Aliyev, Alovsat Garaja

Article

Regional-sectoral characteristics of the formation of digital economy sectors and evaluation of its innovative perspectives

Management dynamics in the knowledge economy

Provided in Cooperation with:
National University of Political Studies and Public Administration, Bucharest

Reference: Aliyev, Alovsat Garaja (2024). Regional-sectoral characteristics of the formation of digital economy sectors and evaluation of its innovative perspectives. In: Management dynamics in the knowledge economy 12 (3/45), S. 262 - 284. https://www.managementdynamics.ro/index.php/journal/article/download/588/502/2843. doi:10.2478/mdke-2024-0016.

sciendo

National University of Political Studies and Public Administration
Faculty of Management

Regional-Sectoral Characteristics of the Formation of Digital Economy Sectors and Evaluation of Its Innovative Perspectives

Alovsat Garaja ALIYEV[1]
[1] Institute of Information Technology, 9A B. Vahabzade St., Baku AZ1141, AZ;
alovsat_qaraca@mail.ru

Received: March 10, 2024
Revised: May 19, 2024
Accepted: July 5, 2024
Published: September 25, 2024

Abstract: The analysis of the characteristics of regional-sectoral approaches to the effective formation of the structure of the modern digital economy and the assessment of their innovative perspectives are considered urgent issues. In this aspect, the analysis of the scientific-theoretical foundations and formation problems of the information economy as the main element of the digital economy has been attempted. The structural features and characteristics of the digital economy were studied, and the method of evaluating the innovative perspectives of its sectors was developed. New information, knowledge, and technology-intensive economic sectors have been identified. The method of assessing the perspective of sub-sectors of the digital economy was developed in the form of a sequence of certain algorithmic steps. In the evaluation process, the selection of organizations and experts, the determination of the experts' weighting coefficients, and the indicators for assessing the perspective of sub-fields were also determined by the experts themselves. As a result of the assessment of the innovative perspectives of the sub-fields of the digital-information economy, the level of innovativeness of the relevant sectors, the level of potential development, the level of the possibility of creating new jobs, the level of social utility, the level of influence on the development of other areas, the level of current infrastructure provision and cyber resistance, the level of necessary staffing, export orientation indicators such as level, green, inclusion and sustainability level, competitiveness level have been adopted. The results of the generalized systematic analysis and evaluation of the research results of the preliminary expert evaluations of the digital economy sectors on the innovative perspective are given schematically. It has been shown that effective results can be achieved with the application of modern computer software in the formation of digital economy sectors based on the technologies of the Industry 4.0 platform and in the assessment of its innovative prospects. Those results can be effectively applied in other regional-sectoral structures with relevant characteristics.

Keywords: digital economy; digital transformation; digitization; information and knowledge economy; expert prices; innovative perspectives; Delphi method; regional-sectoral approach; Industrial 4.0 platform.

Introduction

Currently, the digital economy, which is developing with the rapid integration of innovative and advanced technologies in the context of digital transformations, is reshaping the global economic landscape. As regions and sectors adapt to this wave of transformation, the regional-sectoral characteristics of the digital economy areas become important. Digital economy sectors, each characterized by unique economic, social, and infrastructural contexts, require an assessment of the innovative perspectives and potential they hold for digital transformations with profound implications not only for local economies but also globally.

Regional differences significantly influence the formation and evolution of digital economy sectors. Strong IT infrastructure, favorable business environment, and active

How to cite
Aliyev, A. G. (2024). Regional-Sectoral Characteristics of the Formation of Digital Economy Sectors and Evaluation of Its Innovative Perspectives. *Management Dynamics in the Knowledge Economy, 12*(3), 262-284. DOI 10.2478/mdke-2024-0016
ISSN: 2392-8042 (online)
www.managementdynamics.ro
https://content.sciendo.com/view/journals/mdke/mdke-overview.xml

Vol.12 (2024) no.3, pp.262-284; DOI 10.2478/mdke-2024-0016

government policies accelerate the implementation of digital technologies faster than places that do not have these advantages. Sectoral impacts of digitization, whether in finance, health, agriculture or manufacturing, require the adoption of technology and the application of different models of innovation depending on both regional strengths and the characteristics of the sectors themselves.

The transformative power of digital technologies provides great opportunities for regional economies to leapfrog directly from traditional stages of development. Innovations such as blockchain, artificial intelligence (AI), Internet of Things (IoT), and Big Data analytics are not only tools for operational efficiency but also catalysts for creating new value chains and business models. This dynamic interplay between regional capabilities and sector-specific transformations through digital means necessitates a comprehensive assessment of both the current state and future potential of the digital economy.

The need for innovative digital technologies in society's socio-economic life should increase steadily. The production of innovative and scientific high-tech products has become one of the key sectors in the world economy. There is a growing need to improve the scientific and methodological bases and management mechanisms for the formation of new technological and economic sectors based on the rapid development and widespread application of ICT.

In accordance with the recently accepted Regional Development Concepts, there has been a transition to the stage characterized by the efficient formation of new technological economic sub-sectors and the superiority of innovative development. Renewal of regional economic structures and process management system mechanisms has been one of the main issues. It was decided to introduce high technologies and smart systems, digitalize economic development based on innovations, and dynamically increase ICT infrastructure and ICT industry potential. These types of issues are compatible with the development requirements of the National Strategy for the construction of the Global Information Society and the regional Information Society at the international level. The continuous development of entrepreneurial activity in this direction for regional development is considered one of the main priorities of the economic policy formed by the relevant state structures (Decree of the President of the Republic of Azerbaijan, February 23, 2017). In this direction, the continuous development of entrepreneurial activity in the field of regional development is considered one of the main priorities of the economic policies of the respective states.

The real-time operation of www.azexport.az Internet portal, which reflects information on nationally produced goods and their producers, has been ensured to increase the opportunities to export local goods to traditional and new markets and accelerate the integration into international markets. In the Strategic Roadmaps for the national economy and the main sectors of the economy, the export-oriented economic model was highlighted, and the transition to an export-oriented economy creating high-added value was defined as one of the main goals. This framework aims to strengthen Azerbaijan's position as a trade hub due to the implementation of effective customs procedures in a low-tariff environment based on favorable trade agreements with critical regional countries such as CIS countries, Turkey, Georgia, and Iran. This goal requires increasing the export potential and expanding the scope of cross-border trade, including electronic trade, by effectively using the country's diversified transport and logistics capabilities and achievements in the field of ICT.

In modern times, telecommunication technologies have seriously penetrated all areas of society and created wide opportunities for development. In advanced practices, quality, safe and efficient digital transformation, and the effective use of resources in this area are considered the driving forces in the development of innovations. Countries have succeeded in increasing efficiency and transparency through the expansion of digital services and the development of e-government.

In terms of the development of the economy and society, their digital transformation has become one of the priority issues facing the regional and national economy in recent years. In this direction, the Internet network and network technologies, which form the basis of the regional Information and Communication Technologies (ICT) infrastructure, are being developed. "Government Cloud" (GCloud), "Big Data", and "Smart City-Village", etc., such promising digital projects are implemented. It has already become necessary to expand the application of digital technologies further in various areas of the economy and to increase the quality (Decree of the President of the Republic of Azerbaijan, April 27, 2021). Broadband Internet networks are already being implemented in the entire territory of the country. At the same time, in the remote areas that are not considered efficient for private sector activity, digital infrastructure is established, modern services are provided through state companies, and habits are formed in the society in the relevant field. In addition to being the main provider of "Big Data" across the country, the state prioritizes cyber security challenges to protect existing infrastructure and data. Service operators working in this area fulfil the role of critical infrastructure and data providers for digital transformation and cyber security.

The analysis shows that at the current stage, the management of digital service areas is of strategic importance. Field network operators perform the function of necessary infrastructure and data providers and make an important contribution to the technological form of the digital society, including the regions where innovation giants operate. Improvement of the management, coordination, and control mechanisms of the state policy implemented in the field of digital transformation, along with commercial activity and effective implementation of functions of state and public importance are required. At the national level, it was decided to effectively coordinate work in the field of managing the construction of modern telecommunications and digital architecture, as well as the development of a platform for digital services and solutions in various fields (Decree of the President of the Republic of Azerbaijan, October 11, 2021). Digitization, expansion of the application of innovations, development of communication and information technologies, improvement of regulatory mechanisms, formation of a healthy competitive environment, improvement of quality in all mentioned areas, provision of innovativeness, investment attractiveness, and protection of consumers' interests were considered as urgent issues.

It is necessary to develop high technologies that ensure the organization, coordination, and implementation of activities in the field of digital transformation. The main tasks of the central regulatory structure include assisting in the acquisition of modern technologies and technological solutions that carry out scientific, scientific-technical, and innovation activities, relevant testing experiences, providing financial support to innovation-oriented scientific research, innovative projects, startups, and promoting innovation initiatives. All this shows that there is a serious need to study the problems of the formation of digital economy sectors, improve its scientific-theoretical and methodological foundations, and develop a system of new approaches, methodologies, indicators, and indices for assessing the level of development at various regional and sectoral levels.

The purpose of the research is to evaluate the innovative prospects of the digital economy by means of multi-criteria analysis methods and to determine the innovative prospects based on it. It is the substantiation of the relevance of this problem, showing its importance and working out the scientific-theoretical methodological bases of the improved form of the method of multi-criteria expert evaluations in that process. In the new economic conditions, the national, regional, and sectoral approach to the formation of digital economy sectors is to reveal the features, determine their essence and characteristics, and determine effective perspectives in the management of the relevant field by working on methods of evaluating their innovative perspectives.

Among the goals, the following can be included: analysis of the features of the regional-sectoral approach to the evaluation of the innovative prospects of the digital economy

Vol.12 (2024) no.3, pp.262-284; DOI 10.2478/mdke-2024-0016

sectors, determination of the traditional and new science-intensive subfields of the digital economy, determination of the innovative prospects of economic areas with new knowledge and technological capacity, digital economy to improve the methods of multi-criteria expert evaluations in the evaluation of innovative perspectives of the sectors, to create an opportunity to obtain important results by applying the results of multi-criteria expert evaluations in decision-making processes, etc. The main task of the research is to determine the contours and essence of the issues related to the national, regional, and sectoral management level of the formation of digital economy sectors and to provide scientific support for their solution in a conceptual form.

Research methodology

The research methodology includes systematic analysis approaches, methods, statistical and multifactor analysis methods in multi-criteria expert evaluations, decision-making methods and models based on multi-criteria criteria, correlation and regression analysis, mathematical and econometric modelling methods, theory of fuzzy sets, theory of risk management, modern ICT systems and tools.

The initial collection of results and data processing by the Delphi method is based on the autonomous implementation of separate stages. In the presented version, all algorithmic processes are organically coordinated and performed by automated means. Since the iterative algorithmic processes are explained sequentially, there is no need for a separate justification. There is no need to simplify its presentation here, as there is a separate detailed description of the methodology in the research work in other articles. The results of the methodology and the analysis process are understandable, and the results that were obtained confirm this.

The research process was approached at the macro level within certain limitations. The concrete object and process level have not been addressed. Based on the most common cases and data, relevant analyses were conducted, and recommendations were developed. During the research, it was preferred to refer to the most relevant scientific publications. The official information of the central management bodies was mainly referred to, and it was used in the analysis process and evaluations. In addition, conceptual scientific recommendations presented as final results in scientific publications were also used.

The regional-sectoral features of the formation of the digital economy sectors and the assessment of its innovative perspectives are broad topics and include several main research areas. Here, it mainly means how digital and other innovative technologies of the digital economy are applied and developed in different regions and sectors of economic activity. Evaluating the innovative perspectives of digital economy sectors on the online platform is one of the main issues in increasing the future stability of the economy. The scientific-methodological approaches proposed by the author and the method of assessing the perspective of the sub-fields of the digital economy can support its development by being a special means of ensuring the formation and stability of new sectors of the economy.

Procedures such as online processing and clarification of expert evaluations, as well as the inclusion of other similar indicators in the survey process, identification, and assessment of digital economic sub-fields, have helped the researcher to achieve the set goals by supporting the full formation and sustainability of the digital economy. The proposed indicators for online assessment of innovative perspectives of sub-fields of the digital economy can lead to more effective results for achieving the formation of the digital economy. Initial expert assessments on innovative perspectives were carried out online, and the results of the assessment on the innovative perspectives of the sectors were given. The researcher tried to contribute to the generalized systematic analysis of research results on digital economy sectors, the application of modern ICT technologies in providing perspective assessment, and the investigation of solutions to problems that will

help ensure the formation of economic sectors. For this reason, the indicators for the online evaluation of innovative perspectives of the digital economy subfields proposed by the author can help ensure the formation and development of the digital economy. The proposed recommendations can be used in decision-making at different management levels of digital economy sectors.

Problem statement and overview analysis of relevant scientific research work

As we mentioned, one of the urgent issues is to create a methodology for calculating its innovative perspectives based on the characteristics of the regional and sectoral approaches to the formation of digital economy sectors and develop mechanisms for solving existing problems in that field (Digital Economy Report, 2021). In the aspect of solving this issue, digital economy sectors Industry 4.0 platform components, artificial intelligence, digital twin, etc., should be formed with the application of the latest technologies. The sectoral-regional problems of the development of economic activities on the basis of ICT should be solved. Appropriate methodologies should be developed, and assessments should be made of the mentioned issues.

In the development of the digital economy and its sectors, the scientific research works of many scientists have been of great importance (Aliyev & Shahverdiyeva, 2021; Oteshova & Prodanova et al., 2020; Pomerantseva & Yashchenko, 2020; Richter & Pakhomova, 2018; Rumana & Richard, 2018; Tenyakov & Zakirov, 2022; Zoltan, 2022). The analysis of national, regional, and sectoral approaches to the formation of digital economy sectors, as well as the development of relevant recommendations on the evaluation of its innovative perspectives, are very important. Many works are devoted to the characteristics of the digital economy and its technological base, the ICT sector, its scientific-theoretical foundations, and the analysis of formation problems. In the works dedicated to the characteristics, scientific-theoretical foundations, and analysis of formation problems of the Digital-Information economy and the ICT sector, which is its technological base structural features of the information economy, principles and symptoms have been studied in an experimental form (Kholiavko, 2017; Kowal & Paliwoda, 2017; Kvilinskiy et al., 2019; Laitsou & Kargas et al., 2017; Sangki & Cheong, 2015; Semenyuk et al., 2017; Shkarlet et al., 2017; Sukhodolov & Popkova et al., 2018). Despite such works, there are quite a few problems in the field of studying the digital information economy.

Problems in the formation and innovative perspectives of digital economy sectors have been clarified. The innovative features and directions of the formation of the competitive development potential of the ICT sector have been studied. The general situation of the ICT field, problems of infrastructure and institutional formation were analyzed, and prospective directions were indicated. The issues of creating a competitive business environment in the ICT sector and the production of export-oriented products/services were investigated. The formation of a single economic information space and the problems of integration into the world's information infrastructure were explained. Innovative directions for increasing the development potential in the ICT sector have been identified.

At the same time, attention was paid to the problems of the formation of the ICT-based National Innovation System and the management of innovation structures. In the formation of the theory of innovation, the main features of innovations and innovative processes were investigated. The need to create an ICT-oriented National Innovation System is justified. The characteristics and principles of the National Innovation System were explained. The theoretical and methodological aspects of the organization, marketing, and commercialization of scientific innovation and innovation processes were investigated.

The appropriate model, algorithm, and mechanisms of the stage of commercialization of innovation processes have been developed. The main goals and directions of innovation

Vol.12 (2024) no.3, pp.262-284; DOI 10.2478/mdke-2024-0016

activities were analyzed. A system of indicators for the formation of the complex socio-economic efficiency of the activity of innovative structures has been developed. An architectural-technological structural model of an effective information provision system for the management of innovation structures has been established. Based on the effective use of limited resources in innovative enterprises with a complex structure, a system of mathematical and economic models of the production process of products and services has been developed.

The problems of developing the main socio-economic activity sectors and processes on the basis of ICT have been investigated. Issues of ICT-based development in regions and areas of economic activity were considered. The current state of the Internet economy has been analyzed, and development prospects have been determined. The problems of developing the economy of education, healthcare, socio-cultural and other socio-political, humanitarian fields based on ICT were investigated, and the innovation potential and commercialization prospects of those fields were studied. The formation and management problems of some modern technological innovation economy areas have been investigated.

Emphasis has been placed on the application features and development problems of electronic commerce and payment technologies, which is one of the important areas. The specific features of electronic commerce and business technologies and systems in the formation of the digital economy were investigated. Issues of national, regional, and international regulation of the use of e-commerce systems were considered. Existing organizational and economic models of e-commerce systems were analyzed, and prospective development directions were developed. Development trends of electronic money, payment systems, and technologies were investigated. The need to create a single payment system is justified. Innovative features and development prospects of Internet banking technologies are shown. The problems of application of green, inclusive and cyber security technologies in ensuring sustainable and resilient socio-economic development and their solution directions have been studied in detail. The reasons and tasks of the transition to a green, inclusive and sustainable economy were analyzed. International initiatives and experiences in this field have been reviewed.

The mechanisms of managing the level of use of green, inclusive, and cyber security technologies in solving the problems of sustainable and resilient development were analyzed. The issues of ICT application in the green development of the information economy have been revealed. Some necessary models related to the formation of the green economy itself on the basis of ICT, as well as the methodology for assessing the level of development, have been studied. The methodology for evaluating the level of inclusiveness of economic growth has also been developed. Along with these, mechanisms and technologies for ensuring cyber security of the information economy at the regional and national levels were proposed.

In addition to all this, attempts were also made to measure the level of formation of the digital economy and evaluate the innovative perspectives. The requirements for the system of indicators for measuring the level of formation of the digital economy were investigated. A comparative analysis of the methods of measuring the level of digital economy was carried out. The formation level of the digital economy was studied using some complex indicators. Issues of evaluating the impact of ICT in the development of the innovative economy were considered.

Analysis of the current state of ICT and assessment of its role in economic development, as well as econometric dependencies related to the release of products/services in the ICT sector, are modelled. The interaction of the constituent elements of the composite index of the digital economy and the process of their assessment has been modelled and algorithmized. The innovative perspectives of the information economy's sectors were evaluated based on the analysis and synthesis of the features of the national, regional, and sectoral approaches to the assessment of the formation level of the digital economy.

However, the role and functions of information and knowledge in economic development have not been fully explored. In this sense, there are still quite a few problems in the field of studying the information economy. Although such problems are general, regional-sectoral features of the formation of digital economy sectors and their innovative perspectives should be taken into account. For this reason, the development of relevant research, which is considered relevant, has been studied in the scientific works of many scientists and specialists indexed in Web of Science and other international databases (Abdulkarim et al., 2023; Aliyev & Shahverdiyeva, 2022; Grazia et al., 2023; Ke Rong, 2022; Tianyu et al., 2023; Xiaoya et al., 2024; Yiran et al., 2023)

In relation to the state of problem-solving, it should be noted that in Aliyev and Shahverdiyeva (2022), the problems of formation and development of new ICT-based digital economy sectors were studied. Necessary information about 5G mobile systems and technologies, which is one of the main sectors of the digital economy, has been analyzed. A structural scheme of the special weight of organizations on the use of digital technologies in some industries has been presented. A system of indicators for evaluating the level of development of the digital economy has been developed. Structural elements, such as some sub-indices of the Digital Economy and Society Index, have been explained. The main indicators affecting it are explained. A system of basic Composite Indicators characterizing the measurement of the digital economy has been proposed. Although the direct determination of those indicators is not possible from a statistical point of view, the interdependence and effects of digitalization and innovation of the economy are given in the article.

Another article (Ke Rong, 2022) is dedicated to scientific research on the development, perspective, and potential directions of the digital economy. Here, for the development of the Digital Economy, 1) I-digital infrastructure (Infrastructure), 2) B-industry platforms (Business), 3) C-two-sided platforms (Consumer), 4) D-data ecosystem (Data) and 5) E (economic). Although five prospective IBCDE frameworks, such as economic contexts, are proposed, social, regional factors and effective governance issues are not addressed here.

Abdulkarim et al. (2023) addressed the issue of a systematic review and meta-analysis on measuring the impact of the digital economy in developing countries. A systematic analysis was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses) - PRISMA model to examine the factors and indices used to measure the level of development of the digital economy. The effectiveness of existing digital economy indices and methods in assessing the level of digitization in developing countries was assessed. In addition, a roadmap for the development of a toolkit that provides a comprehensive measurement of the contribution of the digital economy to the Gross Domestic Product (GDP) in those countries is also proposed. However, the measurement of all necessary indicators in regional-social aspects has been neglected here.

In Grazia et al. (2023), the digital age, sectoral structure, conceptual and empirical analysis were conducted. Here, 1) wide spread of digital technologies; 2) processes for digital products; 3) specialization processes; 4) external and internal business strategies; 5) analysis of Amazon; 6) Sectoral analysis of the largest world companies using the ratio of assets on Machinery and Equipment; 7) Main directions such as application to the "digital" sector, etc. have been studied. Redondo et al. (2023) analyzed the impact of technological innovations on digital entrepreneurship and the economy. For evaluation, more than 70 indexed articles published in top scientific databases (Scopus and Web of Science) between 1990 and 2022 were systematically analyzed. The results showed that technological innovation is the main driver of digital entrepreneurship but should be combined with other key factors such as digital knowledge and skills. Such studies provide a realistic picture of how digital entrepreneurship positively affects the well-being of individuals. Although a separate analysis was not carried out here, some generalizations were made at the expense of other analyses.

Vol.12 (2024) no.3, pp.262-284; DOI 10.2478/mdke-2024-0016

Xiaoya et al. (2024) analyzed the impact of the digital economy on sustainable development in China based on empirical research. The Cobb-Douglas production function has been used to explore the interrelationships between the cost minimization perspective and the digital economy, industrial agglomeration, and sustainable development. Based on the panel data of 30 Chinese provinces covering the period from 2015 to 2021, the impact of the digital economy on sustainable development was analyzed through the effectiveness model determined by working time and the mediation effectiveness model. The results showed a significant positive impact of the digital economy on sustainable development. Nevertheless, some issues have been considered at the macro level.

The work of Tianyu et al. (2023) is devoted to the measurement of the digital economy, as well as to the analysis of perspectives from the digital industry to the digitization of the industry. Here, some accounting systems are built to measure the scale of the digital economy industry from the point of view of the transition from the digital industry to the digitization of industries. Data from China's Beijing, Tianjin, and Hebei provinces in 2017 were used as an example. The results showed that there are still large gaps in the development of the regional digital economy industry in terms of the overall scale of the digital economy industry, the scale of industry digitization, and the scale of digital industrialization relative to GDP. However, the cause-and-effect relationships of these gaps in the territorial context have not been clarified.

In Xia et al. (2024), the new possibilities of technology and electronic communications in the digital economy are generally explored. The aim was to examine the impact of the digital economy on businesses and users and assess the possibilities of easy and quick access to products and services that lead to increased efficiency and productivity. Although the impact of the digital economy on education, health, culture, and other sectors has been mentioned, it has not been indicated in which sectors this happens. Yiran et al. (2023) analyzed the impact of digital transformation on the overall productivity of enterprises in the real sector of the economy. Using the data of listed companies from 2007 to 2020, an empirical investigation of the impact mechanism of the development of digital transformation of real economy enterprises on total factor productivity was carried out. The results reveal a positive non-linear U-shaped relationship. This demonstrates that the total factor productivity of real economy enterprises declines in the early stages of digital transformation and then improves after a critical threshold is crossed. The results of the scientific analysis show that the impact of the digital transformation of the developing real economy enterprises on the total factor productivity does not depend much on the size of the assets and property of the enterprises. At the same time, these also show that despite the modernity and relevance of the regional-sectoral features of the formation of digital economy sectors and the development of mechanisms for evaluating its innovative perspectives, that field has not yet been formed in the necessary manner.

A systematic multidisciplinary analysis of its conceptual foundations is still lacking in the scientific literature. Therefore, the existing theoretical and practical aspects of the regional-sectoral characteristics of the formation of digital economy sectors and the problems of evaluating its innovative prospects should be analyzed more deeply. It is necessary to study the processing aspects and semantic content of the existing concepts in that field, as well as to study the perspectives and limitations of evaluating the innovative perspectives of the digital economy sectors.

Features of the methodological approach to economic analysis

There are many difficulties in assessing the current level of the information and knowledge economy, of which the digital economy has been formed and is considered an integral part. In this field, there are various cases of detail, incompleteness, and contradiction in the approaches, indicators, methodologies, and indices for conducting relevant analyses.

The analysis groups to be selected for comparison do not comprehensively respond to the current needs and regional characteristics. Therefore, in the systematic analysis of the state of formation of the information and knowledge economy at the global and national levels, it is proposed to accept functionally the stages of economic development at five different levels, such as 1) agricultural, 2) industrial, 3) information, 4) knowledge, 5) intellectual. Five stages should be considered in the process of conducting systematic reviews and empirical evaluations (Alguliyev et al., 2017).

The group of countries selected for comparative analysis and empirical evaluations includes 1) leading developed countries (G7, G10, G20, etc.), 2) post-Soviet - former USSR, CIS countries, 3) regional countries, 4) developing countries, 5) countries with similar conditions would be included. From such a point of view, the group of states and countries selected for systematic comparison include the USA, Germany, Japan, China, Russia, Turkey, Iran, Israel, Pakistan, Ukraine, Azerbaijan, Belarus, etc. 30 countries are included. Among those countries are the USA, Germany, Japan, China, Russia, Turkey, Iran, Israel, Pakistan, Ukraine, Azerbaijan, Belarus, etc. can be shown. At the same time, new regional administrative-economic levels were adopted within the country. New economic regions, East Zangezur Karabakh, were included (Decree of the President of the Republic of Azerbaijan, July 7, 2021).

Digital subsectors of the economy can be taken into account more widely in order to conduct economic analyzes in a more logical and coordinated manner. In this case, the sectoral classification of the economy can be formed as follows: Internet; software engineering; automation technologies; digital contents; ICT service; telecommunication, computer, and electronic industry; digital media; robotics and artificial intelligence; military industry; space and aviation industry; management services; nano high technologies; business industry services, pharmaceutical electronic medicine industry; environmental, green technologies, ecology; optical industry; transport communication; energy sector; chemicals and petrochemicals, scientific-research, experimental-constructive works; service areas with scientific and technological capacity; e-learning; Big Data and cloud; IoT; cyber-physical systems; smart technologies.

It should be noted that many traditional economic fields, such as agriculture, industry, metallurgy, transport, construction, oil and gas, energy, and natural resources, can be included in the field classification of the digital economy during the analysis of this division. At the same time, information, knowledge, technological, and innovation-intensive new sub-fields of TDF should be included in the analysis group as follows: 1) ICT in management; 2) Technologies of production/service processes; 3) Agrotechnical breeding technologies; 4) Marketing – sales, logistics, service technologies. In addition, it is necessary to include the science-intensive sub-areas of the TDF and newly created information-science-intensive economic areas (Table 1) in the analysis process.

Method of evaluation of innovative perspectives of digital economy sectors

The development of the new method in this area is based on the Delphi method. In the process of its realization, more expert evaluation is used. Because the existing field is considered a new direction, this area is not provided with enough information, resources and data.

The current era is characterized by an abundance of information. However, despite this, expert evaluations are developing quite rapidly. This field is already becoming a serious scientific-practical direction (Baldin, 2016; Marjan et al., 2018). The main issue of the expert method is the systematic acquisition of knowledge and information related to a certain field from a person-expert. Then, it is their structuring, processing and interpretation. This method is the main instrument for solving problems that are not formalized or are difficult to formalize in scientific research activities (Table 1).

Vol.12 (2024) no.3, pp.262-284; DOI 10.2478/mdke-2024-0016

Table 1. Economic areas with new information, knowledge, and technological capacity

ICT economy	Bioeconomy
The economics of the space	Nanoeconomy
Medicine and health economics	Language economy
Economics of science and	Innovation economy
The economy of culture and art	Creative – Industrial economy
The economy of artificial	Ecological (green) economy
The economics of mobile	Industry and the Internet of Things
The economy of unmanned	The economics of cyber-physical systems
Sports economics	Content-data economy
Alternative energy economy	Diaspora economy
Theological (religious) economy	Patent (license) economy
Behavioral economics	Digital economy

Source: own processing

Besides, methods and tools for multi-criteria analysis are used during management decision-making (MDM) under conditions of uncertainty (Estrella et al., 2017; Korobov, 2019). Its main essence is to present the most useful from a set of possible alternatives to the decision-maker (DM). Different methods of multi-criteria analysis allow for obtaining results corresponding to different scenarios of MDM.

The main idea of the TOPSIS method applied in this field is based on the evaluation of the distance of the relevant indicators from the pre-determined ideal and worst points. There are also many advanced options for its implementation. The main issues of expert evaluation can be attributed to 1) determination of the goal or the tree of goals; 2) expert forecasts; 3) development scenarios; 4) generation of alternative options; 5) determination of ratings; 6) assessment systems; 7) making collective decisions, etc. There are many methods for organizing and conducting the expertise: the commission method, the method of multiple forecasting, the method of weight coefficients, the method of pairwise comparison, the scenario method, the Delphi method, etc.

Scientific-theoretical bases and characteristics of multi-criteria expert evaluations

The essence of expert methods is to find the average value of the opinions of specialists-experts obtained by various means on any issue under consideration. The structure of expert assessment can include several main components such as subject (expert), object, criteria, methods, and result. In order to perform the expert assessment, two groups are created within the expert commission - worker and expert groups. The expert group includes 7 to 20 highly qualified and specially trained specialists. To reduce psychological factors in the joint activity of experts, the object evaluation process is sometimes carried out in several stages (Mamedova & Jabrayilova, 2018).

The objectivity of expert assessment methods depends significantly on the correct selection of that method. At this time, the features of the object and the evaluation conditions must be taken into account (Zhao et al., 2018). During the expert assessment in solving multi-criteria issues, the high level of professionalism, competence, and knowledge of the expert can lead to obtaining subjective results to a large extent. Evaluation by an expert commission is relatively more objective. From this point of view, the combined evaluation based on the comparison of the opinions of the individual expert and the group can be considered a compromise option. In order to reduce subjectivity during expert assessment, the form of collecting opinions has the following types of variations: questionnaire, interviewing, discussion, meeting, and business game. During the subjective assessment, methods such as ranking, direct assessment, and comparison are also applied.

In the solution of multi-criteria issues, the relatively accurate determination of the weighting coefficients in the expert evaluation allows for a more reliable result in the

complex evaluation. Such weighting coefficients serve as a regulatory mechanism and provide a basis for the selection of indicators included in the comprehensive assessment of quality. These methods serve to maximally reduce random, personal opinions and decisions arising from individual characteristics of the subject or local errors of the expert process.

Multi-criteria expert evaluations of innovative prospects of digital economy sectors can be performed using a special software package. Those expert evaluations can be performed through appropriate evaluation parameters. A system of questions, lists, information, indicators, and criteria relevant to the following content and direction to experts for the purpose of determining the organizations, specialists, indicators, criteria, sub-sectors, indices, sub-indices weighting coefficients, impact factors, etc., which have a more advanced level for carrying out expert evaluations presented:
- expressing the attitude to the participation of various organizations and enterprises, specialists as experts in economy, ICT, innovations, and management;
- expressing the attitude toward the expert competence and professionalism of the persons nominated for expertise from relevant organizations and enterprises;
- evaluation of the compatibility level (weight coefficients) of experts from relevant organizations and enterprises in consideration of each other;
- assessment of the level of use of indicators and criteria in the assessment of the various activities of the Digital economy sectors;
- evaluation of the level of perspective development of digital economy sectors in possible directions according to relevant indicators and criteria;
- evaluating the criteria and indicators for evaluating the various activities of the digital economy sectors against each other (weighting coefficients).

Determining the quality indicators of the activities of the digital economy sectors and analyzing the experimental results of their multi-criteria expert evaluations in the indicated aspects were the basis for the subsequent decision-making processes. In accordance with the methodology, experts perform the role of decision-makers at the local level in the assessment of quality indicators. In the multi-criteria evaluation of the innovative perspectives of digital economy sectors, the weighting coefficients determined on the basis of the values given by the experts are also used. At this time, fuzzy evaluation methods and probability theory are used because the results of measurements are random values in all possible cases.

As a concrete case, it can be noted that during the evaluation of the innovative prospects of the Digital economy sectors, the results of expert evaluations of indicators, proposed criteria (criteria), and their weighting coefficients, which have a large impact on the final price, can be accepted. These results can be analyzed together with some available statistical information, as well as development strategies and programs, to obtain useful information to support decision-making.

Application features of the Delphi method in expert assessment

In this presented scientific study, the Delphi method was used as one of the expert assessment tools. The Delphi method or the Delphi technique is considered one of the effective expert evaluation methods for making decisions based on the existing information base. Using the Delphi method, a system of indices and indicators was developed for multi-criteria evaluations of the innovative perspectives of the Digital economy sectors, and related evaluations were conducted.

The Delphi method is one of the most widespread methods of expert evaluation. This method creates new opportunities for obtaining agreed information in the process of anonymous exchange of opinions between the members of the expert group in decision-making. By improving the Delphi method, it can be characterized by new features such as

Vol.12 (2024) no.3, pp.262-284; DOI 10.2478/mdke-2024-0016

anonymity of experts, adjustable feedback, statistical processing of survey results, and group formation of the answer.

The stages of implementation of the Delphi method can be attributed to:

1) Group members are offered to answer in detail the questions defined on the problem under consideration.
2) Each group member should answer the questions independently and anonymously.
3) Obtained information and answers are collected, and based on them, a document containing proposed solutions is drawn up.
4) Each member of the expert group receives a copy of the collected information document and material.
5) Acquaintance with the proposals of other participants about the possible solutions to the problem can lead to new changes in opinions.
6) Steps 4 and 5 above are iteratively repeated several times to reach a consensus decision. Here, the independence of individual members of the expert group is ensured.

The Delphi method can be applied more effectively and allow obtaining new results if competent experts are involved not only in the entire problem but also in its various aspects. The difference in the results of the evaluation obtained by the experts is the amount of information possessed by the experts, the criteria used in the evaluation, the specialization of the experts, the characteristics of their mutual relations, the ability of the experts to make logical judgments, the degree of familiarity with the evaluation objects, etc. can be explained by a number of reasons (Delphi Method in Emerging Technologies, 2020).

To obtain more accurate indicators, various methods reduce the differences in the evaluation results. One of them, through the improvement of the Delphi method or in the expert evaluation, has a positive effect on the further development of the Delphi technique. It should be recalled that the Delphi method was developed in the USA in the 50s of the 20th century under the leadership of O. Helmer and T. C. Gordok and was based on a program of successive individual surveys (Orlov, 2004). In this program, previously given values are analyzed, and then corrections are made if possible.

The Delphi method was developed as an effective tool for gathering and synthesizing expert opinions (Delphi Method in Emerging Technologies, 2020). This technique has been used very often in a wide range of subjects. The process of carrying out expert evaluation using the Delphi method was carried out according to the following principles:
- it should be possible to give experts' answers to questions with quantitative characteristics;
- the survey of experts should be conducted in several stages, and the questions and answers should be clarified at this time;
- at the end of each stage, all experts involved in the survey should be familiar with the results of the survey;
- experts must justify their decisions differently from the majority's evaluations and opinions;
- statistical processing of answers should be followed at each stage in order to obtain a generalized grade.

The Delphi method has the main advantage of obtaining joint opinions of authoritative experts on a specific problem based on independent judgments. Various variants of the Delphi technique have been developed and implemented in recent years. The SEER method is of particular importance during expert assessment, and the work is performed in 2 stages. In the first stage, the problem is narrowly discussed as a result of the joint activity of specialists. In the second stage, the problem is discussed and solved with experts - government representatives, industry, science, and education experts. After both stages, a decision is made as a result of collective discussion of these problems with the help of experts.

The independence of experts in evaluation processes is also a very important principle. The objective level of evaluation is based on this. A systematic approach to the expert is important in every expert assessment. The essence of this is to summarize, group, and form a certain group of information to conduct an expert assessment. Such systematization should be based on properly selected signs of grouping and classification.

An improved algorithm of the Delphi method

The Delphi method is considered the basis for evaluating the innovative perspectives of sub-sectors of the digital economy. The algorithmic stages of the expert evaluation of the proposed methodology based on its improvement on the ZOOM platform can be presented as follows. The first stage is a selection of experts. N number of specialists-experts with specific work experience in this field, and achievements in the field of scientific research, innovation, and education are involved in a virtual survey on the ZOOM platform. It is stated that the main purpose of the survey is to identify the initial experts.

Taking into account the possibility of certain errors, the acceptance of the initial N number of specialists with the highest number of points as experts is discussed and approved, or this process is repeated again in another new format. Due to the fact that the composition of the expert group is formed based on similar interests and not everyone has a self-assessment, it is not realistic to create biased relations between them. Some deviations can be resolved promptly by the decision-maker.

The second stage is on determining the weighting coefficients of the experts. It acts on the basis of 2 types of scenarios consisting of n number of experts: 1) experts have equal weight; 2) experts evaluate each other on a 0 - 10-point scale. The obtained results are normalized (arithmetic, geometric, median, average, etc.). The weight coefficient of each expert relative to each other can be determined in 1 - 10 considering the minimum value equal to 1. Thus, in the first case, the weight coefficients of all experts are equal to 1. In the second case, the weighting coefficients are 1, 10. Thus, as a result, they receive values such as 1≤weight coefficients≤10. For the simplicity of the calculation method in the subsequent processes, the weighting coefficients can be taken equal to 1.

The 3rd stage is on indicators of the perspective of sub-sectors. At this stage, indicators are selected by experts from a general list prepared as a result of scientific research. Thus, in evaluating the innovative perspective of the sub-sectors of the digital economy, the following indicators are considered as the basis: The level of innovativeness (INL); Potential development level (PDL); Level of opportunity to create new jobs (NJL); Level of social utility (SUL); The level of impact on the development of other areas (IDL); Existing infrastructure provision and level of cyber resilience (ICL); Necessary staffing level (NSL); The level of export orientation (EOL); Level of greening, inclusion, and sustainability (GISL); Level of competitiveness (CL).

The 4th stage is the evaluation of the prospects of sub-sectors. At this stage, the level of experts is considered equal. In other words, the weight coefficients are considered equal to 1. Therefore, the average expert values for indicators can be calculated as follows:

$$\overline{R_{ij}} = \frac{\sum_{k} PI_{ijk} / M}{M} \quad (1)$$

The average price for directions can be calculated as follows:

$$\overline{R_{i}} = \frac{\sum_{j} \overline{R_{ij}} / M}{M} \quad (2)$$

Vol.12 (2024) no.3, pp.262-284; DOI 10.2478/mdke-2024-0016

The following notations are used here:

i – index of the direction $i=\overline{1,n}$, j – index of the indicator $j=\overline{1,m}$, k – index of the expert (k=1, ..., M).

PI_1, PI_2,..., PI_n, – *i*-th perspective direction (sub-sector) $i=\overline{1,n}$.

PI_{ij}, – *j*-th indicator (subindex) characterizing i-th perspective (sub-sector) ($j=\overline{1,m}$), $i=\overline{1,n}$.

PI_{ijk}, –value that k-th expert has given to PI_{ij}.

Indicators for sub-directions are considered equally important.

$\overline{R_i}$ values are required to be re-evaluated in ascending (descending) order, as in $\max \overline{R_i} \geq \ldots \geq \min \overline{R_i}$ form. In this case, the result will show that the subfields are arranged in order of importance.

In this process, it is assumed that PIijk is an expert value on a scale of (0, 10). This shows that $\overline{R_i} \in (0,100)$.

The 5th step concerns processing of expert prices. Initial expert evaluations on innovation assessment of perspective subfields of digital economy can be expressed as in Table 2.

The average value for the i-th subfield indicator for the final indicator can be calculated as

$$\frac{\sum_j P_{ij} a_i}{\sum_j a_j} \qquad (3)$$

Table 2. Initial expert assessments on innovative perspective

№	Indicators of subfields	Weighting factor of the indicator	Subfields			
			1	2	...	100
1	Indicator-1	a_1	P_{11}	P_{12}	...	$P_{1,n}$
2	Indicator-2	a_2	P_{21}	P_{22}	...	$P_{2,n}$
.	...	...	...	...	...	...
.	...	...	...	...	...	...
.	...	...	...	...	...	...
m	Indicator-m	a_m	P_{m1}	P_{m2}	...	$P_{m,n}$

Source: own processing

The sixth stage is the inclusion of similar indicators in survey processes. At this stage, attention is paid to making expert assessments more accurate. For this, other similar indicators presented below are also included in the survey process. Evaluation of the participation of organizations and enterprises as experts in the relevant sphere: assessment of the level of expertise of candidates for expertise from organizations; evaluating the weighting coefficients of experts' compatibility with each other; evaluation of the level of use of the indicator in the evaluation of prospective subsectors of the digital economy; evaluation of the evaluation criteria of the digital economy sub-sectors against each other (weighting factor); assessment of the level of possibility of development of sub-sectors of the digital economy; evaluation of the perspective of digital economy sub-sectors by criteria; determination of criteria for measuring the digital economy at the international and regional/sectoral level and their evaluation; assessment of ICT capacity at the country and regional/area level; innovative product/service production and formation of an innovative environment and evaluation of the level of development at the regional/field level; evaluation of the formation and development level of e-commerce and trade at the regional/field level; evaluation of the level of sustainability, stability, greenness, and inclusiveness of economic development at the regional/area level; safe

development of technological innovation economy areas and assessment of their cyber resistance level at the regional/field level; evaluation of innovative perspectives of the digital economy at the regional/field level.

The seventh step refers to the identification and evaluation of sub-sectors. Sub-sectors of the digital economy are selected from a large number of possible options. The most promising of them is determined by experts. Clustering is done on the basis of expert evaluations of 100 sub-fields included in the analysis and evaluation process on relevant indicators. A relatively small number of the obtained results are transferred to the aggregation group. As a result, it was considered appropriate to present the following 15 sub-areas and their corresponding perspective evaluations (Figure 1).

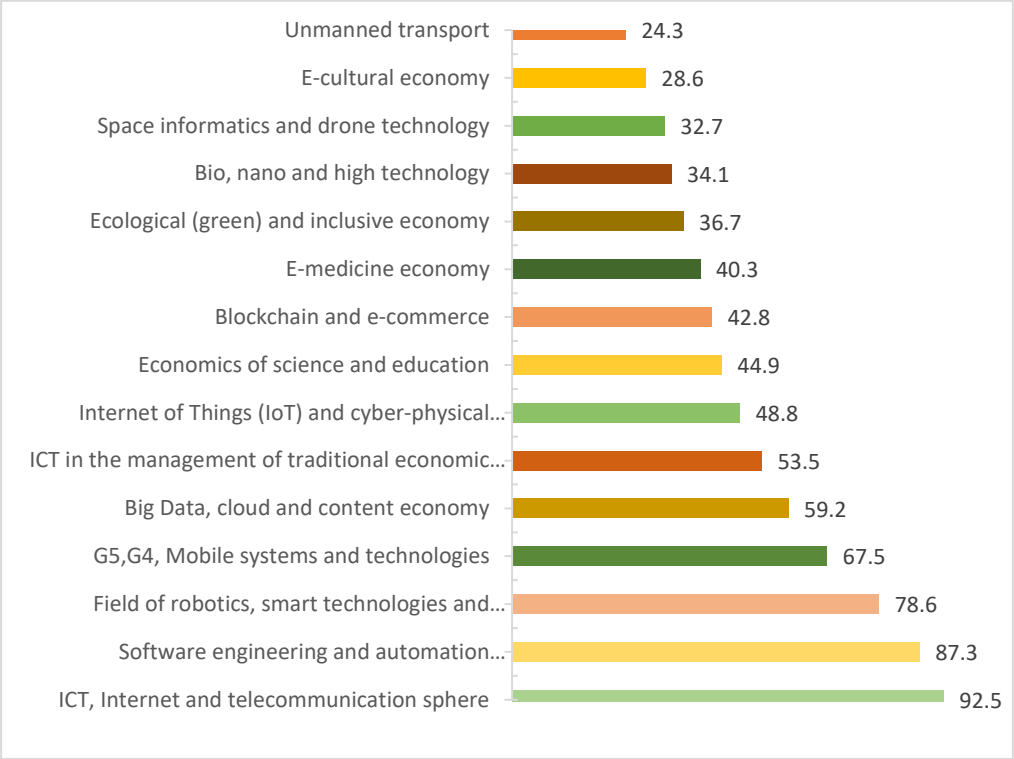

Figure 1. Evaluation results on the innovative perspectiveness of digital economy sectors
Source: own processing

Thus, as a result of the processing of expert evaluations, the innovative perspective of the newest subfields of the digital economy was accepted. This can be considered a serious basis and ground for the development of the country's economy on intellectual grounds.

A comprehensive review of scientific research results in digital economy sectors, their systematic analysis, and perspective expectations

In recent decades, there has been a need to systematize research results in the field of digital and information economy in certain directions. It is possible to conduct some analysis about the proposed methods, models, mechanisms, and recommendations for solving the identified problems, as well as the issues raised according to them. In the process of solving scientific-theoretical and practical issues for the implementation of regional and national priorities, many scientific-methodological and methodical results were obtained, and relevant mechanisms were developed (Aliyev, 2021).

It is known that the scientific-theoretical, methodological, and practical foundations of the information economy have been developed to a certain extent. Its formation and

Vol.12 (2024) no.3, pp.262-284; DOI 10.2478/mdke-2024-0016

management problems have been identified. The conditions and development stages of the information economy were analyzed. This proved that the productivity of the main factors of the new economy depends primarily on their ability to generate, process, and effectively use information and knowledge. Thus, the digital and information economy of the modern age based on ICT is characterized by the rapid impact of new technologies on those areas, the automated knowledge creation process, and the complex development and skills of new human capital that can work and manage new technologies.

The comparative analysis of the experience of developed foreign countries has revealed the formation features, principles, signs, development trends, and strategic development directions of the information economy. Different categories and specific features of the information and industrial economy have created a new structure of population employment in economic development. This has developed new forms of labor and created new types of products/services.

The analysis of the conceptual model of the formation of information and knowledge-based economic systems, which depends on the production resources, means, high technologies, human capital, and the prospective development stages, made it possible to identify many problems. It is accepted that the information economy is a modern practical stage of the development of civilization in addition to being a scientific theory. At this stage, creative work, information, knowledge, and technologies are characterized by their superior role. Determining the directions of formation and potential development of the ICT sphere, which is the basic area of the information economy, is the strengthening of information structures, the creation of information resources, the wider application of science in this area, the application of the elements of the Industry 4.0 platform, which conditioned and accelerated the development of Internet infrastructure and the creation of various information centers.

The assessment of the level of infrastructure and institutional development of the ICT sphere has shown that the proper development of ICT has a positive effect on economic growth, the creation of a competitive business environment, and the expansion of export-oriented innovative product/service production. It became known that it is possible to increase the operational efficiency of those fields and enterprises based on the application of Intelligent Systems and modern information systems such as typical CRM, ERP, and BPM in the management processes of many economic sectors. The efficiency of innovative structures acts as an integral indicator. The main criterion of the socio-economic efficiency of the system is the level of demand satisfaction. This requires the implementation of agreed development plans for innovative structures.

Ensuring the continuous and sustainable development of the information economy requires the development of indices, indicators, and methods for evaluating the level of development based on green, inclusive, and cyber security technologies. At this time, economic modernization should be directed toward progressive, innovative, inclusive technologies that ensure development. These technologies should improve the fertility and accessibility of the natural environment. The formation of a safe, green, inclusive economy that ensures sustainable development is the main way to protect the environment and ensure long-term sustainable development.

The system of multi-level composite indices and indicators for measuring the information economy is regularly improved. Despite the fact that the increase in the composition of composite indices, which are measured on the basis of multidimensional criteria and result from the combination of various indicators into a single index, leads to the use of complex statistical methods, their use becomes important in decision-making processes.
Methodologies in the field of measuring the information economy have different purposes. They cannot properly reflect national-regional characteristics. The information that determines the content of the indexes that characterize the information economy is different. Therefore, there is a need to evaluate the transition to a development model based on information and knowledge at different levels.

The constituent elements of the composite index of the information economy, the modelling of their evaluation process, the numerical composition of the sub-indexes and indicator indicators, and the weighting coefficients of the composite index sub-indexes have provided a basis for evaluating the efficiency of the information economy and the extent of its role in society. It should be noted that the sub-innovative sectors of the information economy were identified using the improved empiric expert method based on online platforms. Their development prospects were evaluated based on the proposed system of indicators. Functionally, the stages of economic development have been considered agrarian, industrial, informational, knowledge, and intellectual. Digital sub-sectors of the information economy have been taken in a broader form in order to conduct economic analytical analyzes in interconnected conditions. Additional indicators were also included in the survey process to make empirical expert assessments more accurate.

These have led to raising the level of scientific-theoretical and practical use of the obtained results. Thus, as a result of the experimental implementation of the proposed models, relevant recommendations on the prospective development of the information economy were developed. As a result of the processing of expert assessments, the innovative perspective of the sub-fields of the information economy creates a serious basis for the development of the regional and national economy on an intellectual basis. This requires the development of programs for building a smart society and economy based on digital technological innovations aimed at a quick and efficient solution to socio-economic issues.

The methodological, scientific-theoretical practical results of the research conducted in the relevant field and the consideration of both in scientific circles and at the management levels of various real economic sectors and their implementation in appropriate conditions can create potential opportunities to achieve more important and useful results in the overall economic development.

Directions of intellectualization of information and digital economy

The intellectualization of the economy with innovative digital technologies requires the transformation of enterprises into unique research centers that produce new knowledge and intellectually develop themselves and their employees. The main principles of the intellectual economy are sustainability, sustainability, greenness, efficiency, innovativeness, and inclusiveness. Its main goals are the greenness of economic growth, resource-saving, intellectualization of the production process, efficient distribution and consumption, and reduction of socio-economic threats. Development instruments of the new economy are the adoption of various level programs, relevant coordination bodies, sustainable investment mechanisms, information and high technologies, ecological, social, innovative management, and intensive use of renewable energy. At the same time, it is the quality of education and research. In other words, the main function of the society and the state in the new conditions is that their intellectual level is higher than the level of each member (Aliyev & Shahverdiyeva, 2023, p. 532).

The foundations of the intellectual economy are the science-education system, ICT infrastructure, social and technological innovation system, and institutional and favorable business environment. Based on them, it is necessary to form the main principles and priorities of the new economy in the directions of 1) intellectualization, 2) institutionalization, 3) environmentalization, 4) socialization and digitalization. Thus, as a result of research, the main characteristics and principles of the newly formed intellectual economy can be expressed as follows: turning ICT, information, innovation, knowledge and intellectual technologies and artificial intelligence into the main driver of the economy; perception of public welfare and sustainable development of the society as the main principle of economic growth; ICT and high-tech innovation systems play the role of the main base for future transformation; formation of the processing and recycling industry as the main base areas of smart production; the fact that smart production, distribution, exchange, and consumption have a global scale and rapid change; promotion

Vol.12 (2024) no.3, pp.262-284; DOI 10.2478/mdke-2024-0016

of smart management, socialization and inclusion; transformation of scientists, highly qualified technological and management specialists into the main labor resources of the economy and their dynamic development.

At present, many developed advanced countries want to build a Super-smart society based on technological innovation and solving major socio-economic issues. For this, they are implementing programs like "Society 5.0" (Carin, 2020). For the smartness of the economy, the program that will be formed in that direction should be based on the platform of the industry 4.0 revolution (Bogoviz et al., 2019; Grabowska, 2020). New values, products/services will be dynamically created based on the technological innovations of that platform, the Internet of Things, Big Data, artificial intelligence, robots, sharing economy, and mass digitalization. This will make society's life more comfortable, more reliable, and stable.

Discussion

Wide application of innovative digital technologies is necessary to ensure the innovative formation of regional and national digital economies on an inclusive basis and to increase their development. For this, various methods were used to evaluate the regional-sectoral characteristics of the formation of digital economy sectors and their innovative perspectives on the online platform. Despite the acceptance of the worldwide results of such a global development trend, there is still a need to discuss this problem at the local, regional, and national level and to use it by large groups of people and enterprises.

In the process of online evaluation of the innovative prospects of the digital economy and its sectors, the selection of experts, the determination of their weighting coefficients, and the indicators of the evaluation of the prospects of sub-fields were determined by the experts. The method of assessing the perspective of sub-areas was developed in the form of certain algorithmic steps. Online processing of expert prices, clarification, and other similar indicators are included in the survey process. An improved algorithm of the Delphi method for processing expert evaluations has been developed.

The presented methodology is based on data reflecting the national, regional, and sectoral characteristics of the formation of real economic sectors based on digital transformation. The data determined on the indicators and criteria of the management of the research object provide an opportunity to evaluate the innovative perspectives of new economic sectors on an appropriate scale. Data grouping, selection, and determination of selection criteria were carried out based on the use of official statistical indicators, data from relevant central executive structures, and scientific research results.

The regional-sectoral characteristics of the formation of digital economy sectors, the application of modern methods in the evaluation of its innovative perspectives, the development of recommendations on the improvement of the efficiency of the Industry 4.0 platform, the strengthening of its prospective development directions should form the basis of future discussions and research.

Conclusions

The study of regional-sectoral characteristics in the formation of digital economy sectors and the evaluation of their innovative perspectives reveals a complex and dynamic picture. Different regions exhibit different ways to embrace digital transformation with their unique economic, geographic, and socio-political contexts. The scale and nature of digitization across sectors such as healthcare, finance, education, and manufacturing show that digital integration is by no means an easy process.

Research shows that regions equipped with strong digital infrastructure, proactive policy frameworks, and strong education systems are better positioned to take advantage of the opportunities presented by the digital economy. These regions tend to develop innovative ecosystems that drive economic growth, increase job creation, and improve quality of life. Conversely, regions lacking these key elements face significant challenges, although they also have untapped potential that, if developed, could yield significant economic and social benefits.

Sectoral analyses show that digital technologies are catalysts for innovation, efficiency, and competitiveness. However, the impact depends on how well these technologies are aligned with current market needs. Industries that are more adaptable to technological change have witnessed rapid transformation. They often help shape new business models and services on an innovative basis.

To harness the full potential of the digital economy, it is critical for business leaders and other stakeholders to develop targeted strategies that respond to the unique needs and strengths of their regions and sectors. This includes investing in digital infrastructure, promoting a culture of innovation and entrepreneurship, increasing digital literacy and skills, and creating a regulatory environment that supports technological development and protects stakeholders.

Looking to the future, as digital technologies continue to evolve, the need for continuous assessment of their regional and sectoral impacts will increase. Such assessments will not only help to adapt to technological changes but also ensure that the benefits of the digital economy are broad and inclusive. Here, the goal should be to create a sustainable, dynamic, and sustainable digital economy that uses regional and sectoral characteristics to meet the challenges and opportunities of the future.

Studies show that the topic of research on intellectual information and the digital economy has become quite relevant and important in the last 30 years. The main provisions of the Industry 4.0 platform also show that this topic will be very relevant and important in the next 30 years. It can be considered that the implementation of this work in the presented volume is the beginning of work in that field, and the following goals and tasks have been set. It is important to analyze the problems of the modern and strategic formation of the new type of digital economy, which is the economic base of the construction of the intellectual information society, to make proposals for their conceptual solutions, to evaluate the prospective development level of the digital economy, to work on the appropriate improved models, methods, algorithms, and mechanisms for solving its problems.

The analysis of the regional-field characteristics of the formation of digital economy sectors showed that their innovative perspectives can be evaluated through multi-criteria analysis methods based on expert methods. This approach can be considered a new methodology for evaluating the economy based on knowledge and information in the world and in the region. So, since these fields entered the formation stage in recent years, separate statistical information about them has not been collected. The results of the evaluation of the innovative prospects of digital economy sectors on the online platform through multi-criteria analysis methods based on expert methods provide a basis for comparing their activities with other innovative sectors and innovative enterprises, as well as for making relevant decisions in economic processes. The perspective of the development of digital economy sectors was evaluated on a 100-point scale and was taken as the basis for preparing recommendations on which sectors should be developed better. Scope of the results. The assessment of innovative perspectives of the digital economy by means of multi-criteria analysis methods based on online expert methods can greatly contribute to the improvement of the efficient operation of the economy based on information and knowledge.

Vol.12 (2024) no.3, pp.262-284; DOI 10.2478/mdke-2024-0016

Effective application of the proposed models and methods can create additional opportunities for increasing efficiency in new economic management, diversifying and restructuring the economy, and forming the non-oil sector. The usefulness of the obtained result and application in practice. The results of complex assessments of the proposed indicators and criteria can serve as a platform for ensuring the formation of the digital economy and its sectors in general and can be the basis for making management decisions in relevant areas.

The proposed methodological approach to the assessment of the regional-field characteristics of the formation of digital economy sectors and its innovative perspectives can be applied to other regional-sectoral structures of the economy. The regional-field approach features of the formation of digital economy sectors and the recommendations proposed in accordance with the current experiences on the evaluation of its innovative perspectives on the online platform can provide an opportunity to achieve effective results in the diversification and digital transformation of the regional and national economy.

The article would benefit from a discussion of potential limitations, avenues for future research, and how the findings can be applied. Since the management and information processing processes are not at a stable stage in both the general and regional-sectoral structures of the digital economy, the realization of the proposed development options is related to certain financial and investment risks. It is impossible to take into account all situational situations in the assessment of those risks. Although this creates many difficulties in the research process, various alternative options should be tried to eliminate them.

Evaluation of the innovative perspectives of digital economy sectors based on multi-criteria expert methods can make a great contribution to increasing the effective activity of the economy based on innovation, knowledge, information, and digital technology in the conditions of digital transformation. The application of the proposed methods will create additional opportunities for increasing the efficiency of the new economic management and the formation of the non-oil sector.

The evaluation of innovative perspectives of digital economy sectors based on multi-criteria expert methods can be applied to similar regional structures. The results of the expert assessment of the weighting coefficients of the proposed criteria can serve as the main platform for evaluating the innovative perspectives of the regional digital economy sectors. In addition, the proposed methodological approach can play the role of a foundation in the formation of the new generation of technological development of the national economy and can significantly help to increase the efficiency of economic activity.

References

Abdulkarim, A. O., Nasir, F., Nasir, N., Ebinimi, T., & Augustine, K. N. (2023). Measuring the impact of the digital economy in developing countries: A systematic review and meta-analysis. *Heliyon, 9*(7), e17654. https://doi.org/10.1016/j.heliyon.2023.e17654

Alguliyev, R. M., Aliyev, A. G., & Abbasova, V. A. (2017). The study of formation characteristics and development tendencies of international information and knowledge economy. *Review of Knowledge Economy, 4*(1), 7-14. https://doi.org/10.18488/journal.67.2017.41.7.14

Aliyev, A. G. (2021). Research of problems of formation of information economy sectors and assessment of innovative perspectives. Abstract of the doctoral dissertation. Baku, Azerbaijan. https://aak.gov.az/upload/dissertasion/

Aliyev, A. G., & Shahverdiyeva, R. O. (2021). Formation of technological innovation sectors of ICT-based economy and the aspects of their impact on socio-economic processes. *Problems of Information Society, 5*(1), 94-110. http://doi.org/10.25045/jpis.v12.i1.09

Aliyev, A. G., & Shahverdiyeva, R. O. (2022). Problems of formation and development of new ICT-based digital economy sectors. *Drukerovskij Vestnik*, *5*, 56-71. http://doi.org/10.17213/2312-6469-2022-5-56-71

Baldin, K. V. (2016). *Conceptual basis for the application of the method of expert evaluation in entrepreneurship*. Monograph / K.V. Baldin - Ukhta USTU.

Bogoviz, A. V. (2019). Industry 4.0 as a new vector of growth and development of knowledge economy. In E. Popkova, Y. Ragulina & A. Bogoviz (Eds.), *Industry 4.0: Industrial Revolution of the 21st Century* (pp. 85-91). Studies in Systems, Decision and Control. http://doi.org/10.1007/978-3-319-94310-7_8

Carin, H. (2020). Technological innovation and building a 'super smart' society: Japan's vision of society 5.0. *Journal of Asian Public Policy, 14*(2), 1-14. https://doi.org/10.1080/17516234.2020.1749340

Decree of the President of the Republic of Azerbaijan. (2017). *On additional measures related to strengthening the position of the Republic of Azerbaijan as a Digital Trade Hub and expanding foreign trade operations.* Azerbaijan Republic. https://president.az/az/articles/view/22892

Decree of the President of the Republic of Azerbaijan. (2021). *On improving governance in the field of digital transformation*. Azerbaijan Republic. https://president.az/articles/51299

Decree of the President of the Republic of Azerbaijan. (2021). *On some measures to improve governance in the field of digitalization, innovation, high technologies and communications in the Republic of Azerbaijan*. Azerbaijan Republic. https://president.az/articles/53407

Decree of the President of the Republic of Azerbaijan. (2021). *On the new division of economic regions in the Republic of Azerbaijan.* Azerbaijan Republic. https://president.az/az/articles/view/52389

Digital Economy Report. (2021). *United nations publication issued by the United Nations conference on trade and development*. UNCTAD. https://unctad.org/system/files/official-document/der2021_en.pdf

Estrella, F. J., Onar, S. C., Rodríguez, R. M., Oztaysi, B., Martínez, L., & Kahraman, C. (2017). Selecting firms in University technoparks: A hesitant linguistic fuzzy TOPSIS model for heterogeneous contexts. *Journal of Intelligent and Fuzzy Systems, 33*(2), 1155-1172. https://doi.org/10.3233/JIFS-16727

Grabowska, S. (2020). Smart factories in the age of Industry 4.0. *Management Systems in Production Engineering, 28*(2), 90-96. DOI:10.2478/mspe-2020-0014

Ietto-Gillies, G., & Trentini, C. (2023). Sectoral structure and the digital era. Conceptual and empirical analysis. *Structural Change and Economic Dynamics, 64*, 13-24. https://doi.org/10.1016/j.strueco.2022.11.004

Ke, R. (2022). Research agenda for the digital economy. *Journal of Digital Economy, 1*(1), 20-31. https://doi.org/10.1016/j.jdec.2022.08.004

Kholiavko, N. (2017). Systematization of scientific approaches to the interpretation of information economy. *Baltic Journal of Economic Studies, 3*(4), 157-164.

Korobov, V. B. (2019). *Theory and practice of expert methods*. Monograph.

Kowal, J., & Paliwoda, G. P. (2017). ICT for global competitiveness and economic growth in emerging economies: Economic, cultural, and social innovations for human capital in transition economies. *Information systems, Management, 34*(4), 304-307. https://doi.org/10.1080/10580530.2017.1366215

Kvilinskiy, A., Trushkina, N., & Rynkevich, N. S. (2019). Conceptual approaches to the definition of the term "information economy". *Problems of Economics*, *3*(41), 147-155. http://dx.doi.org/10.32983/2222-0712-2019-3-147-155

Laitsou, E., & Kargas, A. (2017, November 23-24). *The impact of ICT on economic growth of Greece and EU-28 under economic crisis*. Conference "Internet of Things Business Models, Users, and Networks", Copenhagen, Denmark. https://doi.org/10.1109/CTTE.2017.8260993

Vol.12 (2024) no.3, pp.262-284; DOI 10.2478/mdke-2024-0016

Mammadova, M. H., & Jabrayilova, Z. G. (2018). Fuzzy Multi-criteria Method to Support Group Decision Making in Human Resource Management. In L. Zadeh, R. Yager, S. Shahbazova, M. Reformat & V. Kreinovich (Eds.), *Recent Developments and the New Direction in Soft-Computing Foundations and Applications. Studies in Fuzziness and Soft Computing* (pp. 209-222). Springer. https://doi.org/10.1007/978-3-319-75408-6_17

Marjan, S., Carayannis, Elias G., Ferreira, João J. M., & Ferreira, Fernando, A. F. (2018). Multiple criteria decision analysis in knowledge-based economies: Methodological developments and real-world applications. *Technological Forecasting and Social Change*, 131, 1-3. https://doi.org/10.1016/j.techfore.2018. 01.028

Orlov, A. I. (2004). *Econometrics? Izdatel'stvo*. Ekzamen.

Oteshova, G. S., Prodanova, A., Gaziz, S., & Natalia, Savina (2020). Digital economy and its role in the process of economic development. *Journal of Security and Sustainability*, *9*(4), 1225-1235. https://doi.org/ 10.9770/jssi.2020.9.4(9)

Pomerantseva, P., & Yashchenko, S. D. (2020). Big data technology as the basis for the formation of the digital economy. *Intellectual Resources for Regional Development, 2*, 365-371.

Redondo-Rodríguez, L., Yábar, D. C. P. B., & Díaz-Garrido, E. (2023). Impact of technological innovation on digital entrepreneurship and the effects on the economy. *International Entrepreneurship and Management Journal, 19*, 1501–1526. https://doi.org/10.1007/s11365-023-00873-2

Richter, K. K., & Pakhomova, N. V. (2018). Digital economy as an innovation of the 21st Century: Challenges and opportunities for sustainable development. *Problems of Modern Economics*, *2*(66), 22-31.

Rumana, B., & Richard, H. (2018). Defining, conceptualising and measuring the digital economy. *International Organisations Research Journal, 13*(2), 143-172. http://doi.org/10.17323/1996-7845-2018-02-07

Sangki, J., & Cheong, M. C. (2015). Is ICT a new essential for national economic growth in an information society? *Government Information Quarterly, 32*(3), 253-260. http://doi.org/10.1016/j.giq.2015.04.007

Semenyuk, E. P., Kotlyarevskyy, Y., Kniaziev, S.I. & Melnikov, A.V. (2017). Information economy: The formation of special-purpose categorical framework. *Science and Innovation*, *13*(3), 5-21. https://doi.org/10.15407/scin13.03.005

Shkarlet, S. M., Dubyna, M. V., Tarasenko, A. V. (2017). Basic descriptors of the information economy development. *Scientific Bulletin of Polissia, 3*(11), 8-15.

Sukhodolov, A. P., Popkova, E. G. & Litvinova, T. N. (2018). *Models of modern ınformation economy: Conceptual contradictions and practical examples.* Emerald Publishing Limited.

Tenyakov, I. M., & Zakirov, D. I. (2022). Directions of the impact of digitalization on economic growth. *Problems of Modern Economics, 1*(81), 38-41. http://www.m-economy.ru/art.php?nArtId=7261

Tianyu, Z., & Na, L. (2023). Measuring digital economy: From the perspective of digital industrialization and industry digitalization. *Procedia Computer Science*, 221, 1006-1012. https://doi.org/10.1016/j.procs.2023.08.081

Xia, L., Baghaie, S., & Mohammad Sajadi, S. (2024). The digital economy: Challenges and opportunities in the new era of technology and electronic communications. *Ain Shams Engineering Journal, 15*(2), 102411. https://doi.org/10.1016/j.asej.2023.102411

Xiaoya, M., Xiaying, F., Dandan, F., Jin, T., & Ming, J. (2024). How does the digital economy impact sustainable development? An empirical study from China. *Journal of Cleaner Production*, *434*(1), 140079. https://doi.org/10.1016/j.jclepro.2023.14

Yiran, C., Xiaorui, Z., & Yongjian, L. (2023). The effect of digital transformation on real economy enterprises' total factor productivity. *International Review of Economics & Finance, 85*, 488-501. https://doi.org/10.1016/j.iref.2023.02.007

Zartha Sossa, J. W., Manrique Henao, J. A., Montes Hincapié, J. M., Palacio Piedrahita, J. C., & Orozco Mendoza, G. L. (2020). Delphi Method in Emerging Technologies. *International Journal of Innovation, Creativity and Change, 14*(10), 1210-1230.

Zhao, H., Guo, S. & Zhao, H. (2018). Comprehensive benefit evaluation of ecoindustrial parks by employing the best-worst method based on circular economy and sustainability. *Journal of Environment Development and Sustainability, 20*(3), 1229-1253. https://doi.org/10.1007/s10668-017-9936-6

Zoltan, J. A. (2023). The global digital platform economy and the region. *The Annals of Regional Science, 70*(1), 101–133. https://doi.org/10.1007/s00168-022-01154-6