B R A I N

Broad Research in Artificial Intelligence and Neuroscience

Volume 16, Issue 2

June 2025

EduSoft

https://brain.edusoft.ro/

About the Journal

BRAIN-Broad Research in Artificial Intelligence and Neuroscience aims to create links between researchers from apparently different scientific fields, such as Computer Science and Neurology. In fact, many topics, such as Artificial Intelligence, Cognitive Sciences, and Neurosciences, can intersect in the study of the brain and its intelligence functions.

Our journal contains peer-reviewed articles. These should be original and unpublished works by the authors. The peer review process is conducted anonymously, with reviewers being well-recognised scientists from our scientific board, as well as independent experts.

Some innovative young researchers from around the world had the idea to edit and publish in the BRAIN journal in order to make an agora of an interdisciplinary study of the brain. Young scientists and seniors in artificial intelligence, cognitive sciences, and neurology fields are expected to publish their original works in our journal.

BRAIN Journal is an open-source journal, dedicated to promoting the latest scientific news in the field of multidisciplinary studies of the brain, consciousness, and their connection with artificial intelligence.

BRAIN Journal supports research and novelty in health, medicine, and the life sciences.

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The journal's main topics of interest are related to:

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- Psychology: Cognitive psychology, Psychotherapies, Social work with mentally disabled people, Psychopathology;
- Artificial Intelligence: Artificial Intelligence and computing in medicine, Natural language processing, Formal and modal logics, Brain-machine communication, Machine learning, Deep learning programming, Language processing, Robotics (especially using robotics in medicine), Brain simulations, Computer simulations, Virtual reality and enhanced reality;
- Varia: Philosophy of mind and related, Neuroethics, Philosophy of Artificial Intelligence, Ethics of artificial intelligence technologies, Game theory, Decision theory, Transhumanism, Philosophy of language.

Journal History and website content

BRAIN journal was edited by EduSoft from its first volume, in 2010, until issue 3 of volume 10 (2019). Based on the contract between EduSoft and Lumen, starting with Issue 4, Volume 10, 2019, and finishing with Issue 2, Volume 15, 2024, the Journal was published by LUMEN Publishing House, on behalf of EduSoft.

The content of the journal until August 2024 is available in mirroring, both on https://lumenpublishing.com/journals/index.php/brain/ (Lumen Publishing) and https://www.edusoft.ro/brain/index.php/brain/index (EduSoft Publishing)

The collaboration between EduSoft and Lumen officially concluded in August 2024. Consequently, starting with Issue 3 of Volume 15 (2024), BRAIN Journal is exclusively edited and published by EduSoft Publishing.

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We seek papers for our next issues of the BRAIN journal, from academicians, professors, researchers, doctors and clinicians, linguists, psychotherapists, PhD students, and anyone connected to the journal's topics.

We welcome contributions from all over the world. We plan to put out the next issue of the BRAIN in September 2024. You are invited to submit an article on any topic relevant to our journal. The deadline for sending articles is the 15th of July, 2025. Send your articles to brain@edusoft.ro or sign in to use the online system for submitting papers: https://brain.edusoft.ro/

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Address: Romania, 600065 Bacau, 82/C/13, 9 Mai street.

PRINT: ISSN 2068 – 0473
ONLINE: E-ISSN 2067 - 3957

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BRAIN. Broad Research in Artificial Intelligence and Neuroscience
e-ISSN: 2067-3957 | p-ISSN: 2068-0473
Covered in: Web of Science (ESCI); EBSCO; JERIH PLUS (hkdir.no); IndexCopernicus; Google Scholar; SHERPA/RoMEO; ArticleReach Direct; WorldCat; CrossRef; Peeref; Bridge of Knowledge (mostwiedzy.pl); abcdindex.com; Editage; Ingenta Connect Publication; OALib; scite.ai; Scholar9; Scientific and Technical Information Portal; FID Move; ADVANCED SCIENCES INDEX (European Science Evaluation Center, neredataltics.org); ivySCI; exaly.com; Journal Selector Tool (letpub.com); Citefactor.org; fatcat!; ZDB catalogue; Catalogue SUDOC (abes.fr); OpenAlex; Wikidata; The ISSN Portal; Socolar; KVK-Volltitel (kit.edu)
2025, Volume 16, Issue 2, pages: 84-96.
Submitted: February 15th, 2025 | *Accepted for publication:* April 9th, 2025

Management of Innovative Activities in the Conditions of the Information Society: Neuroeconomic Aspect

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Abstract: *This article examines the neuroeconomic aspect of innovative activity in the scope of global factors affecting the world economy. The megatrend of recent decades is digitalisation and globalisation, which have contributed to the formation and spread of the information society. The purpose of the article is to study neuroeconomic approaches to managing innovative activities in the conditions of information society. A wide range of globalisation's impact on states leads to their closer interaction. Supporters of globalisation emphasise the positive effects of its action, but critics see negative consequences for national economies and local producers. Thus, although the issue of globalisation is not new, there are still antagonistic opinions about its impact on society and the economy. The transition to digitalisation, imbalances and inequalities, as well as other previously existing global trends and problems have been exposed by the Covid-19 pandemic sway. Synchronically, as a great threat, the pandemic revealed the need for global cooperation. It has been established that the positive impact of the globalisation of the world economy is manifested in the openness of markets, which sharpens competition and encourages entrepreneurs to develop innovative activities. The neuroeconomic approach to decision-making makes it possible to respond adequately to the prevailing conditions. In order to rationally manage innovative activities, it is necessary to single out the stages of genesis and formation of the concept, the process of its execution and the realisation of the innovation, at each of which one of the most important factors of effectiveness is the system of decisions made by managers.*

Keywords: *global factors; globalisation; informatisation; digitisation; the Covid-19 pandemic; knowledge network; innovation; neuroeconomics; public management; decision-making.*

How to cite: Baklanova, O., Lytvyn, L., Riabtsev, G., Maltseva, O., Susidenko, V., & Makarov, Z. (2025). Management of innovative activities in the conditions of information society: Neuroeconomic aspect. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience*, *16*(2), 84-96. https://doi.org/10.70594/brain/16.2/6

1. Introduction

Multifaceted and complex digitalization, which is a trend in the development of the world economy during the last decades, is a complex and, at times, even contradictory phenomenon. Digitalisation processes create a transformation of the socio-cultural, economic, and political environment, which leads to both the emergence of new opportunities and new challenges. "Informatisation is the process through which the new communication technologies are used as a means for furthering socioeconomic development as a nation becomes more and more an information society. The informatisation strategy in very recent years has provided an alternative to previous strategies of development communication" (Rogers, 2000). He shows how the phenomena of informatisation and globalisation, and as a consequence, the growth and deepening of the information society, are closely related.

A characteristic feature of the modern economic environment is the simultaneous development of the processes of globalisation and digitalisation. The economy of the 21st century is digital, and innovation is the driving force of progress, not only in the technical but also in the economic sense. Thus, the need for quality management comes to the fore under contemporary conditions, which in turn leads to the need to manage innovative activities.

The main creator of all innovations, information, and globalisation processes is a human being. At the same time, the human being is not only above these processes but also inside these processes. And although in many directions of economic science the human being is accepted as a rational unit, many other sciences and even just other directions of economic science show relative or absolute irrationality of human decisions and behavior (Nash, 1951; Drucker, 2017; Koivisto & Grassini, 2023; Sheth, Roy, & Gaur, 2023; Stepanok, 2024).

Thus, in the framework of the information society, the problem of innovation management with special attention to neuroeconomic aspects is relevant. Therefore, the purpose of the article is to study neuroeconomic approaches to managing innovative activities within an information society.

2. Global Factors Influencing the World Economy

In the 21st century, almost all economic objects and mechanisms interact in the conditions of an open economy, so the events taking place in it are significant for each of them. For the effective operation of postmodern economic agents, it is far-reaching to consider not only the state of the local economic environment but also global trends occurring in the world economy.

To understand the state of the world economy, it is necessary to identify the main processes taking place in it and the global factors affecting it. Eller, Huber, & Schuberth (2020), analysing the constructed model of the dependence of global factors and capital flows, note that although sometimes internal national and local factors smooth out the effect of global factors, it is the action of global factors that exerts the major share of influence on macroeconomic and financial variables in the studied countries.

Among the most influential global factors are globalisation, digitalisation, the post-pandemic crisis, and the crisis of the spread of military conflicts in the world, which are taking place against the backdrop of the deepening diffusion of the information society.

Spector (2007) argues that globalisation is not a new phenomenon but a continuation of the expansion of postmodern capitalist imperialism, which has its roots in pre-capitalist colonisation. The nature of these contemporary global processes reflects the same interests as in ancient times, namely, the desire for cheap resources such as raw materials or labor. The imperialism of the 21st century is not in the national framework of individual states but in globally influential transnational corporations that use labour in inappropriate proportions, carrying out an unequal exchange of value (Suwandi, Jonna & Foster, 2019). From the point of view of the neuroeconomic approach, it should be noted that in this concept of a global system of uneven distribution of resources, it is necessary to prioritise the issue of the object level of decision making. Clark & Auerbach (2018) and Hickel et al. (2022) note the problem of unequal exchange in the context of the globalisation of the world economy, which is manifested in the monopoly position of wealthy countries and corporations,

which clearly and implicitly leads to insufficient economic development of certain parts of the world. However, it's worth noting that fewer and fewer corners of the world are in information exclusion.

Not only is the informatisation of technological and work processes a megatrend of recent decades, but also the informatisation of society in general. In an information society, Industry 4.0 is being replaced by Industry 5.0, and what was considered an innovation yesterday is now commonplace for the average person (Xu et al., 2021; Golovianko et al., 2023; Wolniak, 2023).

3. COVID-19's Economic Legacy

Stiglitz (2022) notes that the transition to digitalisation, imbalances and inequalities, as well as other trends and problems that existed until then, have been exposed and become even more pronounced under the influence of the COVID-19 pandemic. According to Statista Research Department (2022), global losses from the coronavirus in 2020 were reflected in the loss of 3.4% of global GDP (Gross Domestic Product), and the global unemployment rate was 6.18%. Fig. 1 presents data on changes in the GDP of the G7 developed countries in the fourth quarter of 2019 and the third quarter of 2020, namely during the coronavirus pandemic. The United Kingdom, Canada, and Italy felt the negative consequences the most, but the general trend among all G7 countries was a significant decline in GDP.

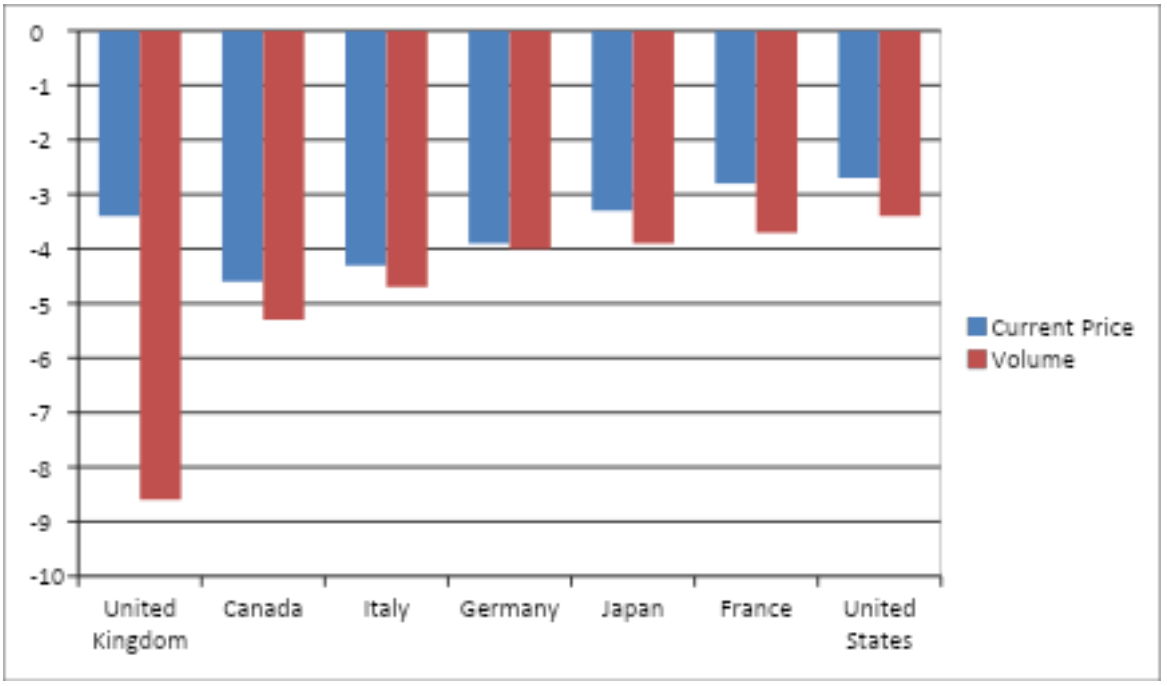

Figure 1. GDP of G7 countries, Quarter 4 2019 to Quarter 3 2020, %.
Source: Created by the authors based on the data of the Office for National Statistics (2021)

Figure 2 illustrates how the negative consequences of the coronavirus pandemic hit different economies of the world, depending on their level of development.

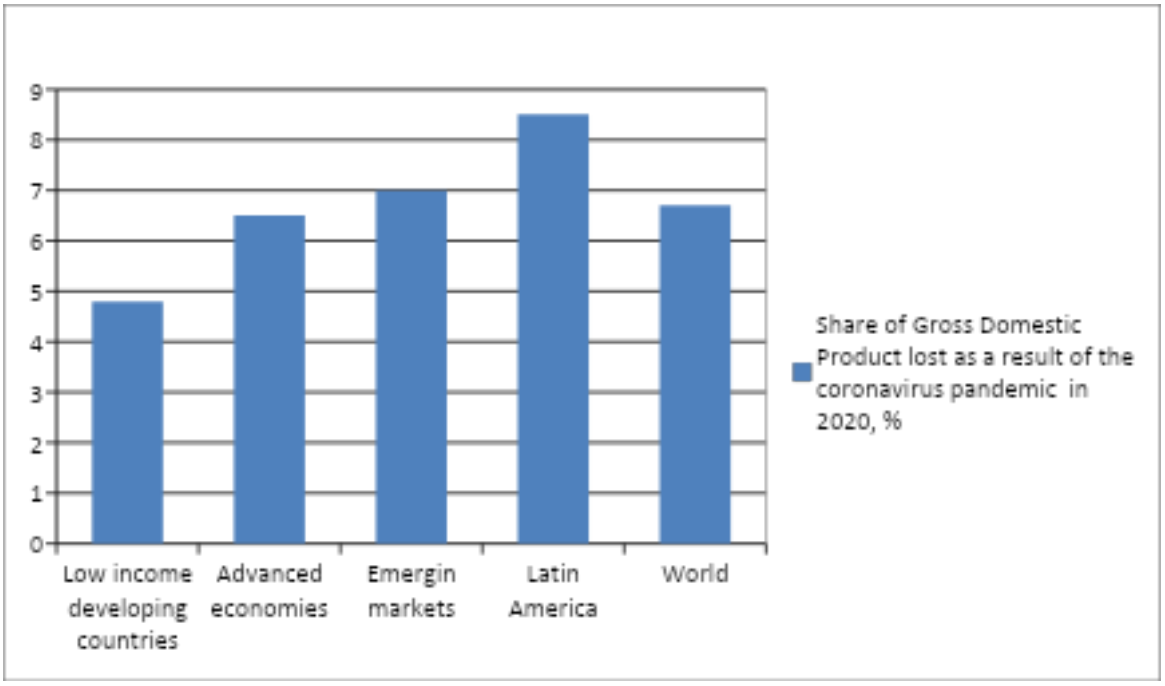

Figure 2. Share of Gross Domestic Product lost in 2020.
Source: Created by the authors based on the data from Statista Research Department (2022)

Stoianenko et al. (2022) and Beyer (2022) note that the devastating impact of COVID-19 has created barriers that have inhibited economic development on a global scale. These barriers were reflected in the total investment volume, which led to a decrease not only in the level of output of products and services in the national economy but also in the level of international trade. Thus, the global effect of this economic barrier created by the global spread of COVID-19 is undeniable.

The COVID-19 pandemic has led to a significant imbalance of demand and supply in the markets of goods and services, but the global economy has also felt the devastating effects of the imbalance among carriers, which was reflected in supply chains.

The globalisation of the world economy would not be feasible without the development of transport connections, and precisely the factors that negatively affect supply opportunities can lead to the collapse of many economic systems and connections. The Federal Reserve Bank of New York has developed the Global Supply Chain Pressure Index (GSCPI) for economic agents to analyse the state of global supply chains. Disruptions in the supply chain can arise from the action of many economic, political, and natural phenomena, as shown in Figure 3, which provides data on the GSCPI for 1998-2022 and the main cataclysms or factors that led to interruptions in distribution networks. Global and local factors such as financial crises, natural disasters, the COVID-19 pandemic, or the war in Ukraine have widespread consequences that are reflected in the world economy in general.

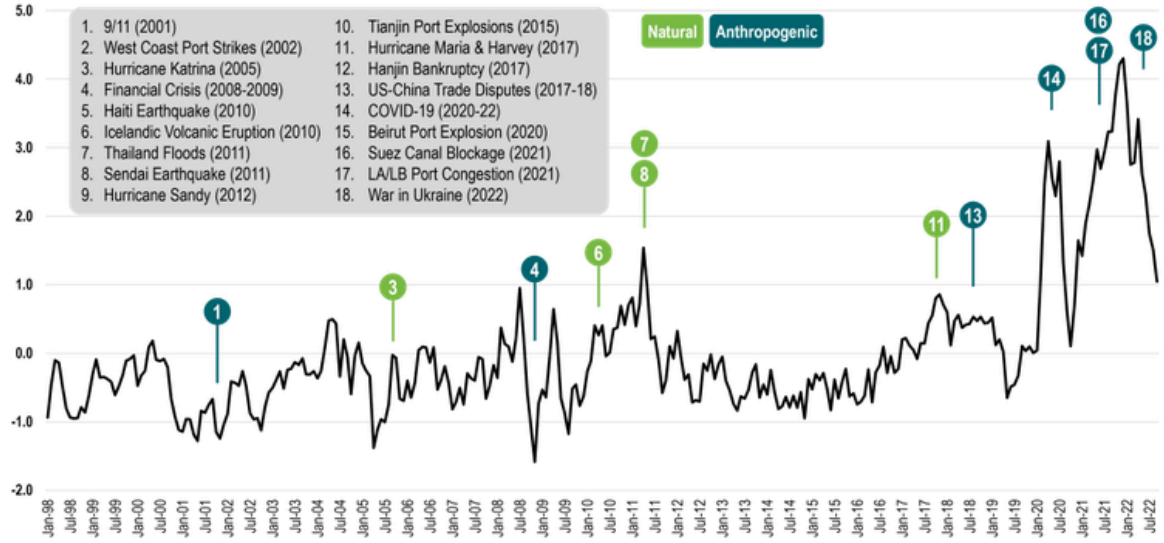

Figure 3. Global Supply Chain Pressure Index, 1998-2022.
Source: Federal Reserve Bank of New York

Considering the problem of neurodiversity, almost every cause that has led to supply chain disruptions requires innovative management strategies based on neuroeconomic solutions because it involves an atypical and unforeseen situation. In this context, in such a contingency, any specialist, manager, or even an individual can find themselves in a situation of ignorance. In the realities of the spread of superintelligence and the increasing implementation of AI in various processes at different levels, it is human intelligence, creativity, and, in general, consciousness that play a decisive role in solving complex problems, and the emotional component is an important criterion in decision-making (Wu et al., 2021).

A study by Campano & Salvatore (2022) showed that under the influence of COVID-19, the world economy fell into a state of uncertainty, and economic conditions worsened in both developed and developing countries. Domestic and international trade slowed down, which had a negative impact on the global economy and dampened economic prospects. Almost the entire service sector got into a difficult situation, and a large part did not withstand the crisis and collapsed. The aggressive effect of the coronavirus turned out to be not only for the health of the world population but also for the health of the world economy. The problem of the coronavirus showed the whole world how closely we are all connected and interdependent.

At the same time, as a great threat, the pandemic revealed the need for global cooperation, which emphasises the positive consequences of the globalisation process. It was thanks to successful cooperation and rapid exchange of experience, methodologies, and technologies that the invention and distribution of vaccines became possible. This represents a vivid example not only of innovation in the field of medicine but also of perfect organisational and economic effectiveness at the global level, which was possible thanks to the right decisions, which emphasises its neuroeconomic nature at the meta level.

4. Globalisation as a Phenomenon Spreading Without Borders

The expansion of globalisation is manifested in horizontal and vertical integration processes, both at the level of companies and states. The result of its action is the direction of national economies into a single stream of the unregulated market economy (Guttal, 2007). A wide range of globalisation's impact on neoliberal states leads to their closer interaction, integration, and partnership. Bohman (2004) notes the practical value of globalisation in transnational contexts for democracy. Heyets et al. (2019) prove the expediency of the existence of a coordinating influence of a suprasystemic agent, which allows the achievement of objectivism and optimal interaction of

agents with both common and antagonistic interests. Davis, Valente, & van Wincoop (2021) note the negative global consequences of the financial crisis, which resulted in the need to analyse international capital flows not only through the criteria of net flows but also of gross ones. At the state level, processes are taking place that cause increasingly intense mutual integration and interdependence of multi-level structures. Constant scaling and urbanisation lead to the appearance of more and more agglomerations. Pindado, Sánchez, & Martínez (2023) investigate the external effects of agglomerations on entrepreneurial activity and reveal their impact on the level of innovativeness among new enterprises, which, in turn, also depends on the level of education and previously acquired experience. Considering the spatial and temporal aspect of regional development in the European Union, Lucendo-Monedero, Ruiz-Rodríguez & González-Relaño (2023) note the significant progress of the information society and the interdependence of the spread of digitalisation and the transition to socio-economic sustainability.

Supporters of globalisation emphasise the positive effects of its actions, but critics highlight negative consequences for national economies and local producers. Thus, although the issue of globalisation is not new, there are still antagonistic perspectives about its impact on society and the economy.

The intensification of economic competition among entrepreneurs under the influence of globalisation is an undeniable fact. In an open and scalable economic space, on the one hand, it is easier for entrepreneurs to find their target audience; on the other hand, there is a higher probability of encountering competitors. In such a situation, price competition can lead to negative consequences for its initiator and destroy a market niche. Therefore, a rational development option for enterprises in the conditions of globalisation is high-quality competition. Thus, globalisation as a phenomenon spreading without borders creates new rules of the game for the management of innovation activities.

Many globalisation processes of a social and economic nature can be interpreted through the prism of the transformations taking place with modern personal activities in the conditions of the information society. Thus, Sawe and Chawla (2021) consider the attitude of mankind to the global issue of climate change using neuroeconomic modeling. Amlung et al. (2022) interconnect the problems of health and the economic background of attitudes toward it, analysing the possibilities of neuroeconomic substantiation.

Cox (1996) shows the computer capabilities of brain research and their interpretation provide ample opportunities for application across fields, including management. Neuroeconomics is concerned with the study of the influence of the brain on the analytical assumptions and levers of human decision-making. The sphere of management is also closely related to decision-making, which indicates the relevance of using a neuroeconomic approach to the problems of our study.

5. The Global Trend of Digitisation and Diffusion of Innovations

The positive impact of the globalization of the world economy is manifested in the openness of markets. The availability of markets for everyone increases competition and may, at first glance, appear to be a threat to producers, but in a global and aggregated sense, increased competition leads to a general increase in quality standards and progress. This reaction to the emerging global trend is largely associated with the use of cognitive abilities of management systems in connection with the need to make evidence-based decisions across multi-level decisions. In a highly competitive open market, an entrepreneur must take care of the image and popularity of his products, which prompts him to take a creative approach to his activities and adopt innovations. This gradually led to the spread of innovativeness and the rise of the global trend of digitalisation, and the issue of managing innovative activity became especially relevant. The neuroeconomic approach to the justification of decisions in the current conditions is an adequate method to achieve the optimal result.

The results obtained by Graham & Bonner (2022) show a significant heterogeneity of factors contributing to entrepreneurship in the globalisation of the world economy. A study by Ghazy, Ghoneim, & Lang (2022) focused on empirical data from 27 EU member states and found

that digitalisation-led entrepreneurship boosts overall productivity. Kibik et al. (2022) note that innovative activity is a strategic vector for the development of contemporary enterprises. To be able to respond in a timely and appropriate manner in situations of intensifying competition as a result of the appearance of new competing firms or new substitute products, enterprises need to maintain organisational flexibility and be in the information flow regarding the search for relevant knowledge, Cegarra-Navarro, Soto-Acosta, & Wensley (2016). Latysheva et al. (2020) highlight the importance of effective governance to achieve balanced development. Therefore, management processes acquire increased significance in the realities of the information society. It should be noted that comprehensive digitalisation promotes the spread of knowledge networks that help integrate knowledge and generate innovations.

Alkhuraiji et al. (2016) showed a practical perspective of a structured knowledge network for the exchange of information and knowledge among organisations, including international ones. Management of innovative activities through the components of a structured knowledge network allows for effective accumulation of knowledge and its dissemination as needed. The use of knowledge networks in the neuroeconomic aspect contributes to optimising the effectiveness of decisions made regarding all key elements associated with the innovation side. (Figure 4). Wang, Chen, and Fang (2018), Ferrer-Serrano, Fuentelsaz, and Latorre-Martinez (2022) demonstrate a positive mediating effect of interorganisational interaction through knowledge networks on innovation performance.

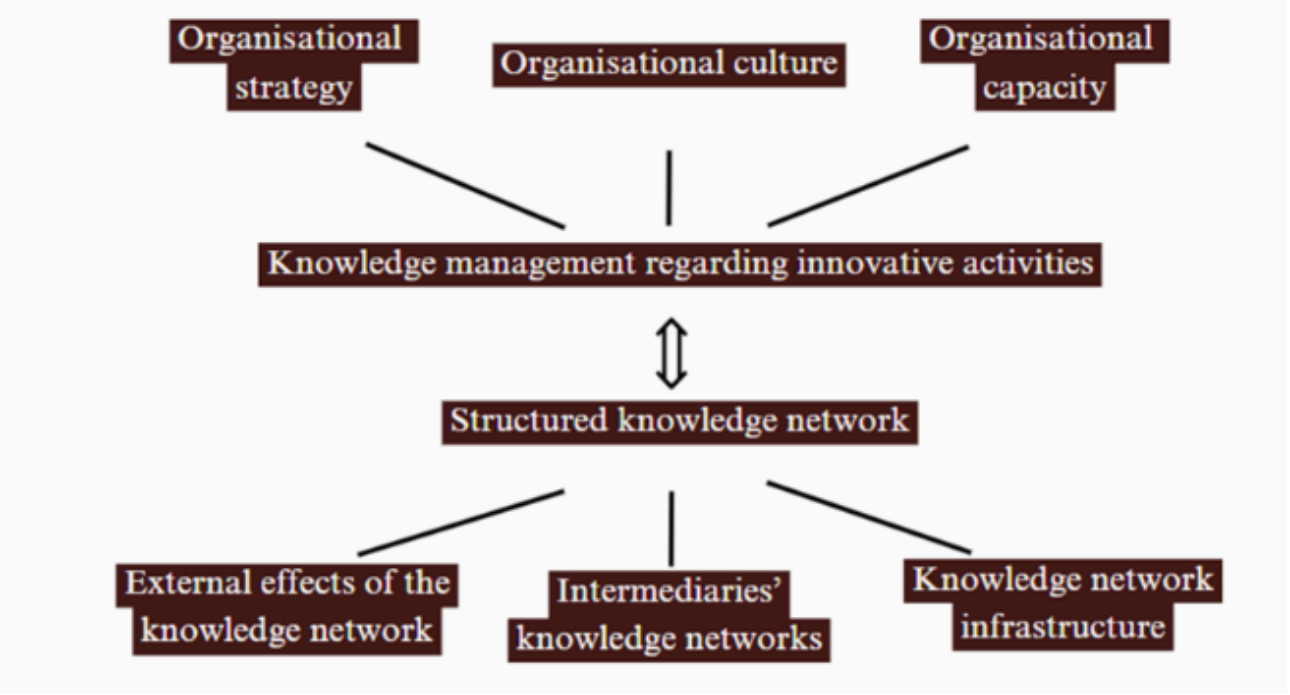

Figure 4. Management of innovative activity through the components of a structured neuroeconomic knowledge network.
Source: Created by the authors

The need to manage innovative activity raises the question of understanding its essence, namely, research through the prism of the stages of its creation. The neuroeconomic approach to decision-making leads to a complex mechanism for the birth of an idea. An idea creates a concept, which requires the implementation of a certain process, only after which the final result in the form of innovation appears.

Thus, to rationally manage innovative activities, it is essential to distinguish stages or phases:

1) concept (idea),

2) process (methods and tools for implementing an idea),
3) result (innovation).

The first stage involves a certain synthesis, generalisation, processing, and visualisation of knowledge. Therefore, in the problem of idea creation, the issue of acquiring knowledge and the ability to process it is of primary significance. According to Kim, Koo, & Han (2021), companies cannot achieve a high level of innovation without appropriate human resources. Behavioural strategy is an important subfield of strategic management. Allen, Dziewulski, & Rehbeck (2022) investigate various types of economic behaviour according to the criterion of rationality and, using experimental data, single out the average rationality of choice among others. When managing innovative activities, which concerns the first stage of the formation of an innovative project, it is important to take into account the global trend of humanisation and the growing role of the individual in society, the struggle for equality and human rights (Herzer, 2020; Nerubasska & Maksymchuk, 2020). Higgins and Elliott (2011) note the importance of education among entrepreneurs to achieve business development. The new era of globalisation and digitalisation requires entrepreneurs to be in a constant educational process, both passive and active. Therefore, in the management of innovative activities, it is important to stimulate creativity and achieve a high level of knowledge and professionalism. Human resource management strategies should aim at motivating the development of inventive behaviour and imaginative solutions.

The second stage of creating innovations is equally critical for the management of innovative activities. Methods and tools for the implementation of an innovative concept must meet the criteria of rationality and efficiency. To achieve specific results in the conditions of comprehensive digitalisation, entrepreneurs use the latest technological developments. The super tool of today is the use of artificial intelligence (AI), which makes it possible to perform tasks related to human intelligence with the help of machines (Shepherd & Majchrzak, 2022). The use of artificial intelligence not only allows the application of specific processes but also effectively models them and predicts performance (Jabeur et al. 2022). The most difficult barrier to the execution of an innovative idea is the insufficient financial capacity of entrepreneurs. Traditional approaches to finding funding sources for innovative solutions are not always effective, while innovative projects most often rely on external funding. A study by Cavallo et al. (2019) showed the advantage of venture capital for the development of innovation, while the contribution of business angels was not so significant. Crowdfunding is among the atypical and alternative ways of attracting investments to finance digital and innovative concepts, and multifunctional crowdfunding digital platforms allow not only the attraction of funds but also ideas, views, and collaborators (Chandna, 2022).

At the third stage, when an innovative product appears as a result of the previous stages, its control, implementation on the markets, and promotion are important. Pogodayev (2013) emphasises the need for marketing tools to promote innovation in open markets. It is important to protect the developed innovation from potential copies and counterfeits, which patenting helps to prevent. Milani & Neumann (2022) note the efficiency of patent activity for high and medium technology firms. Bieńkowska & Tworek (2022) consider it expedient to use the dynamic capabilities of IT, which has a positive effect on the quality of controlling, for the implementation of control in the management of innovative activities.

At all stages of the management of innovative activity, one of the most important factors of its effectiveness is the system of decisions made by managers (Kozioł-Nadolna & Wiśniewska, 2020). Therefore, managers responsible for creating the concept, managers responsible for making decisions regarding the processes of concept implementation, and managers performing higher-level management functions are responsible for the final result. Neuroeconomics, by integrating different approaches to the study of modern human beings in the information society, makes it possible to develop a comprehensive method for managing innovation activity and to

identify strategy options chosen by managers depending on their risk assessments and potential opportunities.

In the realities of the information society and at the existing level of science development, it is necessary to consider a person, innovator, manager, not separately from the ongoing biological and cognitive processes underlying their decision-making.

6. Conclusions

A characteristic feature of the postmodern economic environment is the simultaneous deployment of globalisation and digitalisation processes, the combination of which affects entrepreneurial activity and its innovative component. Neuroeconomics is concerned with the study of the influence of the brain on the analytical assumptions and levers of human decision-making. The sphere of management is also closely related to decision-making, which indicates the relevance of using a neuroeconomic approach to the problems of our study. Therefore, this study differs from others in its focus on the neuroeconomic approach to managing innovative activities in the context of the globalisation and digitalisation of the world economy in the conditions of the information society.

Global factors influencing the world economy were studied, and their significant impact on macroeconomic and financial variables was established. The transition to digitalisation, imbalances and inequalities, as well as other previously existing global trends and problems, have been exposed and become even more pronounced under the influence of the COVID-19 pandemic. From the point of view of the neuroeconomic approach, it should be noted that in the concept of a global system of uneven distribution of resources, it is necessary to prioritise the issue of the object level of decision making. Economic development has slowed due to barriers created during the spread of COVID-19. The negative impact of the pandemic was reflected in the reduction of GDP in all countries of the world and the total world GDP. At the same time, as a great threat, the pandemic revealed the need for global cooperation, which emphasises the positive consequences of globalisation and digitalisation processes. It was thanks to successful cooperation and rapid exchange of experience, work methods, and technologies that the invention and distribution of vaccines became possible. This is a vivid example not only of innovation in the field of medicine but also of perfect organisational and economic effectiveness at the global level due to the right decisions.

It has been established that the positive impact of the globalisation and digitalisation of the world economy is manifested in the openness of markets, which sharpens competition and encourages entrepreneurs to improve the quality of their products and develop innovative activities. Management processes acquire special importance in the realities of globalisation and digitalisation of the world economy. Comprehensive digitalisation promotes the spread of knowledge networks that help integrate knowledge and generate innovation. The use of knowledge networks in the neuroeconomic aspect contributes to optimising the effectiveness of decisions made regarding all key elements associated with the innovation side.

To rationally manage innovative activities, it is necessary to distinguish the stages of formation of the concept (idea), the process of its implementation (methods and tools of idea execution), and the realisation of the result (innovation). It was established that the first stage involves a certain synthesis, generalisation, processing, and visualisation of knowledge. Therefore, in the problem of idea creation, the issue of acquiring knowledge and the ability to process it is of primary importance. At the second stage, when choosing methods and tools, it is necessary to use the criteria of rationality and efficiency and to use the latest technological developments, among which the future belongs to artificial intelligence, which allows combining human intelligence with machine automation. It is noted that at the second stage of management of innovative activities, the problem of attracting funding sources arises, which is not easy in the case of innovative projects due to the uncertainty regarding their riskiness. The solution is to look for alternative sources of financing, among which venture capital and crowdfunding stand out. At the third stage, when an innovative product appears as a result of the previous stages, its control, implementation on the

markets, and promotion are important. It was established that at all stages of the management of innovative activities, one of the most important factors of efficiency is the system of decisions made by managers.

Neuroeconomics, by combining different approaches to the study of modern human beings in the information society, makes it possible to develop a comprehensive method for managing innovation activity and to identify strategy options chosen by managers depending on their risk assessments and potential opportunities.

In the realities of the information society and at the existing level of science development, it is necessary to consider a person, innovator, manager, not separately from the ongoing biological and cognitive processes underlying their decision-making.

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