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В УМОВАХ ГЛОБАЛІЗАЦІЇ»**



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LABOUR MARKET EVOLUTION IN THE AGE OF ARTIFICIAL INTELLIGENCE

The article explores the transformative role of automation and artificial intelligence in reshaping the labour market. It analyses task substitution, job displacement, and the emergence of hybrid professions. Based on recent studies, it also examines labour polarization, national-level challenges such as in Slovakia, and the disruptive potential of generative AI, including ChatGPT. The paper concludes that future adaptation requires proactive education, policy reform, and emphasis on human–AI complementarity.

Key words: automation, artificial intelligence, professions, labour market, inequality, generative AI, reskilling, hybrid skills.

У статті досліджується трансформаційна роль автоматизації та штучного інтелекту у перетворенні ринку праці. Аналізуються заміщення завдань, витіснення робочих місць та поява гібридних професій. На основі останніх досліджень також розглядаються поляризація праці, виклики на національному рівні, такі як у Словаччині, та руйнівний потенціал генеративного ШІ, включаючи ChatGPT. У статті робиться висновок, що майбутня адаптація вимагає проактивної освіти, реформи політики та акценту на взаємодоповнюваності людини та ШІ.

Ключові слова: автоматизація, штучний інтелект, професії, ринок праці, нерівність, генеративний штучний інтелект, перекваліфікація, гібридні навички.

In the near future, artificial intelligence may transform from a promising field of research into a disruptive economic force. Its impact on the labour market is multifaceted, creating both opportunities and threats. Tyson et al. argue that AI is a form of ‘routine technological change on steroids’ that accelerates the replacement of not only physical but also cognitive tasks [2, p. 257].

Furthermore, technological development is not evenly distributed across countries. Novakova emphasises that in Slovakia, the digital transformation of the economy requires a new strategy to address the shortage of skilled workers and prevent long-term unemployment [1, p. 9]. This makes the national context critically important for understanding the consequences of automation.

At the same time, the emergence of generative AI has intensified the debate. According to Zarifkhonavar, ChatGPT alone could completely affect 32.8% of professions, partially affect 36.5%, and leave only 30.7% relatively unaffected [3, p. 101]. Such estimates suggest that the spread of AI tools will be more disruptive than previous waves of digitalisation.

It is important to note that the most important feature of AI-based automation is its task-oriented nature. Tyson and his colleagues emphasize that robots are rarely fully automated. Instead, certain tasks within their scope are indeed replaced, but others are reimagined or new ones are created [2, p. 259]. For example, in healthcare, artificial intelligence can automate the diagnosis of diseases, but it cannot replace the role of humans in communicating results to patients.

This creates a so-called displacement effect, whereby the demand for labor decreases in certain tasks, while in others it remains unchanged or increases. In practice, many jobs are being restructured, and the role of humans is shifting toward supervision, creativity, and responsibility, which gives people more energy for new ideas [2, p. 260].

Novakova notes that in Slovakia, the greatest risk of displacement is in low- and medium-skilled occupations, particularly in manufacturing, logistics, and administrative support [1, p. 12]. However, she also notes that sectors related to ICT and knowledge-intensive industries may create new opportunities, leading to a huge gap between those who can adapt and those who are left behind.

Of course, the consequences of automation will vary depending on the industry, wage level, and country. In developed economies, the introduction of artificial intelligence can lead to increased productivity, but also to polarization of employment structures. Medium-skilled workers are particularly vulnerable, as the routine components of their work are being automated, while the non-routine elements do not guarantee employment stability [2, p. 261].

In Slovakia, for example, Novakova notes that education systems do not yet fully meet the needs of the digital economy. As a result, there is a mismatch between the skills that workers possess and those that employers require [1, p. 14]. This mismatch slows down adaptation and increases the risks of unemployment in traditional sectors in the future.

It is worth noting that generative artificial intelligence exacerbates these imbalances. Zarifkhanavar shows that administrative, office, and content-related professions are most vulnerable to ChatGPT. In contrast, professions that require empathy, creativity, and complex problem-solving are more resilient [3, p. 105]. However, paradoxically, many highly paid intellectual workers are also vulnerable, as AI can now perform a significant portion of analytical and communication tasks, which could lead to staff reductions in the future [3, p. 107].

Beyond theoretical aspects, one of the most notable outcomes of AI implementation is the emergence of hybrid professions. For example, lawyers can rely on AI to draft documents, focusing their own efforts on interpretation and client relations. Teachers can use AI tutors to assess students, but must remain central to motivating and guiding learning.

Moreover, Tyson et al. argue that such hybridization leads to polarization in the labor market. There is a growing demand for highly skilled professionals capable of managing AI, but the number of mid-income jobs is declining [2, p. 262]. At the same time, many low-paying jobs remain, especially in the service sector, where human presence is essential.

Novakova also confirms these trends in Slovakia, warning that without large-scale retraining, social inequality will deepen and many regions risk prolonged economic stagnation [1, p. 15]. This underscores the importance of public policy in mitigating transition processes.

Generative artificial intelligence makes this issue even more pressing. Zarifkhanavar concludes that adaptation will require continuous learning and retraining for a significant portion of the workforce, as workers must master AI tools to remain employable [3, p. 110]. Nevertheless, automation of repetitive tasks using AI has long been popular in manufacturing and logistics, where AI improves efficiency through predictive maintenance, robotics, and intelligent logistics. This reduces the demand for routine jobs but increases opportunities for engineers, technicians, and systems supervisors [1, p. 13].

Unfortunately, administrative and clerical functions are also significantly affected by generative AI. ChatGPT can already compose emails, reports, and resumes, threatening a significant portion of administrative jobs [3, p. 104]. However, professionals in these sectors can transition to AI employee positions, controlling accuracy and rules. Although intellectual labor

and creative sectors are often considered safe, they also face challenges. AI can compose texts, analyze data, and even create designs. Tyson et al. emphasize that the reorganization of intellectual work is one of the greatest challenges, as it affects professions that were once considered safe from automation [2, p. 258].

In summary, the future of work largely depends on how well people can respond to change. Tayson et al. argue that the complementarity of humans and AI should be paramount in the evolution of work, so instead of replacing humans, AI should enhance their strengths [2, p. 262]. It is for this reason that Novakova emphasizes the need for a policy of continuous learning. In her opinion, Slovakia should reform its educational programs, invest in digital skills, and support retraining programs. These are urgent priorities for preventing structural unemployment [1, p. 16].

Zarifkhanavar adds that policymakers should monitor which professions are most vulnerable to generative AI and provide targeted support to people, such as training subsidies, incentives for the implementation of complementary AI, and social protection systems for displaced workers [3, p. 112]. Automation and AI are not homogeneous forces, but components of a driving force for change. They displace workers from routine tasks, increase productivity, and create new opportunities. However, they also deepen inequality, polarize labor markets, and require new skills.

In the end, research shows that the crucial question is not whether jobs will disappear, but how they will transform. Hybrid professions, continuous learning and collaboration between humans and AI will shape the future. Policymakers, educators and businesses must work together to ensure that automation becomes a driver of sustainable development rather than a source of exclusion.

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КІБЕРБЕЗБЕКА. БЕЗПЕКА ВЕБ-САЙТУ

У статті розглянуто комплексний підхід до забезпечення кібербезпеки веб-сайтів в умовах зростаючих цифрових загроз. Проаналізовано статистичні дані щодо масштабів кіберзлочинності, досліджено основні типи атак на веб-ресурси. Представлено технології захисту, зокрема міжмережеві екрани веб-додатків, сканери вразливостей та системи моніторингу. Особлива увага приділена превентивним та детективним заходам безпеки, семиетапній стратегії захисту веб-сайтів та сучасним тенденціям.

Ключові слова: кібербезпека, безпека веб-сайтів, кіберзагрози, SQL-ін'єкції, DDoS-атаки, міжмережеві екрани, багатофакторна автентифікація, квантово-стійка криптографія, превентивні заходи безпеки.

The article examines a comprehensive approach to ensuring website cybersecurity in the context of growing digital threats. Statistical data on the scale of cybercrime is analyzed, and main types of attacks on web resources are studied. Technologies and protection tools are presented,