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Comprehensive modernization and innovative development of the SMART economy of the future

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Abstract: The article examines the SMART economy concept and basic principles. The problems and prospects for the implementation of SMART specialization in the economy in the context of globalization processes, digitalization, and technological progress are identified. The described research in this article is based on 20 relevant scientific papers by Ukrainian and foreign authors. Based on the analyzed sources, current trends in economic development are compared with those that occurred in the past. Such an analysis allowed seeing in dynamics the directions and pace of development of the future economy. It is determined that the implementation of the SMART-concept leads to long-term strategic structural changes in the economy of each individual region and the country as a whole. The author's vision of improving the approach to economic development with the use of SMART specialization is proposed.

Keywords: SMART economy, innovation, modernization, digitalization, technology, SMART specialization.

Introduction

Information and technology are driving society's further development. Globalization processes require a constant review of the principles and foundations on which economic, technological, and social processes are based. Modern technologies provide new opportunities for continuous progress, so in order to have competitive advantages and the ability to function, the economy of each region, both regionally and internationally, must make the most of the opportunities provided by transformational large-scale changes.

Research Problem

The definition and study of the SMART economy concept occupies an important place in modern global economic science. Many scientific papers are devoted to covering this topic, but today the trends of the SMART economy in the new conditions in which society functions are of great importance. Given the speed of technological progress and globalization of economic processes, it can be concluded that research on the concept of the SMART economy of the future is not enough, which determines the relevance of this study.

Research Focus

The purpose of the study is to analyse the trends in the development of the SMART economy in the strategic perspective in the context of globalisation and digitalisation and to identify the problems and prospects of the SMART economy of the future.

Research Aim and Research Questions

The subject of the study is a set of theoretical and practical principles of the SMART economy as a basis for the development of the economy of the future.

Research Methodology

In order to solve the tasks, set and achieve the purpose of the study, a number of scientific methods were used, in particular: structural and categorical analysis, which involves the ordering and systematisation of research categories, as well as general methods of scientific knowledge.

Research Results

For an accurate understanding of the SMART economy category, it is advisable to consider separately the definitions of "economic system" and SMART specialisation.

An economic system is a set of interconnected economic activities of people in the process of their interaction, aimed at the production, exchange, distribution, and consumption of goods and services (Levytskyi, 2021).

SMART specialisation is a strategic approach to developing a policy to maximize the potential of a region. This approach involves identifying competitive advantages and using them as efficiently as possible to ensure the innovation, scientific, and technological potential of a particular economic region (Danylyshyn, & Prasolova, 2022).

The concept of "SMART specialisation" first appeared in 2005. It was developed by scientific consultants to the European Commission (Yatsiuk, 2018).

SMART specialisation has become an important part of the European Strategy 2020 program. This strategy as a whole is designed to build European capacity in the framework of smart, sustainable, and inclusive development.

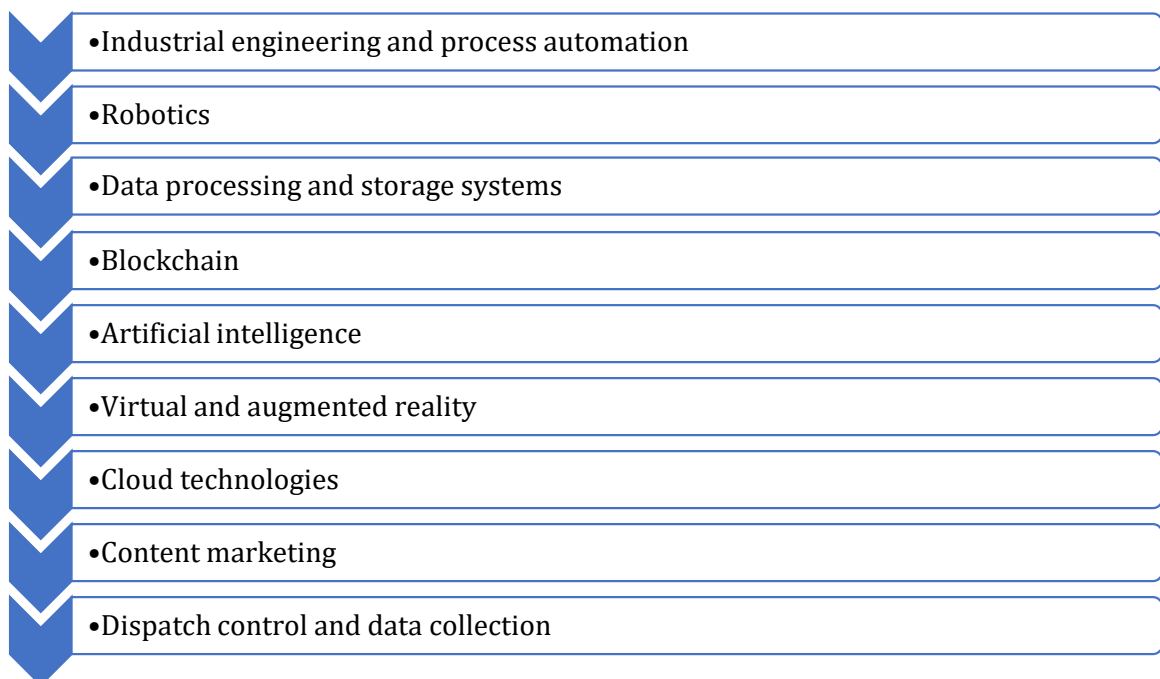
SMART specialisation is intended to introduce innovations in the most promising sectors of the economy, increase the competitiveness of economic regions, and optimise the structure of the economy.

Such scientists as (Finahina, Kovalenko, & Pryhodiuk, 2019; Holovatiuk, 2020) have studied the conceptual apparatus and concepts of the SMART economy in their scientific works. The modern concept of SMART-city and the implementation of the principles and models of SMART-specialisation in the newest cities for their development have been described in scientific works (Bonte, 2018; Nastjuk, Papageorgiou, & Trang, 2022; Noor, Saqib, & Zarine, 2022).

Intelligent innovative technologies build fundamentally new approaches to technological processes. Modern, so-called “smart” equipment, telecommunication, information, and computing technologies improve and accelerate many processes, provide certain industries with new opportunities, thereby making them more efficient, reliable, and modern (Nosyriev, 2018).

Gaining key competitive advantages today is impossible without the introduction of the latest SMART technologies. This is a rapidly developing industry that offers new opportunities that can improve the production of goods, services, etc. Figure 1 shows the main most promising SMART technologies that are being actively implemented in every sphere of public life.

Figure 1
Most promising SMART technologies



Source: Deineko, Deineko, Kushnirenko, Sychevskiy, & Tsyplitska (2020)

Within the framework of the SMART-technologies concept, the economic system should be viewed as a single system that acquires the status of “smart” and is able to provide:

- system flexibility;
- multifunctionality;
- cost minimization;
- change of parameters in real time;
- providing wide control limits;
- full-scale information providing (Haidukevych, Leskiv, & Semenova, 2022).

SMART technologies used in every sector of the national economy contribute to the development of the country's economy or a separate economic region. This fact proves the need for an integrated approach to implementing the concept of SMART specialization of the economy.

Table 1 shows examples of the impact of the introduction of SMART technologies in various economic sectors.

Table 1

Use of SMART technologies in various sectors of the economy

<i>Economic sector</i>	<i>Name of SMART technology</i>	<i>Essence of the impact</i>
Industry	SMART industry	Integration of various information systems and technologies into the industry allows optimising all production processes, speed them up and increase the efficiency of industrial activities in general.
Education	SMART-education	With the help of the latest technologies, and digitalisation, the education process is being modernised, accelerated, and optimised for both students and teachers.
Construction	SMART-city	Implementation of technologies in city development, which significantly improves and modernises the lives of city residents. Process management in the city that optimises the use of resources, the quality of services, and improves communication.

Source: (Khlystun, & Shatska, 2021)

The concept of the SMART economy should be considered as a whole, as it is closely related to such concepts as SMART society and SMART environment. The definition of the concept of economy states that it is a set of all types of economic activities of people, i.e., society, in the process of their interaction, i.e. in the environment in which they interact. Therefore, the implementation of SMART-economy principles is three-dimensional, as shown in Table 2.

Table 2

A three-dimensional development system based on the SMART concept

<i>Components</i>	<i>Characteristics</i>
Economy	Maximise the use of competitive advantages of each individual economic region for the overall economic development of the country. Improving the standard of living of the population by increasing the results of economic activity.
Society	Implementation of technologies and innovations in the development of society, in particular, in the field of training, professional development of the workforce, raising public awareness, and increasing the share of people who keep pace with technological progress.
Environment	Taking into account the environmental consequences of decision-making and the impact of these decisions on the environment in the long term.

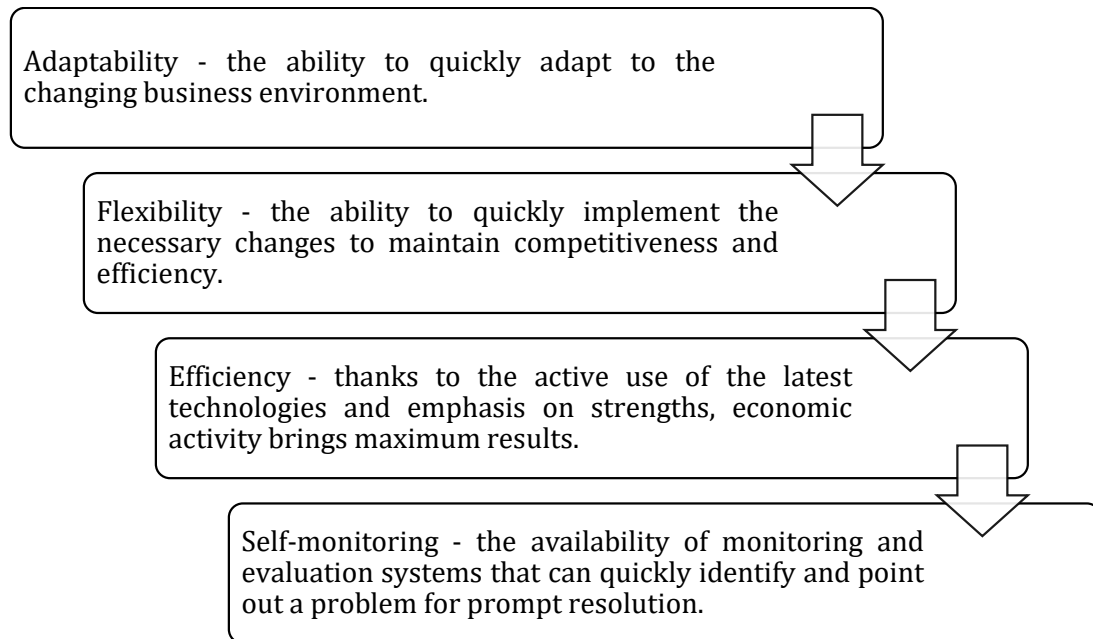
Source: (Vasylieva, & Vasylieva, 2018)

SMART specialization involves the interconnection between economics, science, and education (Povna, 2020). That is, the definition of the economy as a SMART economy implies an ecosystem approach, in which complexity is important. By integrating information, innovative SMART technologies into all sectors of the economy, social life, and environmental development, a single comprehensive result can be achieved. Creating a favorable ecosystem will contribute to the overall active development of the economic sector.

SMART specialization in the economy is characterized by the features shown in Figure 1.

Figure 1

Characteristics of SMART specialization of the economy



Source: (Drachena, Karpovich, Orlova, Suglobov, & Vologdin, 2020)

When studying the theoretical and practical foundations of the modern SMART economy as a phenomenon of the future, it is worth analysing the stages of economic development from the beginning to the present.

According to the classification of scientists A. Aron and J. Galbraith, there are three stages of industrial civilization:

- pre-industrial society;
- industrial society;
- post-industrial society.

The key differences between these periods and the factors that prompted the changes are summarized in Table 3.

Table 3

Characteristics of the stages of industrial civilization

<i>Stage</i>	<i>Period</i>	<i>Characteristics</i>
Pre-industrial society	Until the end of the XVII century	Agriculture and manual labour prevailed among the industries.

Industrial society	Early XVIII - first half of the XX century	The industrial revolution took place, after which mechanised industrial production began to play a leading role.
Post-industrial society	Second half of the XX century - to the present day	Intellectual capital, knowledge, and innovation are driving social production. Automation, robotisation, and digitalisation dominate in all industries.

Source: (Kozlova, & Yemelianov, 2019)

Discussion

The concept of the SMART economy is already being actively applied today. However, it is important to analyse further trends in its development. Like any other concept, the SMART economy concept has its prospects and threats. It is important to identify, compare and analyse them.

The prospects that the SMART economy may have in the future include:

1. Optimization of production operations, equipment, and inventory through the introduction of the latest technologies.
2. Improvement of goods and services for the population, thanks to the emergence of opportunities to create a product that can best meet the needs.
3. Increasing the level of staff qualification, due to the need to work under the new conditions dictated by the modern SMART economy.
4. The emergence of avant-garde economic solutions that will be possible thanks to nanotechnology: robotics, nanomaterials, WR technologies (Bilska, Khvostina, Kucherova, & Ocheretin, 2021).

In addition to the advantages and prospects for development, there are also preconditions that pose threats and obstacles to the SMART economy of the future. The following risks can be identified:

1. Technical. These risks are related to the security of use and compatibility issues of computer networks. Their emergence and modernization is a significant advantage, but their effective implementation in all economic processes and adjustment of work requires a lot of time.
2. Socio-economic risks. This group of risks is related to human resources. Automation has triggered a labour shortage. Since machines can replace people in certain activities, there is a need for highly qualified personnel who not only have certain knowledge to perform work directly but also communication and management skills, regardless of their position. The SMART economy requires fundamentally new competencies, but there is a risk that society will not be able to fully meet the need for such capital.
3. Institutional. These are the risks associated with the need to completely rebuild business models in a new way. In addition to being a long-term process, it requires considerable effort. New business models, instead of the already accepted ones, are painfully perceived by society (Chekina, Cherevatskyi, Harkushenko, Kniaziev, Liakh, Vietska, & Vyshnevskiy, 2018).

Despite the fact that the threats to the further active development of the SMART economy are quite serious, it is important to understand that the process of integrating the economic system into SMART specialisation is continuous, and the task of humanity is to take advantage of the benefits as efficiently as possible to improve the quality of social life in general (Kozlova, & Yemelianov, 2019).

Risks can be minimized by the following methods:

- Government support for economic development, creation of certain legislative and regulatory conditions (Patytska, 2019).

- Investments in human capital, including its development and education.
- Development of the IT sector and cybersecurity (Hafarova, & Voitko, 2019).
- Building a comprehensive marketing strategy, benchmarking.

Conclusions and Implications

In a post-industrial society, SMART technologies are becoming a driving force for progress. The SMART economy is the main direction of development of the economy of the future. Regardless of whether an economic region has a high level of economic development at this stage or is a backward economic region, the introduction of SMART technologies will help to reach a radically new level of economic development.

Comprehensive modernization of the economy based on SMART specialisation takes place as an ecosystem, not as an individual. This suggests that the introduction of SMART technologies into the economy is possible if they are implemented in each individual sector. In addition, the concept of a SMART economy should also be considered alongside the SMART development of society and the environment. Only if the integrity of the ecosystem is maintained is comprehensive, full-fledged, and inclusive development possible.

SMART specialisation in the economy is characterised by flexibility, adaptability, efficiency, and self-control. There are many positive prospects for further development, such as optimisation of production operations, equipment and inventories, improvement of goods and services for the population, staff development, emergence of new avant-garde solutions, and risks associated with the dangers of implementing SMART technologies. These include: technical risks, socio-economic and institutional risks.

Compared prospects and threats allow identifying methods that will help minimise risks and have a positive impact on the further development of the SMART economy. These methods include government support for economic development, investment in human capital, development of cybersecurity, and building a high-quality marketing strategy.

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