Economic Affairs, Vol. **69**(Special Issue), pp. 125-137, February 2024
DOI: 10.46852/0424-2513.1.2024.15

AESSRA

Review Paper

Studying the Role of Highly Intelligent Technologies in Creating an Innovation Ecosystem in the Business Landscape

Vasyl Goi[1]*, Dmytro Mykolaiets[2], Vira Lebedchenko[3], Olena Zavadska[4] and Oleksiy Khakhlov[5]

[1]Department of Economics and Marketing, O.M. Beketov National University of Urban Economy in Kharkiv, Kharkiv, Ukraine
[2]Interregional Academy of Personnel Management, Kyiv, Ukraine
[3]Department of Economics and Public Administration, Software Engineering and Business Faculty, National Aerospace University "Kharkiv Aviation Institute", Kharkiv, Ukraine
[4]Department of Entrepreneurship, Trade and Logistics, Faculty of Business and Law, Lutsk National Technical University, Lutsk, Ukraine
[5]Educational and Scientific Institute of Economics and Management, National University of Water and Environmental Engineering, Rivne, Ukraine

*Corresponding author: vasssgoi@gmail.com (**ORCID ID:** 0000-0003-1822-4478)

Received: 28-09-2023 **Revised:** 07-01-2024 **Accepted:** 25-01-2024

ABSTRACT

In the investigation of the role of highly intelligent technologies in the establishment of an innovative ecosystem within the realm of business, it has been ascertained that the incorporation of these technologies stands as a pivotal determinant for attaining fruitful innovative endeavors within enterprises. Specifically, artificial intelligence and machine learning methodologies provide the capacity to conceive intelligent systems capable of prognosticating and scrutinizing market trends, formulating sales forecasts, and endorsing the most advantageous avenues for developmental strategies. A fundamental observation derived from this research emphasizes the significant impact of advanced technologies, specifically artificial intelligence, machine learning, and data analysis, in optimizing production processes. Their incorporation enables the real-time acquisition, processing, and evaluation of extensive datasets, consequently augmenting decision-making effectiveness, refining supply chain management, and reinforcing the ability to respond to market fluctuations. Nonetheless, the significance of highly intelligent technologies in the establishment of innovative ecosystems should not be underestimated. These technologies facilitate inter-enterprise collaboration, the exchange of innovative concepts, and collaborative efforts in the creation of novel products and services. Such collaborative endeavors engender a synergistic effect of interaction, thereby amplifying competitiveness, not only at the individual enterprise level but also among innovative entities as a collective whole. This constitutes a critical stride in the establishment of innovative ecosystems and the attainment of competitive advantages within the market. The findings from this investigation delineate the noteworthy role of highly intelligent technologies in the configuration of innovative ecosystems within the business context. These technologies significantly contribute to the optimization of production processes, enhancement of product quality, and the creation of an environment conducive to collaborative efforts and innovative advancements.

HIGHLIGHTS

- Highly intelligent technologies, including artificial intelligence, machine learning, and data analytics, play a fundamental role in reshaping business ecosystems by fostering innovation, enhancing productivity, and enabling efficient collaboration among diverse stakeholders.
- The proactive integration of highly intelligent technologies into business operations not only

How to cite this article: Goi, V., Mykolaiets, D., Lebedchenko, V., Zavadska, O. and Khakhlov, O. (2024). Studying the Role of Highly Intelligent Technologies in Creating an Innovation Ecosystem in the Business Landscape. *Econ. Aff.*, **69**(Special Issue): 125-137.

Source of Support: None; **Conflict of Interest:** None

optimizes production processes, augments product quality, and diversifies product portfolios but also positions enterprises to navigate evolving market dynamics, secure competitive advantages, and contribute to the establishment of resilient and adaptive innovation ecosystems.

Keywords: Management, entrepreneurship, innovation, business, highly intelligent technologies, ecosystem, artificial intelligence, data analytics

In the contemporary global economic milieu, characterized by rapid change and the incessant evolution of technology, businesses are continually in pursuit of novel growth opportunities and competitive advantages. Consequently, the exploration of the role of highly intelligent technologies in fostering an innovation ecosystem has emerged as a prominent challenge for business leaders and researchers.

Within an information landscape where data has ascended to the status of being the most invaluable resource, its manipulation has become a determining factor for success and innovative competitiveness. Highly intelligent technologies, such as the Internet of Things (IoT), machine learning, artificial intelligence (AI), analytics platforms, and other pioneering developments, have risen to prominence as potent instruments. These technologies are profoundly reshaping the paradigms of work, goods production, and service provisioning.

Within the contemporary business landscape, the innovation ecosystem has evolved into a pivotal element for the effective functioning of enterprises. It serves as a unifying platform for companies, startups, research institutions, investors, and various stakeholders to collaboratively devise and execute innovative solutions. Highly intelligent technologies present a multitude of opportunities for these innovation ecosystems, empowering enterprises to convert substantial datasets into actionable information, mechanize processes, prognosticate and adapt to trends, and innovate novel products and services that cater to the exigencies of the contemporary market (Lyalina *et al.* 2021).

Contemporary business operations have been markedly shaped by the expeditious evolution of advanced intelligent technologies, encompassing artificial intelligence, machine learning, data analytics, and related domains. These technologies present an extensive array of possibilities for enterprises, including process automation, production optimization, enhanced customer service, and the innovation of novel products and services (Pikulyk, 2021).

Intensifying competition and the imperatives of innovation are compelling businesses to view highly intelligent technologies as a fundamental instrument for securing their market standing. Firms that adeptly integrate these technologies stand to accrue substantial competitive advantages, manifesting heightened productivity, elevated quality standards, and increased operational efficiency.

The significance of investigating the role of highly intelligent technologies derives from their burgeoning role as the foundation for forging innovative ecosystems that conjoin companies, startups, research institutions, and investors in a collective pursuit of formulating and executing innovative solutions. In a global context wherein data accessibility is increasingly ubiquitous and information volumes are expanding at an exponential rate, highly intelligent technologies furnish businesses with the means to dissect and harness this data to make well-informed decisions and forecast emerging trends. Through technological applications, businesses are better equipped to responsively adapt to shifts in consumer preferences, culminating in the creation of personalized products and services tailored to the demands of the contemporary market.

The study endeavors to scrutinize the influence of intelligent technologies on the configuration and operation of innovation ecosystems, to elucidate the role assumed by highly intelligent technologies in the inception and sustenance of innovation ecosystems within the business domain.

Research Objectives

1. To assess the contemporary utilization of highly intelligent technologies across diverse business sectors and their consequential effects on innovation processes.
2. To delineate the principal determinants governing the adoption of highly intelligent

technologies in business and their instrumental role in the establishment of innovative ecosystems.

3. To scrutinize instances of efficacious deployments of highly intelligent technologies in business and their impact on enhancing the competitiveness of enterprises.
4. To contemplate the impediments and challenges that may manifest during the integration of highly intelligent technologies in business operations and to propose potential strategies for mitigation.

Literature Review

Malynovska Y., Bashynska I., Cichoń D., Malynovskyy Y. and Sala D. (2022) suggest enhancing the engagement of communication department personnel in companies executing project assignments through the application of game theory methodologies. The central hypothesis posits that game theory tools have the potential to serve as a foundational framework for augmenting the motivation of employees within communication departments of energy companies while considering their risk tolerance and utility function. The proposed approach facilitates the specification of the parameters governing both fixed and incentive remunerations for these employees, contingent upon the inherent risk and utility associated with information and communication projects.

The objective of the study conducted by Vakhovych I., Kryvovyazyuk I., Kovalchuk N., Kaminska I., Volynchuk Y. and Kulyk Y. (2021) is to formulate a novel approach to risk management within logistics systems by leveraging intelligent technologies. This approach is designed to enhance the planning, assessment, and oversight of logistics processes, particularly through the application of information technology. The novel methodology encompasses the capability to adapt the parameters and structure of the recommended model in alignment with the conditions under which it is formulated. This adaptability underpins flexible risk management practices within the field of logistics and contributes to the cultivation of an innovative ecosystem in this business domain.

The findings of the investigation carried out by Volosheniuk L.V., Gornostay N.I. and Mikhalchenkova O.E. (2020) underscore a substantial and multifaceted influence of highly intelligent technologies on the innovation ecosystem within the business domain. These technologies engender enhancements not solely in production efficiency and quality but also the establishment of more pliable and adaptive organizational structures. The integration of advanced technologies, encompassing data analytics, artificial intelligence, machine learning, and the Internet of Things, empowers businesses to amass and analyze substantial volumes of data. This, in turn, facilitates more precise forecasting and augments the effectiveness of managerial decision-making.

Ukubassova, G.S., Primzharova, K.K., Daribayeva, A.K., Galiyeva, A.H. and Nurgaliyeva, A.S. (2020) investigate the challenges and prospects associated with the advancement of small and medium-sized enterprises within the framework of industrial production modernization in the energy sector. Their analysis centers on the application of innovative technologies for the optimization of energy-related processes and the mitigation of environmental impacts. The authors also furnish practical recommendations concerning the implementation of innovations in the energy sector, underscoring the pivotal role that small and medium-sized enterprises can play in this transformative endeavor.

Halkiv, L., Kulyniak, I., Shevchuk, N., Kucher, L. and Horbenko, T. (2021) ascertained that the effective functioning of an enterprise necessitates not only the streamlining of production and economic operations but also the incorporation of highly intelligent technologies. This integration facilitates the establishment of an innovative business ecosystem, empowering enterprises to attain competitive advantages and foster adaptability in the face of change. Manufacturing facilities that leverage advanced technologies enable businesses to augment production capacities, enhance product quality, and diversify their product portfolios. Nevertheless, to attain these objectives, businesses must implement highly intelligent technologies geared toward automating and optimizing production processes.

Koval, L., Tserklevych, V., Popovich, O., Bukhta S., Hurman, O. and Komarnitskyi, I. (2020) investigated the influence of intelligent technologies on the

development of innovative ecosystems within the gastronomic business domain, with specific emphasis on the restaurant industry. The study underscores the emerging significance of tools designed to impact human behavior, particularly those that pertain to gender roles and stereotypes in food selection, in shaping the strategic direction of businesses operating in this sector.

Within their research, Koval, L., Tserklevych, V., Popovich, O., Bukhta S., Hurman, O. and Komarnitskyi, I. (2020) arrive at conclusions regarding gender-associated dietary preferences. Nevertheless, it is important to acknowledge that their study does not exhaustively elucidate the pivotal role of gender-related factors in the shaping of dietary patterns and eating habits. This highlights the potential distinctions in food choices and approaches to maintaining a healthy lifestyle between men and women.

METHODS

In the course of this analysis, the author employed the following research methodologies:

1. **Literature Analysis:** This approach was employed to examine prior scholarly works and provide a theoretical underpinning for the role of highly intelligent technologies in the establishment of innovation ecosystems within the business context.
2. **Generalization Method:** This method was utilized to categorize information and consolidate findings from diverse sources, facilitating a comprehensive understanding of the interrelationship between the advancement of highly intelligent technologies and the proliferation of innovation ecosystems within the business sector.
3. **Statistical Data Analysis:** This technique was executed to evaluate the prevalence of highly intelligent technologies within the business domain and to assess their influence on the innovation ecosystem.

RESULTS

In the contemporary milieu, characterized by the pivotal significance of technological progress and innovations for achieving business success, the role of highly intelligent technologies in the establishment of innovative ecosystems is escalating in importance and relevance. Intelligent technologies assume a central role in the transformation of approaches to the creation and enhancement of business ecosystems, thereby affording enterprises novel opportunities and tools for fostering innovative development.

Alec Ross, an American innovation expert and former senior innovation advisor to former Secretary of State Hillary Clinton, has recounted that in his experiences across various countries, a recurrent aspiration was articulated: the desire to replicate the success of Silicon Valley. Moreover, a well-established concept for the creation of a technology cluster akin to Silicon Valley, as delineated by Mark Andreessen, encapsulates several pivotal components. These elements encompass the construction of a well-equipped technology park, the consolidation of scientific research laboratories and academic centers, as well as the deployment of innovative strategies to engage scientists, businesses, and consumers. Effective operations within such a technology park necessitate the establishment of industry collaborations through the creation of consortia involving specialized suppliers. Furthermore, safeguarding intellectual property rights and facilitating technology transfer are indispensable to cultivating a conducive business environment and institute requisite regulatory frameworks (Kyzymenko *et al.* 2021).

By an analysis undertaken by DigiTimes Asia, encompassing a survey of 7,502 enterprises worldwide, conducted from March 30 to April 12, 2022, commissioned by IBM, it was determined that the current global prevalence of enterprises that have integrated artificial intelligence technologies stands at 35%. This represents a growth of four percentage points in comparison to the figures reported in 2021 (DigiTimes Asia, 2022).

Ukraine has exhibited a proactive approach to fostering innovation within its domain. In July 2019, the Strategy for the Development of Innovative Activities until 2030 was endorsed and ratified. Among the primary objectives outlined in this strategic document is the establishment of a national innovation ecosystem aimed at expediting the translation of concepts into innovative products and services, subsequently facilitating their market

integration (Cabinet of Ministers of Ukraine, 2019). However, specific funding mechanisms, accountable entities, and individuals for strategy implementation remain undefined, and the strategy does not encompass considerations for the industrial dimension. Consequently, it is imperative to direct attention towards nurturing innovation ecosystems at the regional level within Ukraine, especially in light of the perpetual shifts in the global landscape and market requisites (Shevchenko *et al.* 2021). It is of significance to cite examples of well-established and productive innovation ecosystems within Ukraine, including:

1. ***UNIT.City:*** Represented as the foremost initiative in Ukraine and one of the most expansive within Central and Eastern Europe, UNIT.City serves as a pioneering innovation space. This platform functions as an ecosystem and amalgamates infrastructure to support the continuous expansion of sectors pertinent to high technology and creative industries. The coalescence of numerous companies, startups, experts, and research laboratories within this innovation space engenders an exceptional milieu conducive to the expeditious development of entrepreneurship and the materialization of innovative concepts.

2. ***Sikorsky Challenge (IE Sikorsky Challenge):*** This influential innovation ecosystem is underpinned by the esteemed National Technical University of Ukraine "Kyiv Polytechnic Institute" and the dynamic Science Park "Kyiv Polytechnic." The ecosystem is instrumental in advancing technology transfer, stimulating the evolution of technological concepts, and actively fostering the inception of new startups.

3. ***The All-Ukrainian Festival of Innovations:*** This event is dedicated to the promotion of academic entrepreneurship and the presentation of innovative projects by Ukrainian scientists and innovators.

4. The Science Park Corporation of Taras Shevchenko National University of Kyiv collaborates with the university and academic researchers to harness their collective capabilities for the initiation and advancement of intelligent research and development (R&D) and technology projects.

5. Additionally, the **Vernadsky Challenge** represents an annual open competition tailored for engineering startups specializing in engineering, design, development activities, and hardware development. The victors of this competition gain access to grant funding and scientific and technical assistance to support the evolution of their projects (Volosheniuk *et al.* 2020).

Within the realm of business, an ecosystem denotes an intricate system comprising interactions among diverse participants, wherein each entity exerts an influence on and is, in turn, influenced by others. This dynamic interaction engenders an environment characterized by continually evolving relationships, necessitating flexibility and adaptability on the part of businesses, akin to the dynamics observed in biological ecosystems. A principal catalyst driving the evolution of business ecosystems is the endeavor to minimize the collective social costs associated with the production and dissemination of goods and services (Haustov *et al.* 2022).

Presently, the concept of the platform economy emerges as one of the most efficacious and dynamic paradigms within the domain of business ecosystems. It aligns with novel principles of management actualized through integrated innovation platforms and business ecosystems. The contemporary platform economy affords a broad spectrum of opportunities, notably in the domains of public, transparent, and open exploitation of regional resources, encompassing natural capital. Moreover, it facilitates the identification of prospects and financial resources through the structural management system and project financing (Khlivniuk, 2021).

Information and technology network platforms empower diverse stakeholders within the market to devise novel products and services and engage in the exchange of created value. The genesis of the platform economy is intricately linked with the formation of business ecosystems wherein a myriad of economic agents, including enterprises, consumers, and public authorities, interconnect through a communication network to collaboratively generate meaningful value. This mode of interaction is aptly characterized by the concept of "network collaboration."

It is imperative to highlight that the platform economy, being a macroeconomic phenomenon, concurrently shapes the mechanisms of value creation at the microeconomic level, chiefly through

the integration of the advancements stemming from the fourth industrial revolution. Research conducted by Jeremy Rifkin illuminates that the inception of economic platforms is a consequence of the new industrial revolution, and they subsequently emerge as a pivotal stimulus and instrument for the realization of innovative transformations in technological structures (Kyzymenko *et al.* 2021).

The economic orientation inherent in the concept of sustainable development within this context mirrors overarching trends linked to the metamorphosis of markets toward augmenting network interactions, culminating in the broadening of the conventional interpretation of the ecosystem concept. The resemblance of business operations to natural ecosystems becomes evident through the systemic interactions that propel development, while principles governing business processes are readily observed in the realm of environmental management.

This phenomenon engenders a dynamic interplay, fostering systemic growth and the pragmatic fusion of natural and business ecosystems into a unified entity. Such amalgamation is facilitated by the active involvement of the public sector in the establishment of communication management platforms vested with the authority to oversee national assets, including natural resources.

Contemporary business ecosystems, underpinned by information and communication platforms and established through equitable involvement of both government and business entities, manifest as decentralized, adaptive, and open socio-technical frameworks. They function on the principles of self-organization, scalability, and sustainability. Within these processes, virtual spatial communication solutions assume a pivotal role in ensuring effective interaction among participants in the business ecosystem (Lemeshko, 2021).

In the process of Ukraine's integration into the European Union's research, education, and innovation landscape, the implementation of a comprehensive framework concept for the establishment and execution of state innovation policy holds paramount importance. This conceptual framework, commonly referred to as the "knowledge triangle," advocates for an integrated approach that intertwines science, education, and innovation policy (Kobeleva, 2021).

In recent times, the emphasis of this concept has evolved from the support of constrained research projects with limited participants to a heightened emphasis on bolstering the competitiveness of Europe's innovation ecosystem. Experts from the European Commission, in part, underscore the significance of symbiotic relationships between various organizations and their collaborative interactions in fostering innovation. These relationships can be either harmonious, yielding positive outcomes, or contentious, yet their systemic influence serves as the cornerstone of the innovation process (Pidorycheva, 2020).

Approaches to comprehending innovation ecosystems have witnessed a surge in prominence in recent years, and they can be categorized into two primary domains. The first approach perceives ecosystems as platforms around which stakeholders orchestrate their endeavors. Conversely, the second approach centers its attention on ecosystems structured around a focal (central) enterprise (Birillo *et al.* 2021).

To scrutinize the role of highly intelligent technologies in the establishment of an innovation ecosystem in business, it becomes imperative to delineate the essence and principal constituents of intelligent technologies. Consequently, intelligent technologies represent an array of diverse innovative methodologies grounded in the application of artificial intelligence (AI) and machine learning, which serve the purpose of scrutinizing, comprehending, decision-making, and problem-solving in scenarios that previously necessitated human intelligence or entailed extensive data processing (Silka, 2020). The main components of intelligent technologies are listed in Table 1.

Today, there is an active spread of highly intelligent technologies in Ukraine, which is determined by the percentage ratio of their use in various fields (Fig. 1).

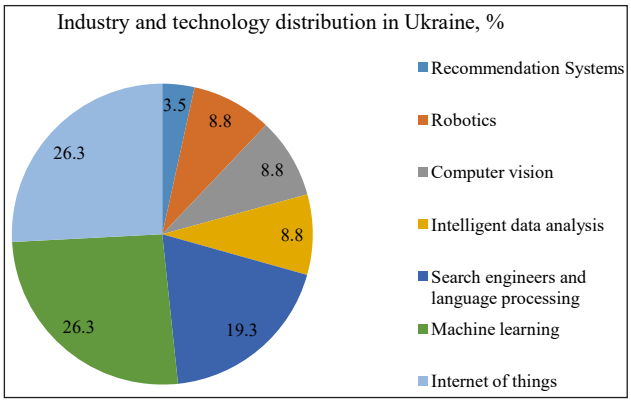
According to a survey conducted by McKinsey, it is noteworthy that spreadsheets persist as the predominant planning tool utilized by supply chain leaders, with 73% of respondents relying on this method. Concurrently, 20% of the professionals surveyed have already incorporated artificial intelligence and machine learning into their planning processes, while 43% intend to employ these tools for addressing specific planning tasks.

Table 1: The main components of intelligent technologies

Technologies	Characteristics
Artificial Intelligence (AI)	A term that describes the ability of computer systems and software to simulate human intelligence, including functions such as speech recognition, natural language understanding, problem solving, planning, and decision making
Machine learning	A subfield of artificial intelligence that studies the creation of algorithms and models that computers can program based on data. Machine learning is used to solve tasks such as classification, prediction, clustering and recommendations
Data analytics	The process of discovering, interpreting and using information from large volumes of data. Intelligent technologies help to automate the process of data analysis, detection of dependencies and decision-making based on this data
Computer Vision	A branch of intelligence technology concerned with the recognition and analysis of visual information such as photos and videos. Intelligent systems can identify objects, faces, movements and other attributes in images
Natural Language Processing (NLP)	It is used to understand and process human language by computers and includes automatic translation, text recognition, text generation and response to user requests

Source: *Compiled by the author based on (Khocha et al. 2023).*

Additionally, 17% of respondents are exploring the adaptation of these technologies to tackle a broader spectrum of planning tasks (McKinsey, 2022).



Source: Compiled by the author based on (N-iX, 2020).

Fig. 1: Spread of highly intelligent technologies in Ukraine, %

Intelligent technologies have found application across diverse industries, encompassing business, medicine, finance, transportation, robotics, energy, and numerous others. They serve to automate processes, augment productivity, enhance decision-making, and address intricate challenges that hitherto necessitate substantial human resources (Terenyak *et al.* 2023). Consequently, human beings and the nature of their interactions emerge as pivotal determinants for the success of the innovation creation and implementation processes.

In the modern economic landscape, the imperative for collaboration among all stakeholders engaged in the innovation process assumes critical significance. This collaboration yields a synergistic interplay, contributing to the competitive advantages of individual participants, their collectives, and the comprehensive innovation system within a designated region. Within this framework, there exists an imperative to cultivate innovative ecosystems (IE) as a fundamental prerequisite for fostering innovation-driven progress (Perminova *et al.* 2022). Basic and additional conditions for the emergence of entrepreneurial ecosystems see Table 2.

Within the framework of exploring the role of highly intelligent technologies in shaping an innovative business ecosystem, the distinctiveness of communication projects within companies serves as a conspicuous illustration of the impact of innovative approaches on the organization of business processes. These projects exhibit a wide-ranging scope and exert influence over the functional duties of personnel within the communication system, encompassing all facets of their roles. It is worth noting that while certain employees contribute to the development and operation of communication systems, others are tasked with their maintenance, and enhancement, or are engaged in the realm of data security. The divergence in functional responsibilities affords opportunities for the implementation of diverse mechanisms to activate employees' engagement, including motivational measures (Kobernyk, 2021).

Personnel can be categorized into two groups: those whose duties revolve around processes, and

Table 2: Basic and additional conditions for the emergence of entrepreneurial ecosystems

Basic conditions	Additional conditions
The existence of a venture capital sector and key players within the innovation system, including universities, venture capitalists, and a highly skilled workforce, represents exceedingly vital factors.	**Cultural Aspects:** ◆ Diversity of cultural and national dimensions ◆ Opportunities for meaningful leisure activities ◆ Fulfillment of liberal values within the region ◆ Existence of vibrant communities and public organizations
The existence of a significant number of gifted and talented individuals	Geographical location
Market demand for innovative products (IP)	Climate conditions
The existence of favorable legislation and taxation systems for entrepreneurship development	The presence of large corporations in the market
Availability of success stories that serve as an example for others	High regional status
Cultural Aspects: ◆ Promotion of entrepreneurship within the region ◆ Tolerance towards failure and an emphasis on a learning-oriented approach to business ◆ Significance of meaningful recognition and the status of technical experts within specific companies	Entrepreneurial freedom combined with limited financial support from the state
Supporting small businesses through entrepreneurship development programs Developed material and human infrastructure System of employee motivation through material incentives The aspect of time that determines the period of ecosystem formation The geographical proximity of the investor to the investee Focus on the comparative advantage of the region	Independent analysis and testing of innovative products constitute a pivotal phase in their developmental process. Products must undergo a rigorous quality assurance procedure. The rationale for this lies in the notion that if a technology has demonstrated success in one geographic region, it will probably exhibit efficacy in other regions as well.

Source: *Compiled by the author based on (Kobernyk, 2021).*

those whose responsibilities are project-oriented. In numerous companies, information communication has assumed a pivotal role, and the management of information communication projects holds significance for accomplishing distinct objectives. This approach serves to augment the engagement of employees in the execution of information and communication projects and enhances the strategies for motivating them (Malynovska *et al.* 2022).

Within the context of investigating the role of highly intelligent technologies in the establishment of an innovative business ecosystem, particular emphasis should be directed towards the management of contemporary economic systems in light of the escalating influence of diverse risk categories. Among these systems, logistics systems hold a pivotal position in streamlining economic processes. Ensuring more precise and expeditious management decision-making within the domain of logistics is assuming heightened importance, underscoring the significance of information technology deployment (Vakhovych *et al.* 2021).

Ensuring the efficiency of an enterprise constitutes a pivotal facet of success within today's market. The enhancement of production and business operations assumes a critical role in this endeavor, particularly leveraging the existing production infrastructure. The incorporation of cutting-edge technologies and the optimization of production processes within the enterprise serve to optimize production capacities, elevate product quality, and diversify the product range. This underscores the significance of highly intelligent technologies in fostering an innovative business ecosystem, contributing to the amelioration of productivity and the competitive edge of the enterprise (Halkiv *et al.* 2021).

Globalization of economic processes, encompassing the digitalization of the economy, represents a pivotal factor of significance. Digital technologies have emerged as a formidable force that exerts

influence over various domains of business, fostering the creation of innovative solutions and heightening productivity. Research endeavors are increasingly directed toward the cultivation of a business ecosystem wherein distinct enterprises collaborate in the pursuit of innovation. Highly intelligent technologies hold the potential to enhance interactions amongst ecosystem participants and facilitate the development of novel products and services. A fundamental strategic avenue for augmenting the efficiency in managing the innovation potential of enterprises is to proactively invest in digitalization. This proactive stance furnishes enterprises with the opportunity to harness contemporary tools and resources to conceive and effectively implement innovations (Shenderivska *et al.* 2021).

Presently, there is a discernible surge in the proliferation of software products that leverage advanced technologies and broaden their applications, resulting in substantial economic ramifications. Mechanisms for automated analysis and information processing, commonly known as Data Mining, constitute a pivotal element within the framework of electronic data warehousing and the orchestration of intelligent computing. Access by users to a data warehouse is confined to queries that are explicitly posed; however, Data Mining technology empowers the revelation of concealed patterns and rules within datasets that elude the user's foresight. Harnessing such discoveries can profoundly enhance a company's profitability.

The client-server architecture assumes a pivotal role within the domain of data mining technology. This architectural paradigm facilitates the execution of intricate data processing procedures on a high-performance server, serving the interests of both project developers and end-users. Such a server is proficient in the storage and execution of corporate projects in response to client requests.

The purview of intelligent technologies is remarkably broad and encompasses diverse industries. Data mining techniques have already gained widespread adoption across numerous organizations due to their capacity to augment revenues. Their application extends to customer relationship management, where the analysis of customer characteristics potentially exploring alternatives empowers companies to take proactive measures to retain them. It is worth emphasizing that retaining a customer is invariably more cost-effective than acquiring a new one (Dubenko *et al.* 2021).

Data mining additionally serves as a valuable tool for the identification of fraudulent activities and misuse. A multitude of financial institutions and online commerce platforms have incorporated this technology into their operations to uncover irregular patterns and fraudulent schemes linked to credit cards and transactions. The application of Data Mining enables the timely detection of such anomalies, thereby safeguarding the financial interests of both customers and businesses (Chubukova *et al.* 2020).

In addition to the aforementioned examples, intelligent technologies find extensive application in various sectors. In the field of medicine, they are instrumental in analyzing patient data, while the manufacturing sector harnesses them for process optimization. In the realm of research, these technologies facilitate the discovery of new knowledge and connections, and their utility extends to several other industries. Their capabilities encompass trend prediction, informed decision-making, productivity enhancement, and the simplification of intricate data analyses (Yaremko *et al.* 2020).

Nevertheless, it is imperative to acknowledge that the increasing potency of intelligent technologies also engenders ethical concerns regarding the use of personal data and privacy. Ensuring the protection of data and the safeguarding of user rights constitute crucial tasks in this domain.

Investigating the role of highly intelligent technologies in shaping innovative business ecosystems unveils a noteworthy aspect - the impact of gender perceptions on consumers' gastronomic preferences. An analysis featured in The Wall Street Journal highlights a growing trend where individuals increasingly adhere to gender stereotypes when making food choices and consuming them. Researchers focusing on the influence of brands on consumers have also identified this sway of gender attitudes on dietary preferences. Research findings indicate that consumers tend to opt for products characterized by a distinct gender identity, as it aids in aligning the brand with their personality. This phenomenon is explored within the context of the

interplay between gender and food choices. Details such as the quantity of food consumed, the manner of consumption, product selection, and attitudes toward healthy eating can all exhibit variations based on an individual's gender (Koval *et al.* 2020; Lelyk, 2022).

As a result, smart technologies are reshaping gender stereotypes within the gastronomy sector. They achieve this by fostering more inclusive and personalized concepts, leveraging big data for tailored recommendations and marketing, and breaking away from constricting gender roles. These advancements are instrumental in mitigating gender biases, contributing to a fairer and more adaptive environment for consumers within the gastronomy industry.

Additionally, intelligent technologies are revolutionizing industrial production and facilitating the comprehensive collection of substantial data concerning manufacturing processes. The analysis of this data is pivotal in identifying bottlenecks amenable to improvements and proactively predicting potential issues. These technologies also play a pivotal role in optimizing energy-related procedures and curtailing environmental impact. Strategies to achieve these ends encompass the continuous monitoring of energy consumption and related processes through the employment of sensors and data collection systems, the implementation of energy efficiency management systems underpinned by intelligent technologies, and the utilization of sensors and smart systems to oversee emissions and pollution levels in production (Ukubassova *et al.* 2020).

DISCUSSION

We concur with the assertion made by Malynovska, Bashynska, Cichoń, Malynovskyy, and Sala (2022) regarding the necessity to enhance the engagement of employees within the communication departments of companies tasked with project assignments. Their recommendation to leverage game theory tools as a means of bolstering employee motivation holds particular significance within the domain of energy companies. The central hypothesis advanced in their study revolves around the potential of employing game theory tools to incentivize employees in communication departments, with cognizance of their individual risk tolerance and utility function. This approach explicitly acknowledges the pivotal roles that risk and utility considerations play in shaping the most optimal remuneration system for these employees. Considering the distinctive characteristics of projects within the information and communication sectors, the proposed approach facilitates the establishment of remuneration parameters, encompassing both fixed and commission-based payments, that are finely attuned to the unique risk and benefit profiles of each project. This nuanced approach, in turn, can heighten employee motivation, fostering increased engagement in project implementation and yielding superior outcomes within the communication departments of energy companies.

We concur with the findings presented by Vakhovych, Kryvovyazyuk, Kovalchuk, Kaminska, Volynchuk, and Kulyk (2021) as their research elucidates a novel approach to risk management within logistics systems, one that harnesses the potential of intelligent technologies. This approach holds promise for enhancing the planning, assessment, and oversight of logistics processes, especially through the integration of information technology. Of particular note is the adaptability of this model, permitting the alteration of its parameters and configuration in response to the specific contextual nuances underpinning its formation. The strategic advantage of this adaptive management approach is its ability to facilitate precise alignment with prevailing circumstances and the attendant risks endemic to logistics operations. By tailoring strategies to these specific scenarios, this framework significantly bolsters risk management within logistics systems, thereby serving as a pivotal component within the overarching innovation ecosystem of this sector.

The analysis conducted by Volosheniuk, Gornostay, and Mikhalchenkova (2020) underscores that the integration of highly intelligent technologies, including artificial intelligence, machine learning, data analysis, and the Internet of Things, undoubtedly enhances both productivity and production quality within contemporary enterprises. We find merit in their assertions. Nevertheless, it is imperative to acknowledge that the influence of these technologies on the business innovation ecosystem extends beyond these quantitative metrics.

In particular, highly intelligent technologies serve as catalysts for the establishment of more agile and adaptable organizations. Their capacity to amass and analyze substantial datasets contributes to heightened precision in forecasting and facilitates informed decision-making at the management level. Such capabilities are instrumental in fostering the creation of an innovative ecosystem, wherein businesses can engage in more efficient collaboration and respond adeptly to market fluctuations. Hence, the assimilation of highly intelligent technologies undeniably exerts a transformative impact on the development of the innovation ecosystem within the business domain, imbuing it with greater dynamism and heightened competitiveness.

We hold a partial agreement with the perspectives presented by Ukubassova, Primzharova, Daribayeva, Galiyeva, and Nurgaliyeva (2020). Their study delves into aspects of enterprise development within the framework of industrial production modernization in the energy sector. In our estimation, to fully align with the aspirations of sustainable development, it is imperative to engage in a more comprehensive examination of the challenges and deficiencies that persist within the energy sector. The authors aptly expound upon the opportunities that emerge through modernization and emphasize the significance of integrating innovative technologies into this sector. Notably, they elaborate on how such innovative technologies can be harnessed to optimize energy processes and diminish the sector's environmental footprint. This is especially germane in the contemporary context where environmental concerns are paramount. Innovative technologies, as highlighted by the authors, have the potential to enhance production efficiency and concurrently ameliorate the environmental impact attributable to energy companies.

We concur with the findings of Halkiv, Kulyniak, Shevchuk, Kucher, and Horbenko (2021), as their research underscores the significance of introducing highly intelligent technologies into the realm of business. Their study accurately underscores that the optimization of production and business operations transcends mere enhancements in productivity and product quality. In particular, it underscores the critical importance of cultivating an innovative ecosystem to empower enterprises with a competitive edge and resilience amid the ever-evolving business landscape. Leveraging advanced technologies within production facilities not only facilitates the maximization of production capacities but also facilitates the enhancement of product quality and the diversification of the product portfolio. Nevertheless, achieving these objectives necessitates the deployment of highly intelligent technologies that specialize in the automation and optimization of production processes, emerging as a linchpin in the modern business landscape.

CONCLUSION

Examining the role of highly intelligent technologies in the establishment of innovative ecosystems within the business domain affirms their fundamental significance in contemporary entrepreneurship. These intelligent technologies have emerged as the primary catalyst for transformative changes within the business landscape, introducing novel possibilities that permeate all sectors of enterprise. This is exemplified by the persistent proliferation of artificial intelligence and machine learning applications within companies across the globe. Ukraine actively participates in this global evolution, recognizing the pivotal role of innovation development and the establishment of indigenous innovation ecosystems. Within the Ukrainian context, these modern innovation ecosystems play an active role in fostering business advancement and nurturing a conducive environment for innovation. Successful instances of innovation ecosystems, such as UNIT.City and the Sikorsky Challenge, underscore the proactive engagement of universities, enterprises, and various stakeholders in the pursuit of innovation promotion.

Innovation ecosystems necessitate a high degree of adaptability and preparedness for dynamic shifts, enabling businesses to effectively respond to continuously evolving circumstances and secure their long-term viability and progress. At the core of these innovative ecosystems is the concept of the platform economy, which establishes a novel blueprint for business ecosystems characterized by interconnectivity and innovation. This framework fosters synergistic collaboration among diverse stakeholders in the market, facilitating the generation of significant value. The idea of sustainable development underscores the imperative for harmonious coexistence between business entities

and the natural environment within an ecosystem. Contemporary business ecosystems evolve through a process of autonomous organization and cooperative interactions among participants, resulting in the establishment of resilient and open socio-technical platforms.

In the context of Ukraine's integration into the European Union's research, education, and innovation sphere, the development and implementation of a comprehensive approach to state innovation policy assume paramount significance. Within this context, innovation ecosystems play a pivotal role in enhancing competitiveness and fostering symbiotic relationships among diverse organizations. An integral component of this process pertains to the adoption of intelligent technologies, encompassing artificial intelligence, machine learning, data analytics, pattern recognition, and natural language processing. These technologies serve as pivotal tools for enhancing the efficiency and innovation potential of the ecosystem. In sum, the examination of highly intelligent technologies' role in shaping an innovation ecosystem within the business domain underscores their profound significance in sustaining growth, fostering value creation, and heightening competitiveness in the contemporary global landscape.

REFERENCES

Birillo, I. and Bogachek, E. 2021. Intelligent systems and technologies in the formation of coworking space. *Demiurge: Ideas, Technologies, Design Perspectives*, **4**(2).

Chubukova, O. Yu., Ponomarenko, I.V. and Nedbailo, N.V. 2020. Using Data Mining to process business data. *Problems of Innovative Development*, **23**.

DigiTimes Asia. 2022. AI adoption rising, says IBM survey. https://www.digitimes.com/news/a20220706PD203.html?mod=3&q=Morning+Consult

Halkiv, L., Kulyniak, I., Shevchuk, N., Kucher, L. and Horbenko, T. 2021. Information and Technological Support of Enterprise Management: Diagnostics of Crisis Situations. *2021 11th International Conference on Advanced Computer Information Technologies*, ACIT 2021 - Proceedings, pp. 309–312.

Haustov, M.M., Danko, A.T., Bondarenko, D.V., Yurchenko, O.K. 2022. Study of startup ecosystems of countries around the world to ensure their economic growth. *Business Inform*, **8**.

Cabinet of Ministers of Ukraine, 2019. Strategy for the development of the sphere of innovative activity for the period up to 2030, № 526-r, 10.07.2019, https://zakon.rada.gov.ua/laws/show/526-2019-%D1%80#Text

Khlivniuk, T.P. 2021. Platform economy as a factor of modernization of the welfare state. *Epistemological Studies in Philosophy, Social and Political Sciences*, **4**(1): 123-131.

Khocha, N.V., Tenyukh, Z.I. and Peleh, U.V. 2023. Technologies of artificial intelligence (AI) in management accounting. *Scientific notes of the Lviv University of Business and Law*, **39**: 12-19.

Kobeleva, A. and Pererva, P. 2021. The current state and prospects for the development of the Ukrainian market of intellectual and innovative technologies. *Bulletin of the National Technical University "Kharkiv Polytechnic Institute" (economic sciences),* (4), 79–87.

Kobernyk, A.O. 2021. Regional innovative ecosystems in Ukraine. *Business Inform*, **7**: 56–61.

Koval, L., Tserklevych, V., Popovich, O., Bukhta S., Hurman, O. and Komarnitskyi, I. 2020. Gender Targeting of Restaurants' Visitors-Representatives of Generation Z. *International Journal of Management,* **11**(6): 155–162.

Kyzymenko, K.S. and Kravchenko, M.O. 2021. Development of an innovative ecosystem model for defense enterprises of Ukraine. *Economic bulletin of NTUU "Kyiv Polytechnic Institute"*, **19**.

Lyalina, N.S., Matvienko-Bilyaeva, G.L. and Panchuk, A.S. 2021. Modern business in Ukraine. *Problems and Development Prospects*, **53**.

Malynovska, Y., Bashynska, I., Cichoń, D., Malynovskyy, Y. and Sala, D. 2022. Enhancing the Activity of Employees of the Communication Department of an Energy Sector Company. *Energies*, **15**(13): 4701.

McKinsey & Company, 2022. To improve your supply chain, modernize your supply-chain IT. https://www.mckinsey.com/capabilities/operations/our-insights/to-improve-your-supply-chain-modernize-your-supply-chain-it

N-iX, 2020. The why and how of partnering with AI software developers in Ukraine. *N-iX insights.* https://www.n-ix.com/hiring-ai-software-developers-in-ukraine-ultimate-guide/

Perminova, S. and Chuprina, M. 2022. Development of the national innovative ecosystem in the context of interaction of subjects of science and business. *Igor Sikorsky Kyiv Polytechnic Institute,* **38**.

Pidorycheva, I. 2020. Innovation ecosystem in contemporary economic researches. *Institute of Industrial Economics of the NAS of Ukraine*. https://doi.org/10.15407/econindustry2020.02.054

Pikulyk, O. 2021. Business environment in ukraine. *Problems and Prospects of Development,* **2**(119).

Shenderivska, L. and Kvasko, A. 2021. Directions of development of the innovative potential of enterprises. *Economic space,* (166): 74-80.

Shevchenko, O. and Dzyuba, O. 2021. Economic and legal analysis of the implementation of the "Strategy for the development of the sphere of innovative activities for the period until 2030". *Economy and society*, (23). https://doi.org/10.32782/2524-0072/2021-23-14

Silka, T.B. 2020. Application of artificial intelligence to improve the efficiency of telecommunication systems. *Igor Sikorsky Kyiv Polytechnic Institute*.

Terenyak, L.V. and Yevchenko, V.V. 2023. The role of information provision and the influence of artificial intelligence in the process of making marketing decisions. *Bulletin of the Kherson National Technical University*, **2**(81).

Ukubassova, G.S., Primzharova, K.K. Daribayeva, A.K., Galiyeva, A.H. and Nurgaliyeva, A.S. 2020. The development of small and medium-sized enterprises in the modernization of industrial production in the case of the power complex enterprise. *Industrial Engineering and Management Systems*, **19**(1): 103–119.

Vakhovych, I., Kryvovyazyuk, I., Kovalchuk, N., Kaminska, I., Volynchuk, Y. and Kulyk, Y. 2021. Application of Information Technologies for Risk Management of Logistics Systems. *ITMS 2021 - 2021 62nd International Scientific Conference on Information Technology and Management Science of Riga Technical University*, Riga, Latvia, 1-6, https://doi.org/10.1109/ITMS52826.2021.9615297

Volosheniuk, L.V., Gornostay, N.I. and Mikhalchenkova, O.E. 2020. Innovative ecosystem: concepts, functions, levels of innovative development, examples. *Science, technology, innovation*, **1**. http://doi.org/10.35668/2520-6524-2020-1-01

Yaremko, S.A. and Kuzmina, O.M. 2020. Application of intelligent information technologies to improve the efficiency of management decision-making. *Computer-Integrated Technologies: Education, Science, Production*, **35**, 140.