MODELING THE IMPACT OF DIGITAL TECHNOLOGIES ON UNIVERSITY–INDUSTRY KNOWLEDGE EXCHANGE

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ABSTRACT. The rapid development of digital technologies has significantly transformed the mechanisms of knowledge exchange between universities and industrial enterprises. Digital platforms, cloud technologies, artificial intelligence, and big data analytics create new opportunities for strengthening cooperation between academic institutions and industry. This study examines the impact of digital technologies on university–industry knowledge exchange using econometric modeling and forecasting methods. The ARIMA model was applied to analyze time-series data and identify future trends in digital collaboration. Forecasting results suggest a steady growth in knowledge exchange activities between universities and industrial sectors through 2030.

Keywords: digital technologies, knowledge exchange, university–industry collaboration, innovation ecosystem, ARIMA model, technology transfer, digital transformation, forecasting.

INTRODUCTION

In the digital economy, knowledge has become one of the most important strategic resources for economic growth and innovation development. Universities play a critical role as producers of scientific knowledge, while industrial enterprises act as users and commercializers of research outcomes. Effective knowledge exchange between universities and industry has therefore become a key determinant of competitiveness and technological advancement [1-3]. Digital technologies are fundamentally changing the way knowledge is created, shared, and applied. The emergence of digital platforms, cloud computing systems, artificial intelligence, and virtual collaboration environments has facilitated closer interaction between academic institutions and industrial organizations. These technologies reduce communication barriers, improve access to information, and accelerate the transfer of scientific results into practical applications [4-7].

In recent years, governments around the world have increasingly emphasized the importance of university–industry collaboration as a driver of innovation and sustainable economic development. The application of the ARIMA model allows the identification of long-term tendencies and provides a basis for strategic decision-making in the field of innovation policy and digital transformation.

LITERATURE REVIEW

The growing role of digital technologies in modern economic development has attracted significant attention from researchers studying the integration of education, science, and industry. Many scholars emphasize that effective cooperation between universities, research institutions, and industrial enterprises plays a key role in strengthening innovation capacity and accelerating technological development.

In the scientific literature, the concept of university–industry collaboration is widely discussed as a fundamental element of innovation systems. According to H. Etzkowitz and L. Leydesdorff [11-12], the Triple Helix model explains the interaction between universities, industry, and government as a central mechanism for generating, transferring, and applying new knowledge in modern economies.

Other researchers, including M. Porter and B. Lundvall [13], emphasize that innovation-driven economic development largely depends on the strength of cooperation between scientific institutions and industrial sectors. Furthermore, a number of studies indicate that digital transformation significantly strengthens cooperation between universities, research institutions, and industrial enterprises. Digital platforms, big data technologies, and online collaboration systems facilitate knowledge exchange and accelerate the application of research results in practice [8–10]. As a result, digital technologies contribute to more effective innovation and technology transfer processes.

DATA and Methodology

The impact of digital technologies on university–industry knowledge exchange was examined using econometric analysis methods. Statistical data covering the relevant study period were analyzed to identify the main factors influencing the development of knowledge transfer and collaborative activities between universities and industrial enterprises. For forecasting purposes, the ARIMA (Autoregressive Integrated Moving Average) model was employed with the support of the STATA statistical software package. This approach is widely used in time-series analysis to determine development trends and predict future changes. The model made it possible to assess the dynamics of digital collaboration and

forecast the future development of university–industry knowledge exchange up to 2030.

RESULTS and Discussion

The empirical analysis reveals that digital technologies have become one of the key drivers of university–industry knowledge exchange. Over the last decade, universities have increasingly adopted digital tools for research collaboration, online communication, data sharing, and technology transfer. At the same time, industrial enterprises have expanded their participation in joint innovation projects, creating a more connected knowledge ecosystem.

Table 1

Digital Drivers of University–Industry Knowledge Exchange

Indicator	2015	2020	2025	Growth (%)
Digital connectivity index	42.5	63.8	88.4	108.0
Joint research projects	28	52	96	242.8
Technology transfer agreements	15	31	64	326.7
Digital collaboration platforms	21.4	48.6	84.2	293.5
Knowledge exchange efficiency index	51.2	72.8	95.3	86.1

The data indicate substantial growth in all selected indicators. The most significant increase was observed in technology transfer agreements and joint research projects, suggesting that digital transformation has improved cooperation mechanisms between universities and industrial enterprises.

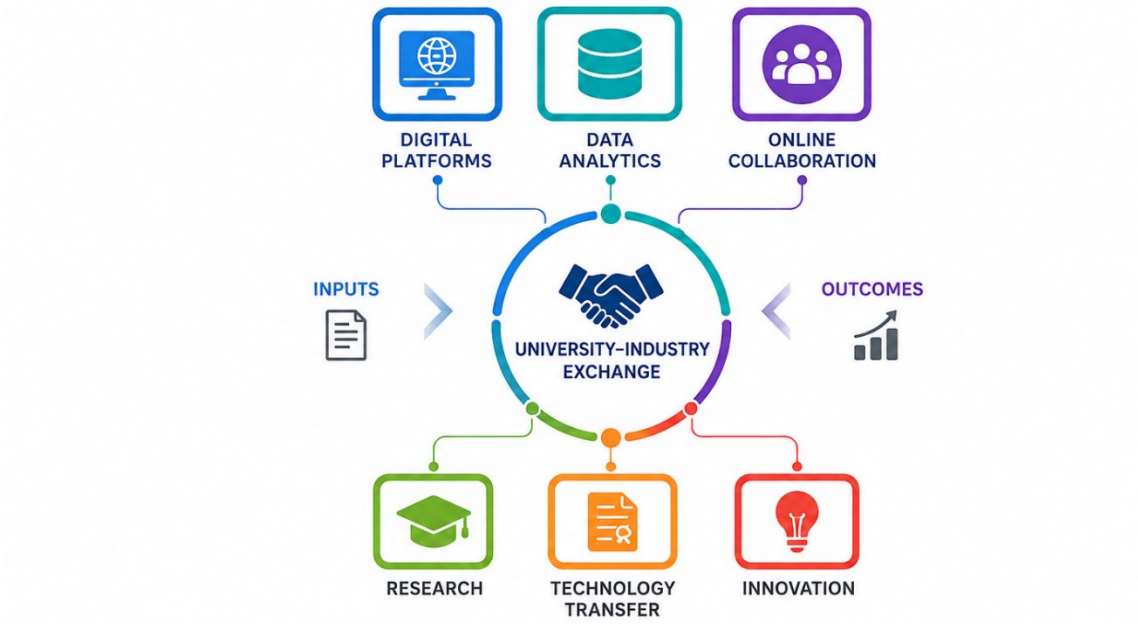

Figure 1. Conceptual Framework of Digital Knowledge Exchange

The framework demonstrates that digital technologies serve as an enabling mechanism connecting universities and industry through information sharing, collaborative research, and innovation activities.

To assess future trends, an ARIMA forecasting model was applied. The forecast results suggest that the knowledge exchange index will continue to increase over the coming years.

Table 2

Forecast of University–Industry Knowledge Exchange Index (2026–2030)

Year	Forecast Value
2026	101.4
2027	107.8
2028	114.5
2029	121.7
2030	129.3

The forecast indicates a stable upward trend, reflecting the growing role of digital technologies in supporting collaboration between academic institutions and industrial sectors. By 2030, the knowledge exchange index is expected to increase by approximately 35% compared with 2025.

CONCLUSION AND RECOMMENDATIONS

This study examined the impact of digital technologies on university–industry knowledge exchange and evaluated future development trends using econometric forecasting methods. The results indicate that digital transformation has become a key factor in enhancing cooperation between universities and industrial enterprises. The increasing use of digital infrastructure, online collaboration platforms, and technology-transfer mechanisms has significantly improved the efficiency of knowledge sharing and innovation activities.

Recommendations

- Increase investment in digital infrastructure to support effective communication and knowledge sharing between universities and industry.
- Expand the use of digital collaboration platforms that facilitate joint research projects and technology-transfer activities.
- Encourage stronger partnerships between academic institutions and industrial enterprises through innovation-oriented programs and initiatives.
- Improve institutional and regulatory frameworks that support the commercialization of scientific research and intellectual property.
- Develop digital skills and competencies among researchers, students, and industry specialists to enhance participation in the digital economy.

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