tools (programs) for high-quality data analysis and visualization. 76% of students support introducing a separate course on data analysis and visualization (Figure 4).

Knowing Data Analytics for students who plan to work in the banking sector is especially important. Central banks and commercial banks intensively use structured databases to perform their functions, particularly in the areas of banking supervision, financial stability or monetary policy. Thanks to technological development, sources of information are rapidly expanding and the amount of information and data that needs to be processed is growing [7; 8].

Conclusions of the research and prospects for further development. The rapid development of information and communication technologies over the past two decades has caused an

explosion in the amount of information collected, leading to a new era of big data and the need for skills in data analysis and management. The development of effective models for forecasting the current situation is important for the activities of enterprises and the state, especially the accuracy of models is relevant during economic shocks. The potential of intelligent data analysis is particularly high in economics and finance. Monitoring the current and future state of the economy is of fundamental importance to governments, international organizations, central banks and businesses around the world. The introduction of new technologies is a key factor in the recovery of the Ukrainian economy. The introduction of Data Analytics and Data Science disciplines for economics students is key to training competitive professionals in today's data-driven economic environment. Knowledge and skills in these areas greatly enhance their professional prospects, as they enable students to better analyze large volumes of data, identify patterns, and make informed predictions and decisions, allowing students to gain a deeper understanding of economic processes and enhance their ability to think innovatively.

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