

INNOVATION AS A CATALYST FOR BUSINESS TRANSFORMATION

Kateryna Slavhorodska^{1*}, ¹Student, Economic Cybernetics Department, Sumy State University, Sumy, Ukraine

*Corresponding author: Kateryna Slavhorodska, email: k.slavhorodska@student.sumdu.edu.ua

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Abstract: The article is devoted to the theoretical-scientometric analysis of the role of innovations in the process of business transformation with an emphasis on strategic planning, change management, and adaptation to new market conditions. A comprehensive bibliometric analysis of scientific publications on the topic "Innovation as a catalyst for business" was conducted to achieve the goal. A corresponding search query in the Scopus database generated the publication input array. Further scientometric analysis was carried out using R Studio software, R language, Shiny, and Biblioshiny packages (for data analysis and visualisations in the form of keyword cloud, treemap, keyword compatibility network, and thematic map). In addition, a statistical data analysis was carried out to assess the impact of digital transformation on the economic growth of countries and the productivity of enterprises. A comparative analysis of data from different countries (USA, Great Britain, Canada, Japan, France, Italy) made identifying general trends and features possible. An effective national system that promotes the generation and implementation of innovations is the key to the country's successful development, and countries that are leaders in technological development set trends for the entire world economy. As a result of the study, it was substantiated that innovation is a crucial factor in the development of modern business. Digital transformation, as an integral part of the innovation process, allows companies to optimise processes, personalise interaction with customers, and increase efficiency. The analysis of scientific publications showed that the main research directions in the context of innovation as a catalyst of business transformations are focused on issues such as digital transformation, artificial intelligence, big data, sustainable development, and innovative business models. The scientific novelty of the conducted research is the substantiation and addition of existing knowledge about the role of innovation in business transformation through detailed scientometric and bibliometric analysis of scientific publications and visualisation of research results. The research results can be used by company managers, scientists, and policymakers to develop innovation strategies, assess the impact of innovation on business, and develop recommendations for implementing innovative technologies.

Keywords: innovation culture, technological and digital development, digital transformation, business reinvention, bibliometric analysis.

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1. Introduction. The rapid development of technologies and the global trend toward digital transformation create potent opportunities for fundamental business changes. Innovation catalyses these changes and contributes to increasing the company's competitiveness and ability to adapt to dynamic market conditions. At the same time, introducing new technologies and business models requires careful analysis and management of risks that arise in the transformation process.

Globalization has made competition so fierce that traditional factors of production, such as natural resources or cheap labor, are no longer a guarantee of success. According to Vetrivel S. C., Sowmiya K.C., Sabareeshwari, V., and Arun, V.P (Vetrivel et al., 2024) innovation is the driving force of economic development. Creative destruction is a process in which new, more efficient ones replace old technologies and business models. A clear example is the digital revolution, which has transformed many industries and created new growth opportunities (Adiguzel, 2024).

The modern economy is going through a profound transformation caused by the rapid development of digital technologies. This process, known as digital transformation, involves the transition of companies from traditional business models to digital ones based on data and technology. The digital strategies at the heart of this transition enable companies of all sizes to streamline processes (Wu et al., 2024), personalise customer interactions, increase efficiency, and adapt to rapidly changing markets. However, digital transformation also brings new challenges, such as cyber security and the need to improve the digital transformation of the workforce. Despite these challenges, digital transformation is an integral part of modern business and offers companies numerous opportunities for growth and development.

The most important feature of modern economic globalisation is the transition to the digital economy and the digital transformation of business and management processes. The latter involves developing and implementing digital strategies and business models to generate business organisations.

Therefore, digital innovation is today a catalyst for global business transformation. Digital innovations introduce new production and management methods and fundamentally change traditional business models (Reim et al., 2020). Adapting to these innovations has become imperative for companies that want to remain competitive in the market. Introducing innovative technologies, such as artificial intelligence, blockchain (Hong and Xiao, 2024), big data, and the Internet of Things, opens up new horizons for business opportunities (Kaur et al., 2024). These technologies allow companies to optimise their internal processes and ensure greater efficiency and productivity. These technologies also help create new customer interaction models and increase customer satisfaction and loyalty. One of the essential aspects of the impact of technological innovations is their ability to transform traditional markets and create entirely new sectors of the economy. This makes both challenges and unique opportunities for business growth and development.

Generally, a business's digital transformation involves restructuring its management system and making several management decisions, namely, choosing a digital transformation method (Ray et al., 2024). Boston Consulting Group (2024) researchers believe that firms use one of two paths. The first is the path of gradual transformation, which is considered ineffective because changes in digital technologies are happening too quickly. The second is jumpy and risky, during which firms build up their internal technological capabilities as soon as possible, redeveloping a company's digital strategy and completely changing the current business model. Consequently, the digital transformation of business leads to significant changes in how work is done, ownership relations, and social structures, prompting the development and implementation of new strategies, business models, and business management solutions.

Also, it should be noted that in today's environment, many technological innovations are affecting business. PwC experts (Technology: PwC) analysed more than 150 modern technologies that are most relevant for business activities. As a result of this analysis, eight technologies were selected that will have the most significant impact on business shortly: artificial intelligence, augmented reality, Blockchain technology, the use of drones, the Internet of Things, robotics, virtual reality, and 3D printers. Thanks to constant monitoring of technological innovations and directing business ideas to their use and dissemination, domestic companies can achieve the desired level of competitiveness in target markets and ensure sustainable development. In addition, creating an innovative culture is a critical factor for the long-term success of any organisation (Pineda-Celaya et al., 2023). A culture of innovation is an organisation's ability to identify, implement, and develop new products and regular processes, making them the organisation's everyday life (Cheong et al., 2024). Innovation does not last long, but the advantage of systematic innovation capacity can last for a long time. Corporate culture is of great importance in innovation.

In general, the digital economy arose and received further development due to the objective need to introduce innovative solutions and demand for products in the conditions of virtual commodity-money relations. The economic paradigm not only changes the ways of doing business but also transforms the structure and dynamics of global markets, forcing companies to adapt to new competitive conditions and consumer priorities. In this context, the role of the digital economy as a catalyst for business development is more important than ever, providing it with a path to innovative growth and sustainable competitiveness Yingying Ding, Ziyi Shi, Ruichao Xi, Yanxia Diao and Yu Hu (Ding et al., 2024). Digitisation, to one degree or another, helps to optimize or change the business processes of companies, thereby transforming them and helping to form competitive advantages and the ability to respond to consumer needs promptly.

2. Literature Review.

2.1. Bibliometric Analysis

To generalise the analysis of the works of domestic and foreign scientists, a bibliometric analysis was carried out based on a sample in the Scopus database on the request "Innovation as a catalyst for business," which includes 80 publications for the period from 2003 to July 2024. The bibliographic analysis was done using the R Studio software, R language, and Shiny and Biblioshiny packages (Aria et al., 2017). The primary information of the conducted bibliometric analysis is given in Table 1.

Table 1. Main information about the input array of publications on the research topic

Description	The results
<i>BASIC DATA INFORMATION</i>	
Time period	2003:2024
Sources (magazines, books, etc.)	76
Documents	80
Annual growth rate, %	11.59
Average age of the document	3.92
Average number of citations per document	9.85
Link	0
<i>CONTENTS OF THE DOCUMENT</i>	
Keywords plus (ID)	357
Keywords of the author (DE)	286
<i>AUTHORS</i>	
The authors	357
Authors of individual documents	286
<i>AUTHORS' COOPERATION</i>	
Individual documents	19
Co-authors for one document	2.96
International co-authorship, %	26.25
<i>TYPES OF DOCUMENTS</i>	
article	42
book	4
book section	17
report at the conference	12
conference overview	1
review	4

Sources: developed by the author using R Studio Software language and Bibliometric package (Aria et al., 2017).

Figure 1 shows the relationship between key concepts, research institutions, and countries as a three-field plot. The left field shows keywords representing the main research topics, such as innovation, sustainable development, and digital transformation. The center shows academic institutions, such as universities and research institutes, that conduct these studies. The countries where these institutions are located are indicated in the right field. This visual tool shows scientific activity and international cooperation in critical areas of modern research.

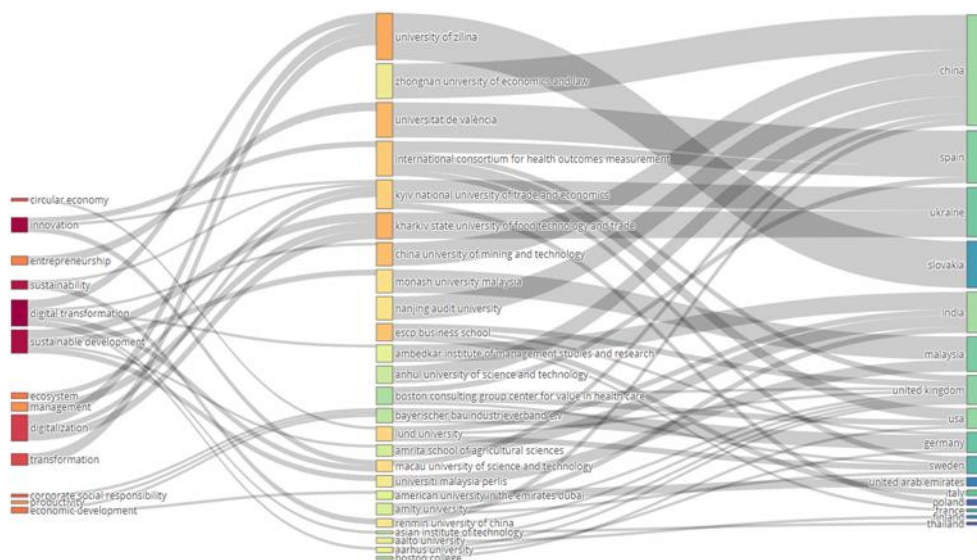


Figure 1. The relationship between keywords, author affiliations, and countries with the research topic
Sources: developed by the author using R Studio Software language and Bibliometric package (Aria et al., 2017).

Figure 2 displays the top 20 universities and organizations most frequently mentioned in the researched database. Each dot on the graph corresponds to one organization, and the size of the dot is proportional to the number of mentions. This graph allows us to identify key institutions essential in the field under study.

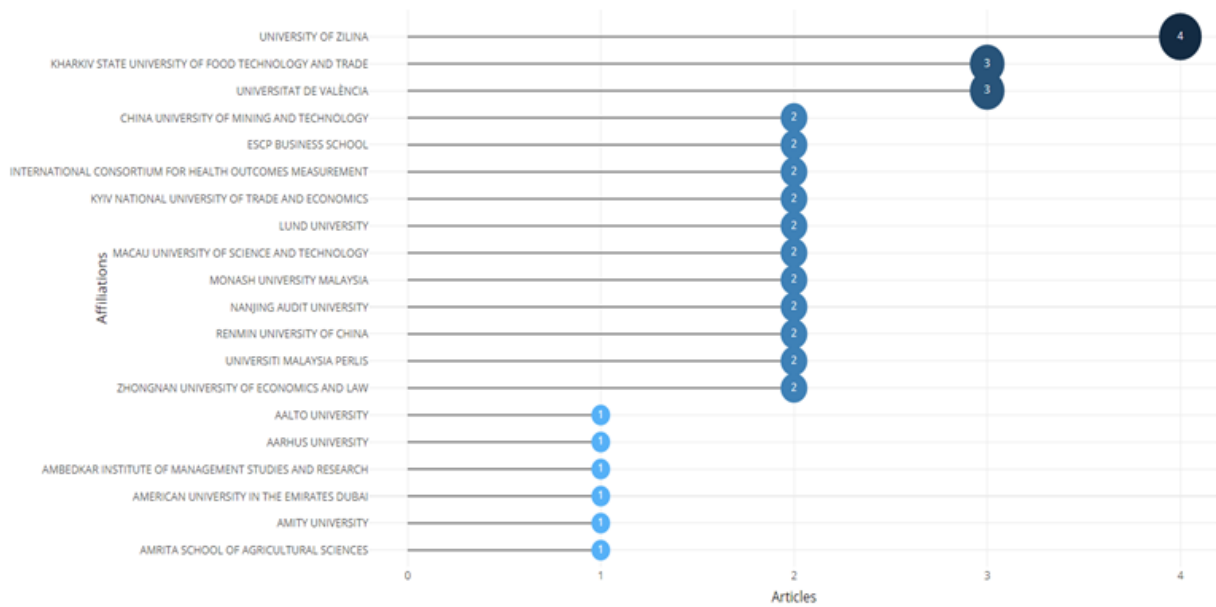


Figure 2. The most significant affiliations of authors (Top-20)

Sources: developed by the author using R Studio Software language and Bibliometric package (Aria et al., 2017).

Figure 3 illustrates the top 20 countries whose scientists are the most cited in the field of research on innovation as a catalyst for business transformation. The visualization shows the number of citations of scientific works in each country, allowing you to assess the impact of research in this field. Finland, Sweden, and the USA are the leaders in the number of citations, which are significantly ahead of other countries. The graph (Figure 3) demonstrates the global nature of innovation research, covering both developed and developing countries.

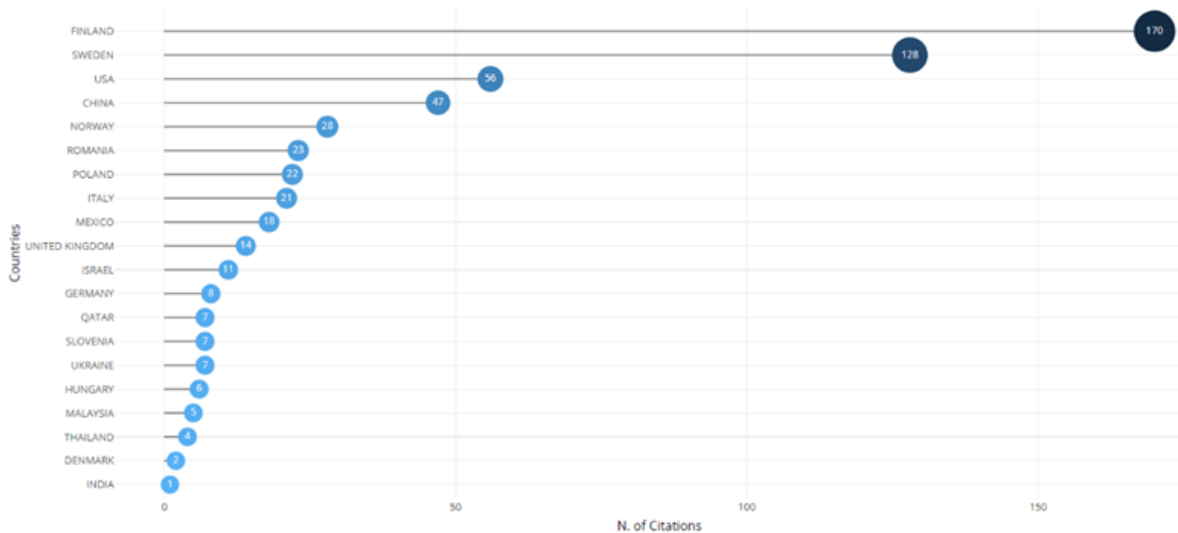


Figure 3. Top 20 most cited countries by research topic

Sources: developed by the author using R Studio Software language and Bibliometric package (Aria et al., 2017).

The cloud of keywords presented in Figure 4 allows you to evaluate information about current trends in innovation research. It will enable you to understand which aspects of innovation interest researchers and which research directions are the most promising.



Figure 4. A cloud of keywords characterizing innovation as a catalyst for business transformation
Sources: developed by the author using R Studio Software language and Bibliometric package (Aria et al., 2017).

A treemap cloud of keywords (Figure 5) allows you to identify key topics, concepts, and relationships in the field under study. It provides a visual representation of which terms occur most often in the textual data and how they relate. Based on the data in Figure 5, we can see that the research focuses on innovation, especially in the context of digital transformation and sustainable development. There is also a strong emphasis on technology and its impact on the economy and society. Indeed, innovation, especially in the context of digital transformation, is becoming a key driver of sustainable development. Current examples include “smart cities” (the use of sensors, data analysis, and other technologies to optimise city management, reduce energy consumption, and improve quality of life) (Almirall, 2024); green energy (development and implementation of new technologies for the production and storage of renewable energy) (Randhawa et al., 2024); digital medicine (using telemedicine, artificial intelligence to diagnose diseases and personalised medicine) (O’Sullivan et al., 2022). There is also a strong emphasis on technology and its impact on the economy and society.



Figure 5. Keyword tree map characterizing innovation as a catalyst for business transformation
Sources: developed by the author using R Studio Software language and Bibliometric package (Aria et al., 2017).

Figure 6 illustrates a topic map that divides research topics into four categories: niche, declining or emerging, driver topics, and core topics. The X-axis represents the centrality of a topic, meaning its relevance and impact on other topics. In contrast, the Y-axis represents a topic's degree of development or density, meaning its depth and research. Niche topics (upper left quadrant) have a high level of development but limited centrality. They are specialized and may relate to certain technological or business development aspects. Declining or emerging themes (lower left quadrant) have low development and centrality. These

topics are just beginning to receive attention or are gradually losing the interest of researchers. These include topics such as the role of government or innovation related to catalysts. The driving themes (upper right quadrant) have high centrality and development. They are vital to advancing scientific research. These include innovation, commerce, and sustainable development, which determine the main directions of modern research and greatly influence other topics. Basic themes (lower right quadrant) are essential and have high centrality but low elaboration. They are the foundation for further research but have not yet received sufficient scientific attention. These are, for example, digital transformation and information systems, which are actively discussed but need further development. Such a division helps identify the most promising and critical topics for further research and understand which directions are gradually losing relevance or are just beginning to develop.

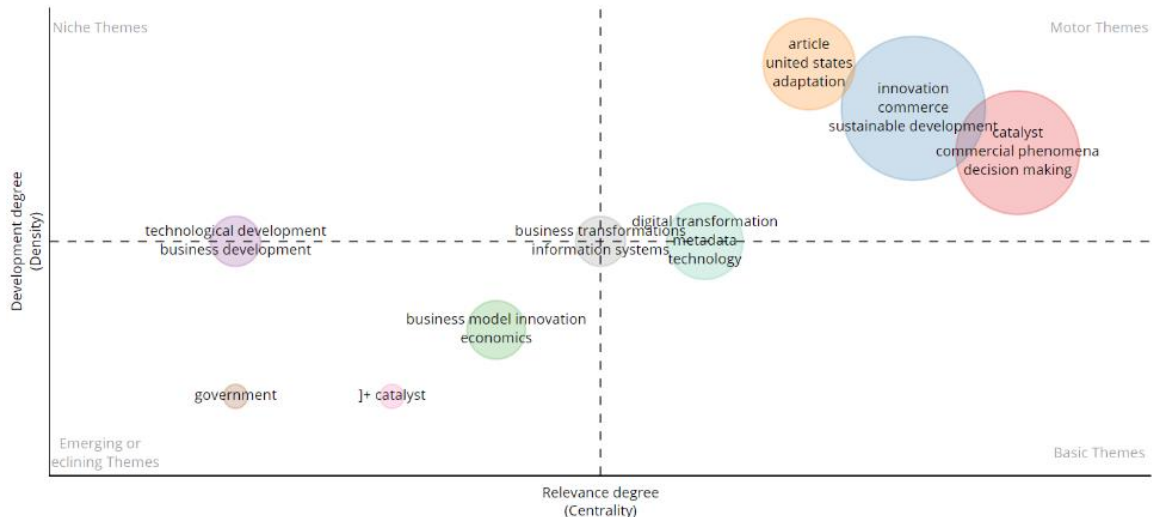


Figure 6. Thematic map characterizing innovation as a catalyst for business transformation
Sources: developed by the author using R Studio Software language and Bibliometric package (Aria et al., 2017).

Figure 7 visualizes the relationships between the keywords that occur most often in the studied array of publications. Each word is represented as a node, and the lines between the nodes represent the relationship of documents where corresponding keywords occur together in the text. This type of network allows for the identification of thematic clusters, key concepts, and their relationships.

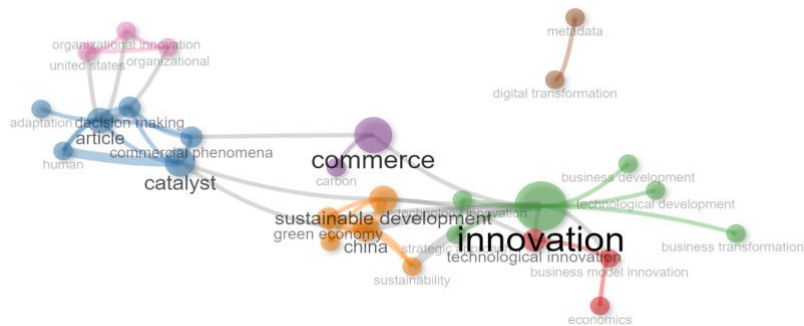


Figure 7. Co-occurrence Network
Sources: developed by the author using R Studio Software language and Bibliometric package (Aria et al., 2017).

Thus, the bibliometric analysis shows that research in innovation as a catalyst for business is dynamic and multifaceted. Innovation, digital transformation, and sustainable development are critical topics of modern research. Research in this field is international, which indicates a global interest in this topic. Much attention is paid to the role of technologies in innovation processes.

3. Methodology and research methods.

To determine the role of innovations in transformational business processes, a complex of general scientific and unique research methods was used, namely methods of analysis and synthesis, concretization and formalization – to determine the role and place of innovations in modern business; methods of scientometric (using the search and analytical platform of the Scopus database) and bibliometric analysis (using R Studio software, the R language, packages Shiny, Biblioshiny and their respective functions) – to form an input array of publications covering the issue of the role of innovations as drivers processes of

transformations in business and formation of visualization maps (treemap, three field plot, thematic map, co-occurrence network) to determine key trends and directions for further research; methods of statistical and comparative analysis – to identify general trends and features of the role of innovations in different countries of the world.

4. Results.

In today's dynamic business world, innovation has become not just an advantage but a necessary condition for the survival and prosperity of companies. Rapid technological change, globalization, and growing consumer expectations require companies to update and adapt constantly. Innovation is the driving force behind these changes, enabling the creation of new products, services, and business models that significantly impact a company's competitiveness.

For the economy to thrive in the coming decades, it must rely on productive science and an effective national innovation system capable of generating and effectively using technological innovation. Digital innovations are developing frantically, penetrating new areas of human activity. According to the forecast of Statista, over the next decade, the real sector of the economy will experience significant transformations in all areas of business processes, interaction between enterprises and stakeholders, and in the markets of all types of resources, adapting to the requirements of digital technologies and systems (Tian et al., 2024).

Thus, studying the nature of technological innovations and their transfer is a critical scientific task. Countries that are leaders in technological development set the direction and nature of global shifts and adapt to these changes from the beginning (Rosyidiana et al., 2024). In outsider countries, which do not keep up with the pace of international scientific and technological progress, there is a deformation of the production system caused by the moral aging of the technological base. Using innovative technologies, businesses become more flexible and able to adapt to changing market conditions and anticipate customer needs. The Digital firm emphasizes digital support of business processes and services using modern technologies and information systems. Creation of a particular department and the position of director of digital technologies (chief digital officer for managing the digital program: coordination, focus, scaling, and talent support) in the company. Many firms believe that they need a director to oversee the organization's digital innovation and digital transformation depending on the firm's digital strategy and business priorities, creating a digital firm. Moreover, he must know the content of the entire management cycle and the specifics of the company's business. The primary industries for which such processes are relevant now are banking and insurance, media and entertainment, education and tourism, telecommunications, and retail.

From 2011 to 2023, the governments of developed countries implemented special programs for the digital transformation of the economy and business, and during the last three years, the emphasis was placed on several key technologies: artificial intelligence (Adiguzel 2024), robotics of production and business processes; multi-channel collection and analysis of big data, the use of behavioral economics tools based on it – both for forecasting and for satisfying consumer demand and desires, as well as their active formation.

To understand Ukraine's digital development level and determine the direction of further transformation, it is essential to refer to international benchmarks, such as the Digital Transformation Index (GCI) developed by Huawei. The GCI was created to analyze various indicators for ICT infrastructure and digital transformation. The GCI assesses the development of the digital economy in 79 countries, using 40 indicators that track the impact of ICT on the country's economy, digital competitiveness, and future growth. The GCI index contains four sub-indices: supply, demand, experience, and potential; and five technology drivers: broadband, cloud, data center, big data, and the Internet of Things. According to this methodological approach, countries are assigned to one of the clusters: Starters (GCI Score 20-34), Adopters (35-55), and Frontrunners (56-85). Together, these countries account for 95% of world GDP. In 2018, Ukraine took 50th place in the GCI rating. The digital transformation index, developed by the independent British firm Vanson Bourne, is calculated as follows: the firm surveys business leaders - managers with the right to make strategically important decisions for the business organization. In 2019, 4,600 business leaders from 42 countries participated in the survey. Ukraine was not among them, but the study's results can be exciting and valuable for domestic businesses to understand global trends.

Various studies, including PricewaterhouseCoopers and Accenture, confirm a direct link between a country's level of digital transformation and its economic growth. According to Pricewaterhouse Cooper's research, a 10% increase in the country's digitization level leads to a rise in GDP per capita of up to 0.75%. According to the conclusions of the Academics resource, an increase in the same indicator by 10 points contributes to a decrease in the unemployment rate by 1.02%. According to Accenture, digital technologies can be used as an impetus for faster economic development, which will add up to \$1 trillion to the GDP of the top 10 largest countries in the world. According to the Dell Technologies Digital Transformation Index study, digitization facilitates forecasting, resource management, and supply tracking. McKinsey experts claim that firms that resort to digitalization achieve revenue growth of more than 7% compared to others in the industry and almost 6% more EBITDA2.

An analysis of the characteristics of successful firms shows that they have developed a corporate culture in which innovation is seen as everyone's responsibility and a goal that employees and business entities at all levels strive to achieve in their daily work.

The history of the development of leading economies demonstrates that innovation and high technologies are the main drivers of labor productivity. According to retrospective data from experts of the Organization for Economic Cooperation and Development (OECD), in the USA in the 80s and 90s of the last century, almost 50% of all labor productivity growth was achieved due to high-tech sectors, in Great Britain, Canada, Japan – more than 30%, France and Italy – 25%.

At the same time, the industry structure of the "innovator countries" of the latest technologies until the mid-1990s. The last century was identical - aerospace industry, automotive industry, electrical engineering engineering – each accounting for 10 to 15% of all R&D spending in the USA, Japan, and the EU. But in the mid-90s. The situation has changed qualitatively. In the USA, the service sector represented by information technology (20% of all expenditures on research and development works) became the leader, which displaced the aerospace industry (12%) and the automotive industry (11%). In the EU, electronics (15%), automotive (13%) and services (14%) became the leaders. In Japan, priority directions are electronics (18%), electrical engineering (11%) and automotive (10%) (Digital business transformation, 2020). Therefore, OECD studies confirm the importance of innovation for economic growth and the need to update the technological base constantly.

Thus, success in the age of digital technologies requires companies to make fundamental changes in their structures and approaches to management. In addition, the ability of businesses to innovate is one of the critical factors in the competitiveness of any company.

Companies must adopt new technologies and change their culture, management processes, and structures to remain competitive in the digital age. This requires significant investment in developing human resources, technology, and innovation. Only those businesses that can successfully adapt to the new environment will achieve long-term sustainable success.

5. Discussion

In their study (Zhu et al., 2024), the authors argue that "green" innovation is a fundamental strategy for companies seeking sustainable and extraordinary growth. In our study, this hypothesis is also followed, as evidenced by the frequency of mentions by scientists of the world of the role of innovative technologies in the green economy, the visual distribution of frequencies is shown on the tree-shaped map (Fig. 5). Using data from 571 high-tech companies, the authors () proved that digital transformation is a powerful catalyst for "green" innovations. Hierarchical regression analysis confirmed that the relationship between digital technologies and environmental innovation is strengthened under the influence of market pressure on environmental protection. The obtained results also proved that the role of "green" innovations has a direct impact on the transformational processes in business, which in turn is important for the economy as a whole.

Scientists (Cariba et al., 2024) consider the role and place of public digitization and technological innovation in their study and justify their crucial importance for sustainable development in the EU. Let's agree with the relevance of the mentioned research direction because, in the era of 5G and the transition to 6G., the study of ultra-rapid changes in cyberspace becomes an urgent necessity. We should also note that during the last decade, the European Commission has updated statistical information annually about digital skills, digital infrastructure, digital transformation on businesses, digitalization of public services. Thus, it is actively monitors the development of the digital decade in the EU countries and the European Economic Area.

6. Conclusions.

Innovation is an integral part of modern business and a key driver of its development. Rapid technological change, globalization, and growing consumer expectations require companies to update and adapt constantly. Innovations enable creating new products, services, and business models that significantly impact a company's competitiveness. Digital transformation is one of the most critical trends in the modern economy. It opens up unlimited opportunities for companies to optimize processes, increase efficiency, and create innovative products and services. However, digital transformation also creates new challenges, such as cyber security and the need to develop the digital skills of staff. For successful digital transformation, companies need to create an innovative culture that involves encouraging employees to generate new ideas, creating a favorable environment for experimentation, supporting internal entrepreneurs, investing in technology development, change business models because traditional business models may become ineffective in the digital age, companies need to develop new, more flexible and scalable models; develop human resources, as digital transformation requires new skills from employees, it is necessary to invest in training and retraining of personnel. Research results indicate that innovation is not just an advantage but an essential condition for the survival and prosperity of enterprises in the modern world. Countries that invest in innovation achieve higher economic growth rates and are more competitive in the world market.

Conflicts of Interest. Authors declare no conflict of interest.

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ІННОВАЦІЇ ЯК КАТАЛІЗАТОР БІЗНЕС-ТРАНСФОРМАЦІЇ

Катерина Славгородська, студентка, кафедра економічної кібернетики, Сумський державний університет, Суми, Україна.

Стаття присвячена теоретико-наукометричному аналізу ролі інновацій у процесі трансформації бізнесу з акцентом на стратегічне планування, управління змінами та адаптацію до нових ринкових умов. Для досягнення означеної мети проведено комплексний бібліометричний аналіз наукових публікацій за темою «Інновації як каталізатор бізнесу». Вхідний масив публікацій згенеровано за відповідним пошуковим запитом у базі даних Scopus. Подальший наукометричний аналіз проведено за допомогою програмного забезпечення R Studio, мови R, пакетів Shiny, Biblioshiny (для аналізу даних та візуалізацій у вигляді хмари ключових слів, деревоподібної карти, мережі сумісності ключових слів, тематичної карти). Крім того, проведено статистичний аналіз даних для оцінки впливу цифрової трансформації на економічне зростання країн, продуктивність підприємств. А проведений компаративний аналіз даних різних країн (США, Велика Британія, Канада, Японія, Франція, Італія) дозволив

виявити загальні тенденції та особливості. Ефективна національна система, яка сприяє генерації та впровадженню інновацій, є запорукою успішного розвитку країни, а країни, які лідирують у технологічному розвитку, задають тренди для всієї світової економіки. В результаті дослідження було обґрунтовано, що інновації є ключовим фактором розвитку сучасного бізнесу. Цифрова трансформація, як невід'ємна частина інноваційного процесу, дозволяє компаніям оптимізувати процеси, персоналізувати взаємодію з клієнтами та підвищити ефективність. Аналіз наукових публікацій показав, що основні напрямки досліджень в контексті інновацій як каталізатору бізнес-трансформацій зосереджені на таких питаннях, як: цифрова трансформація, штучний інтелект, великі дані, сталий розвиток та інноваційні бізнес-моделі. Наукова новизною проведеного дослідження є обґрунтування та доповнення існуючих знань про роль інновацій у бізнес-трансформації шляхом детального наукометричного та бібліометричного аналізу наукових публікацій та візуалізації результатів дослідження. Результати дослідження можуть бути використані менеджерами компаній, науковцями та розробниками політики для розробки інноваційних стратегій, оцінки впливу інновацій на бізнес та розробки рекомендацій щодо впровадження інноваційних технологій.

Ключові слова: інноваційна культура, технологічний та цифровий розвиток, цифрова трансформація, переосмислення бізнесу, бібліометричний аналіз.

*Scientific supervisor - Vitaliia Koibichuk,
Phd, Economic Cybernetics Department,
Sumy State University*