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Artificial intelligence and the transformation of the labor market: Pedagogical challenges in training specialists

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Abstract

This study aims to examine the impact of artificial intelligence (AI) on the transformation of the global labor market and to identify the pedagogical challenges in preparing specialists for effective performance in the digital economy. The research employs theoretical analysis, a comparative review of educational programs, and content analysis of national and international policy documents to capture current trends and gaps in workforce preparation. Findings. The results indicate a growing demand for specialists with interdisciplinary thinking, digital literacy, adaptability, and lifelong learning competencies. Yet, existing educational systems often lack sufficient flexibility and innovative capacity to meet these emerging requirements. Conclusions. Higher education institutions play a critical role in revising curricula, integrating AI-related content, and applying innovative pedagogical strategies. A shift toward competency-based, interdisciplinary, and technology-integrated education is essential to close the gap between traditional approaches and the needs of an AI-driven economy. Practical implications. The findings provide guidance for curriculum developers, policymakers, and academic institutions seeking to align educational practices with labor market demands. By implementing these recommendations, stakeholders can enhance the readiness of future professionals to thrive in rapidly changing digital environments.

Keywords: Artificial Intelligence, Labor Market Transformation, Digital Economy, Educational Innovation, Curriculum Development, Future Skills, Higher Education.

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Institutional Review Board Statement: The study was conducted in full compliance with ethical standards and the principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of the L.N. Gumilyov Eurasian National University (approval protocol No. 4, dated 26.11.2024). Prior to participation, all respondents and their legal guardians were fully informed about the objectives, procedures, and potential risks of the research. Written informed consent was obtained from all participants and their legal representatives. Participation in the study was voluntary, and all participants retained the right to withdraw from the research at any stage without any consequences.
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1. Introduction

Artificial intelligence (AI) is radically transforming the labor market and societal structures, imposing new demands on workforce training and the evolution of educational systems. The automation of routine tasks is reallocating human resources toward areas requiring creativity, critical thinking, and emotional intelligence. As a result, soft skills - such as communication, empathy, and complex problem-solving - are gaining equal importance alongside hard skills. These shifts redefine the competencies expected from professionals and reveal new avenues for career development [1]. According to Microsoft's 2024 report [2] approximately 75% of professionals reported using AI tools in their daily work. The emerging pedagogical challenges call for the integration of innovative technologies focused on cultivating critical thinking, flexible skillsets, and universal competencies [3] which in turn necessitate a rethinking of traditional educational models. Moreover, contemporary graduates must be equipped to interact effectively with AI across various fields of application. This requires foundational digital literacy, including proficiency with digital tools and platforms, information search and analysis, and knowledge of cybersecurity principles [4].

Insufficient alignment of educational programs with the current needs of the digital economy leads to a shortage of qualified professionals and decreases graduate competitiveness. Thus, developing digital literacy and the ability to operate under uncertainty becomes a key objective, demanding continuous professional development for educators and the adoption of new teaching methods. The growing influence of AI on society necessitates educational and social adaptations to ensure a smooth transition to a new economy and to mitigate social inequality.

Despite increasing academic attention to AI's impact on employment, a significant research gap remains in understanding pedagogical strategies that effectively respond to these transformations. There is a particular lack of practical models for integrating AI-related competencies into educational content and aligning curricula with labor market shifts.

This study aims to identify the pedagogical challenges associated with preparing professionals in the context of AI-driven labor market transformation. The research is guided by the following questions:

1. What competencies are in demand in the AI-transformed labor market?
2. How should educational programs be adapted to train future-ready specialists?
3. What pedagogical strategies best support the development of these skills?

The novelty of this study lies in its analysis of AI's impact on labor markets and the associated demands for new professional qualities. The research provides recommendations for improving workforce training and supporting professionals in occupations potentially affected by AI. It includes a comparative analysis of emerging job markets in Kazakhstan, Russia, and the United States. The study is based on the hypothesis that the development of AI significantly influences labor market structures and competency requirements, thereby necessitating the adaptation of educational programs and pedagogical approaches to prepare graduates for the realities of the digital economy and collaboration with AI systems.

This research seeks to propose solutions for overcoming identified challenges and creating an effective system of professional training. The recommendations developed are intended for both educators and employees and can be applied in higher education institutions and professional practice to enhance workforce readiness and support individual professional development.

2. Literature Review

The transformation of the labor market under the influence of artificial intelligence (AI) has become the subject of active scholarly debate - from the cybernetic concepts of the mid-twentieth century to contemporary studies on generative AI. This transformation entails not only economic but also pedagogical challenges. Wiener [5] was among the first to highlight the ethical and social implications of automation, emphasizing human responsibility in the use of machines [5].

With the spread of information technologies in the late twentieth century, scholars noted that technological change does not so much eliminate professions as reshape the composition of tasks within them. Autor, et al. [6] demonstrated that automation rarely replaces labor entirely but rather complements it, thereby increasing the demand for non-routine cognitive and social skills [6]. For education, this created a shift toward fostering critical thinking and adaptive competencies.

The study by Frey and Osborne [7] triggered a new wave of debate by evaluating the susceptibility of entire professions to computerization [7]. Their findings pointed to the high risk of automation in routine occupations. For pedagogy, this serves as a signal of the urgent need to prepare workers for new forms of activity that demand flexibility and the ability to reskill. At the same time, subsequent research on the impact of AI on the labor market has noted positive trends. For example, Unuriode, et al. [8] argues that AI facilitates the emergence of new professions linked to the design, implementation, and maintenance of AI systems [8]. Consequently, educational programs should incorporate modules in programming, data analysis, and AI system management.

The 2022 World Economic Forum [9] report forecasts that AI will generate 133 million new jobs while displacing 75 million workers. For education, this presents a dual challenge: retraining those who lose employment and preparing new specialists with advanced digital competencies. The same report predicts that by 2025 AI will replace 85 million jobs while simultaneously creating 97 million new ones [9]. At the same time, contends that AI technologies increase the risk of unemployment for administrative staff. For educational systems, this necessitates the introduction of courses in digital administration and the management of automated processes. Similarly, studies by Maria, et al. [10] point to the disappearance of certain professions and the emergence of others, requiring flexible and modular curriculum design.

AI enhances productivity and efficiency by automating routine tasks, thereby freeing human potential for creative and strategic activities [11]. It also improves the quality of work by supporting data-driven decision-making and offering personalized recommendations [12]. For pedagogy, this underscores the importance of equipping students with skills in data handling, interpretation of algorithmic decisions, and the application of analytical tools in professional contexts.

AI also broadens access to services such as online education, financial consulting, and healthcare [13]. In education, it enables personalized learning and supports teachers in assessing outcomes more efficiently, saving time and enhancing the quality of instruction [8]. As a result, future specialists are likely to be more competitive.

Bozic [14] demonstrated that AI reduces the risk of human error [14]. From a pedagogical perspective, this requires reorienting learning away from repetitive operations and toward the development of critical reflection and complex analytical skills.

The integration of AI and digitalization also streamlines everyday life by automating tasks such as ordering goods, purchasing tickets, and other routine activities [15-17].

Nevertheless, individuals with lower educational attainment and intermediate skills remain particularly vulnerable to displacement [18-20]. Many occupations involving repetitive tasks face high risks of automation, potentially exacerbating unemployment and social tensions. For pedagogy, this highlights the priority of developing programs for professional retraining and lifelong learning. The acquisition of new competencies is becoming critically important [21]. Those unable to adapt to evolving labor market demands may struggle to secure employment. According to the Global Institute of Automation, approximately 375 million people will require significant retraining [22].

Finally, research points to the risks of algorithmic bias and threats to data security and privacy [23]. From a pedagogical standpoint, this necessitates the integration of courses in digital ethics, human rights, and cybersecurity into educational programs.

In sum, each stage of labor market transformation under the influence of AI is accompanied by pedagogical challenges - ranging from ethical awareness and flexible competencies to retraining and digital equity. Education must become a key instrument for mitigating the negative consequences of automation and preparing specialists for the future.

3. Materials and Methods

This study investigates the influence of artificial intelligence (AI) on the labor market, focusing on employer expectations, the responsiveness of higher education institutions, and the challenges faced by workers whose jobs are increasingly being automated. The central research question guiding this work is: How does AI affect the labor market? From this question, we derive several sub-questions:

- How are employers' requirements for employees changing under the influence of AI?
- How should universities respond to these changes?
- What strategies can be proposed for employees being replaced by AI technologies?

The working hypothesis of the study posits that the development and implementation of AI in Kazakhstan are progressing more slowly than in neighboring countries and the United States, leading to a lag in labor market transformation.

To explore these questions, we employed a mixed-methods approach, combining qualitative and quantitative data collection and analysis techniques. The following methods were applied:

Literature review: Analysis of over 50 scholarly articles, international economic development reports, and labor market analytics sourced from databases such as Scopus, Web of Science, RSCI, Google Scholar, and eLIBRARY. The review focused on publications from the last eight years using keywords such as "workforce training," "labor market transformation," "artificial intelligence," "competency development," "future specialist readiness," "critical thinking," "emotional intelligence," and "teamwork."

Labor market analysis: Examination of employment trends, demand forecasts across sectors, and occupational vulnerability to automation based on public labor statistics and vacancy monitoring platforms.

Expert interviews: A series of semi-structured interviews were conducted with 9 experts across three domains: representatives of IT companies, AI developers, and labor market specialists. Each group contributed insights into sector-specific transformations. Interview questions included:

- How do you assess the impact of AI on current and future professions in the IT sector?
- What new competencies will be in highest demand amid growing automation?
- How has the recruitment process changed in your company since the adoption of AI tools?
- What challenges do professionals face in securing employment in the AI-driven job market?

Qualitative content analysis: Used to identify recurring themes and competencies emerging from the expert responses and to assess the degree of automatability in different professional fields.

Quantitative methods: Statistical data on employment patterns and sector-specific AI integration were analyzed to identify broader trends and evaluate universities' preparedness to respond to workforce disruptions caused by AI.

The study was conducted in three phases:

1. Exploratory phase: A comprehensive review of scientific literature, global development reports, and online job market platforms to analyze the current labor market landscape and identify positive and negative trends associated with AI-related change.
2. Empirical phase: Expert interviews were carried out using focus group techniques. A total of 9 interviews (3 per domain) were conducted, providing detailed qualitative data on professional, technological, and educational shifts.
3. Analytical and applied phase: Based on the results, targeted recommendations were developed to improve the training of future professionals and offer guidance for current workers impacted by AI-related displacement.

Unlike earlier studies that predominantly focus on technological implementation or macroeconomic labor shifts, this research distinguishes itself by:

- Emphasizing the intersection of AI-induced labor transformation with university education reform, highlighting institutional readiness and curricular adaptation as key variables.
- Integrating expert perspectives from three distinct but interrelated sectors, enabling a multi-angled understanding of both current and future labor demands.
- Providing a Kazakhstan-centered analysis, contributing regionally grounded insights to the global discourse on AI and employment.
- Employing competency-based analysis to identify specific skills and professional attributes at risk of automation, and those emerging in demand, thus offering practical value to educators and policy makers.

This multifaceted approach enabled a nuanced understanding of how AI is reshaping the labor market and education systems, providing a foundation for strategic workforce development in emerging economies like Kazakhstan.

4. Results and Discussion

The impact of AI on the labor market and society is multifaceted, encompassing both positive and negative consequences. This section focuses primarily on the labor market implications.

Table 1.
Impacts of Artificial Intelligence on the Labor Market.

Aspect	Positive Effects	Negative Effects
Job Availability	Creation of new roles in AI development, maintenance, ethics, data analysis	Job displacement in repetitive and manual sectors (e.g., logistics, administration)
Work Nature	Transformation toward more creative, analytical, and meaningful tasks	Increased demand for high-level skills, potentially excluding less skilled workers
Skills and Education	Opportunities for reskilling and lifelong learning	Skills mismatch between workforce capabilities and AI-related demands
Economic Growth	Enhanced productivity, efficiency, and innovation	Uneven distribution of benefits across industries and regions
Access to Opportunities	Potential for inclusive development with proper education and training	Increased inequality in access to digital tools and education
Workplace Efficiency	Improved quality control, reduced human error, better decision-making	Risk of over-reliance on AI systems
Social Policy and Support Systems	Justification for new policy frameworks (e.g., Universal Basic Income)	High cost and complexity of implementing such systems

Some researchers predict the emergence of a skills and technologies mismatch - a gap between rapidly evolving technologies and the skills of the workforce [24].

Potential Implications for Society. AI is increasingly permeating all areas of society, fundamentally transforming the way we live. AI has the potential to impact every sphere of public life - including political, economic, cultural, recreational, healthcare, educational, transportation, and commercial domains.

In the political domain, AI can analyze vast amounts of data to enhance the accuracy of electoral forecasts and public sentiment analysis, which may contribute to more effective governance and the modernization of legislative systems. In economics, process automation reduces operational costs and increases productivity, potentially enabling reduced working hours and offering individuals more time for leisure, education, and healthcare.

The cultural sector is undergoing transformation through AI-generated art, music, and literature, raising questions of authorship and originality. The entertainment industry is becoming increasingly personalized, offering content tailored to individual preferences.

In healthcare, AI promises revolutionary advances in diagnostics and treatment, improving quality of life while also introducing new ethical dilemmas. Education is becoming more adaptive and flexible due to intelligent learning platforms, and transportation is projected to be safer and more efficient with the development of autonomous vehicles. As such, AI's influence extends across all facets of life, shaping a new societal landscape marked by both unprecedented opportunities and complex challenges.

The societal impact of AI can be systematized as follows:

Table 2.
Societal Implications of Artificial Intelligence.

Impact Area	**Description**
Transformation of social interactions	AI changes human communication via virtual assistants, chatbots, and online matchmaking systems.
Changes in social group structures	Shifts in labor demand and job nature alter class and social group configurations.
Ethical concerns	Issues include data privacy, algorithmic bias, and responsibility for AI-based decisions.
Security and reliability	Ensuring AI system safety is vital to avoid unintended consequences and failures.
Increased technological dependency	Overdependence on AI may reduce human self-reliance and degrade critical thinking or problem-solving abilities.
Enhanced quality of life	Automation and improved services can increase leisure time and raise living standards.
Political system transformation	AI contributes to political forecasting, public sentiment analysis, and targeted campaigning, influencing governance and policy-making.

Thus, the impact of AI on the labor market and society is complex and multifaceted. To fully leverage the benefits of AI while minimizing potential risks, it is essential to:

- Develop education and training systems focused on emerging skills;
- Design policies aimed at supporting worker reskilling and adaptation;
- Address ethical challenges associated with the use of AI;
- Ensure the safety and reliability of AI systems;
- Encourage innovation and foster collaboration among businesses, government, and the academic community.

Only a comprehensive approach will enable the effective management of the transformation brought about by AI and allow society to derive maximum benefit from this technological revolution.

Let us now consider the influence of AI on the labor market in Kazakhstan by analyzing job postings on the HeadHunter (hh) website [25]. As of February 2025, the platform featured 47,825 job vacancies offered by 122,503 companies.

A wide range of sectors was affected, and we can rank them by demand as follows: manager, operator, programmer, remote worker, administrator, sales associate, cashier, driver, and courier (see Table 3).

Table 3.
Vacancies on head hunter (hh).

Vacancy	**Manager**	**Operator**	**Programmer**	**Work At Home**	**Administrator**	**Vendor**	**Cashier**	**Driver**	**Courier**	**Part-Time Job**
Number	13584	2838	2629	2616	2497	2417	1872	1719	1127	4080

To visualize the results of the job vacancy analysis, refer to the horizontal bar chart (see Figure 1).

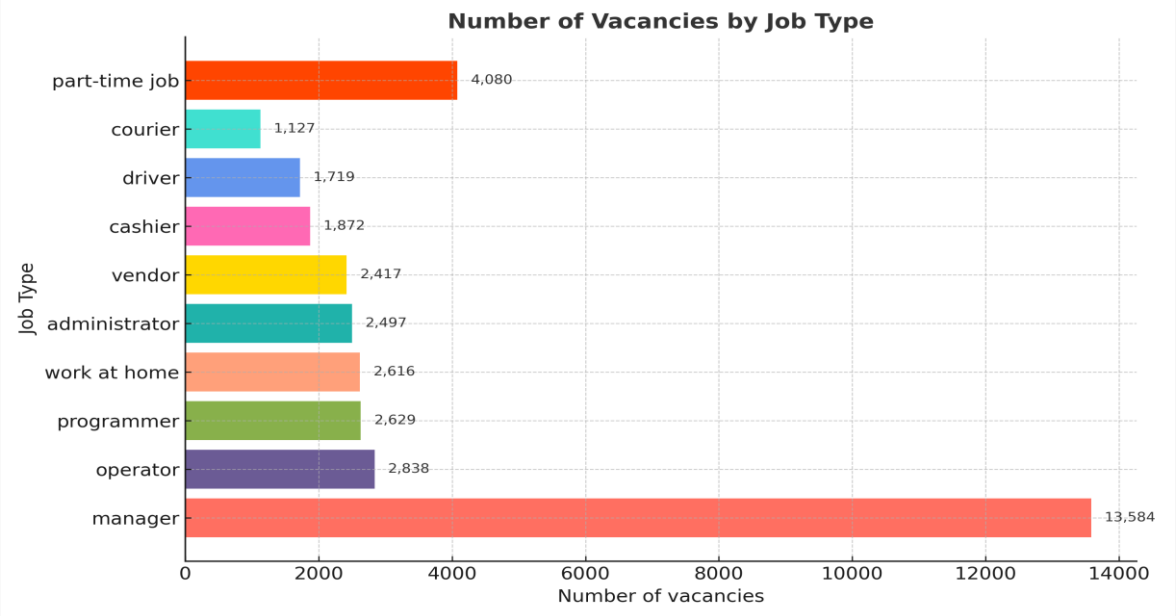

Figure 1.
Vacancies on head hunter (hh).

As shown in Table and Figure, professions that are declining globally - such as administrator, cashier, driver, and courier - remain in demand in Kazakhstan. This trend may be attributed to the relatively limited integration of artificial intelligence across various sectors. Additionally, the position of "manager" significantly exceeds all others in terms of the number of job postings.

Vacancies for emerging professions listed on the HeadHunter (hh) platform were also examined and compared with available positions in the United States [26]. The results are presented in Table 4.

Table 4.
Vacancies of new professions on the website of head hunter (hh) and the US job site.

Profession	Number of vacancies	Kazakhstan	Russia	Other CIS countries	U.S.A.
Machine Learning Engineer	6347	71	2005	75	4196
Data scientists	12116	23	395	63	11635
Data processing engineer	9848	102	2848	144	6754
AI Ethics Specialists	2456	1	11	1	2443

For a more illustrative representation of the job vacancy data, Figure 2 is provided.

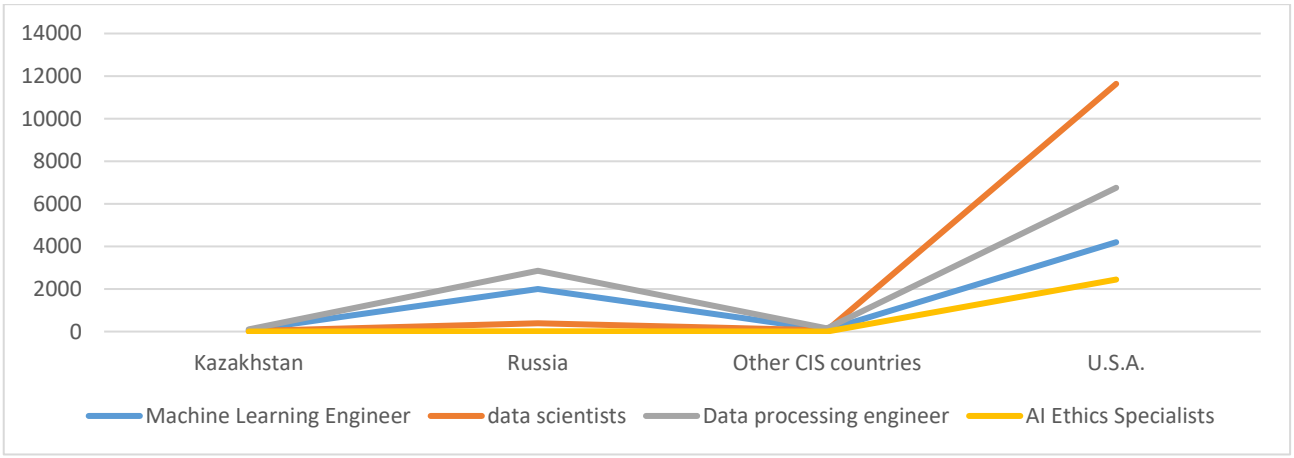

Figure 2.
New occupation vacancies on head hunter (hh) and the US job site.

As shown in the table and figure, there is evident demand for emerging professions in the labor market. A particularly high number of vacancies are observed in the United States, while Russia is also demonstrating significant growth. In contrast, Kazakhstan exhibits relatively few vacancies related to new professions. This analysis supports the hypothesis regarding the insufficient development and implementation of AI technologies in Kazakhstan. These findings are in line

with recent global assessments, such as the *Future of Jobs Report 2023* by the World Economic Forum [9] which emphasizes regional disparities in AI integration and digital skills preparedness.

To obtain accurate data on the impact of AI on the labor market, a series of expert interviews was conducted. Participants included representatives of IT companies, AI developers, and employment specialists.

In response to the first question, "How do you perceive the impact of AI technologies on current and future professions in the IT sector?", all experts emphasized that AI has a significant and growing influence on the professional landscape across various occupations. These conclusions are supported by Frey and Osborne [7] who argue that AI will automate a wide range of tasks across industries. Similarly, Kong, et al. [20] confirm the within-firm transformation in labor roles due to digitalization. However, contrasting evidence from Huang, et al. [19] suggests that certain traditional roles are more resistant to automation than previously assumed, pointing to sectoral and cultural factors as buffers.

Regarding the second question, "Which new skills and competencies are expected to be most in demand in the context of increasing automation?", experts highlighted the importance of critical thinking, adaptability, fast learning, emotional intelligence, teamwork, and self-development. These align closely with McKinsey Global Institute findings [6], which emphasize soft skills and digital literacy as top priorities in future employment scenarios.

In response to the third question on changes in recruitment processes following AI adoption, all experts reported increased efficiency and objectivity. AI tools now enable data-driven hiring and pre-assessment of candidate potential. This trend is confirmed in the Work Trend Index by Microsoft [2] which documents the proliferation of AI-powered hiring platforms. However, other scholars [8] caution that such tools may unintentionally reinforce algorithmic bias and call for the ethical auditing of AI systems.

Experts also discussed key challenges faced by job seekers in the AI-driven labor market. First, there is a growing need for continuous upskilling, as professions evolve rapidly. Second, labor market saturation has intensified competition, demanding high adaptability from candidates. Third, the ethical and societal implications of AI require interdisciplinary knowledge. These findings echo research by Frey and Osborne [7] and are further supported by Maria, et al. [10] who document the dual nature of AI as both a driver of job creation and a source of displacement.

Additionally, an analysis was conducted of job requirements for vacancies posted on the HeadHunter (hh) platform to identify the key competencies currently in demand. This included a comparison between vacancies for programmers and those for emerging professions.

For programmer positions, employers most frequently specified the following requirements: advanced proficiency in programming languages such as C++ and C#; understanding of multitasking, network protocols, and database operations; the ability to work collaboratively under tight deadlines; and strong command of SQL and 1C.

In contrast, the requirements for emerging professions are considerably more demanding and extend beyond machine learning model development. Employers often seek candidates with strong knowledge of Python, Power BI, SQL, Excel, and machine learning libraries (e.g., PyTorch, Scikit-learn, NumPy, FastAPI); experience in natural language processing (NLP) and transformer-based models (e.g., BERT, GPT, Claude); familiarity with version control systems (e.g., Git); and the ability to work with relational databases. In addition, candidates are expected to possess an analytical mindset, the ability to identify patterns and trends in data, monitor systems, debug errors, test hypotheses, and collaborate effectively with cross-functional teams. Some companies also require proficiency in foreign languages. These trends were also observed in the studies by highlighting a gap between current educational outcomes and employer expectations.

Several recent studies contradict the assumption that AI leads to net job losses. For instance, the World Economic Forum 2023 report [5] suggests that AI will ultimately create more jobs than it displaces, particularly in education, healthcare, and green economy sectors. Similarly, Kong, et al. [20] provide empirical evidence from China showing that robotization can coexist with employment growth if appropriate policy measures are in place.

Thus, while expert opinions gathered in this study align with the prevailing view that AI reshapes labor markets by intensifying skill demands and transforming workflows, they also reveal tensions and risks that must be addressed through evidence-based policies, inclusive education strategies, and ethical governance of AI applications.

The conducted analysis enables the formulation of several recommendations aimed at enhancing the effectiveness of specialist training in the context of a rapidly evolving labor market. These recommendations include the following:

1. Curriculum and syllabus modernization. Educational programs should be revised to incorporate up-to-date technologies, tools, and methodologies that align with employer demands. Course content should be regularly reviewed in accordance with projected industry developments.
2. Strengthening practical orientation. It is necessary to increase the number of internships, industry placements, and project-based learning opportunities. Workshops and masterclasses led by industry practitioners should be organized. Faculty should actively employ interactive teaching methods such as case studies, simulations, and gamification techniques.
3. Development of soft skills. Training in communication, leadership, teamwork, critical thinking, and adaptability should be integrated into the educational process as essential components of professional competence.
4. Implementation of individualized learning pathways. Students should be granted the opportunity to select elective courses and areas of specialization that correspond to their interests and career aspirations.
5. Enhancement of assessment methods. A comprehensive approach to student evaluation is recommended, incorporating knowledge testing, assessment of practical competencies, and review of completed project portfolios.
6. Establishment of feedback mechanisms. Feedback from students, employers, and alumni should be regularly collected and analyzed to ensure the continuous improvement of educational programs.

7. Continuous professional development of faculty. Regular upskilling of academic staff in emerging technologies and industry trends is a critical success factor in maintaining the relevance and quality of educational offerings.

Given the dynamic nature of the labor market, the ongoing technological transformation, and the rapid development of artificial intelligence, it is essential that workers acknowledge the possibility of automation affecting not only routine tasks but also more complex professional roles. Therefore, proactive preparation for potential changes in occupational requirements is of utmost importance.

Recommendations for Professionals in Declining Occupations.

In the context of labor market transformation and the decreasing demand for certain professions, the following recommendations are proposed for employees affected by these trends:

The first strategic step is the continuous upgrading of knowledge and skills. Participation in professional development courses, webinars, and specialized training programs is essential for maintaining competitiveness. It is advisable to actively study emerging technologies and explore their potential in order to adapt to labor market shifts. Importantly, this involves not only learning about new technologies but also acquiring the methodological competencies required to integrate artificial intelligence (AI) into work processes. A fundamental understanding of AI systems enhances the capacity to participate in and facilitate their implementation.

The development of future-relevant competencies such as creative thinking, emotional intelligence, and critical analysis is of particular importance in the AI era. These skills contribute to adaptability and resilience in dynamic professional environments.

Career reorientation should also be considered. Exploring adjacent professions or new specializations within the current domain can reveal areas where existing skills remain in demand. Formulating a proactive action plan in anticipation of potential changes in employment conditions enables individuals to respond effectively to future challenges.

Alongside the advancement of technical expertise, it is crucial to strengthen social competencies. Interpersonal communication skills, the ability to understand client needs, and effective teamwork are increasingly valued across professional sectors. This integrative approach supports both adaptation and the creation of efficient workflows.

Establishing interdisciplinary connections with professionals from related fields facilitates knowledge exchange and fosters innovation. Participation in professional communities and online platforms, as well as attending networking events, contributes to the development of valuable contacts and access to new opportunities.

Entrepreneurial skills are also becoming increasingly relevant. In the context of AI-driven innovation, new niches are emerging that create potential for entrepreneurial ventures and startups. The ability to identify and pursue these opportunities will be a key success factor in the evolving labor market.

Ultimately, openness to change and a positive outlook play a critical role. Confidence in one's abilities, combined with readiness to embrace new opportunities, is vital for successfully navigating transformations in the professional landscape. Flexibility and proactive engagement with self-development are essential for building a sustainable and prosperous career in the AI era.

5. Conclusion

The analysis has demonstrated that the rapid implementation of artificial intelligence is profoundly transforming the structure of the contemporary labor market, shifting the emphasis from traditional occupations to new types of activities that demand digital, analytical, and creative competencies. These processes pose significant challenges for the education system, which must not only respond to ongoing changes but also cultivate in future specialists a readiness for professional mobility and lifelong learning.

A reconsideration of pedagogical strategies for workforce preparation is acquiring particular importance. This involves updating educational programs, integrating modules on digital literacy, and implementing interdisciplinary approaches aimed at developing critical thinking, collaboration skills, and the ability to solve non-standard problems. In this context, the role of educators extends beyond the transmission of knowledge to fostering students' value-based attitudes toward innovation and their responsibility for its social application.

Thus, the transformation of the labor market under the influence of artificial intelligence sets before pedagogy the task of preparing a new type of specialist - flexible, socially responsible, and capable of working under conditions of uncertainty. Addressing this task requires further research in the fields of educational policy, pedagogical design, and the assessment of innovative teaching practices.

The results of this study will be valuable for educators in the process of training specialists, for the development of educational programs, and for providing methodologial recommendations to professionals whose occupations may be affected - particularly within systems of retraining and professional development. Moreover, the analysis of vacancies presented here offers useful insights for experts studying labor market dynamics.

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