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THE PROSPECT OF JAPANESE NEW DIGITAL TECHNOLOGIES IN A SMART SOCIETY

Japan, modernized in the 20th century, is a dynamically developed, promising country in the 21st century. Japan, which ranks second in economic terms after the United States, demonstrates a high level of technology. In addition, it is a country that has been able to improve its abilities and preserve its values even at the peak of the world's development, having formed several thousand stories. Rapid changes and the development of new technologies have brought changes to our society and people's daily lives. This article presents the opportunities and disadvantages of Japanese digital technologies, as well as their role in Japan's creation of a smart society. At the same time, clear points of the 5.0 Society trend were studied not only in one direction, but also in different areas. Valuable virtual assistants such as the Internet of Things, artificial intelligence and robotics are shown as an example. Japan, being the country that laid the foundation for a smart society, has worked closely with several countries based on their experience. That is, the Society 5.0 technologies are considered an indispensable force for solving problems related to aging, population decline and major natural disasters. The transition from the information society to a more intelligent Japanese society has had an impact on maintaining a balance between virtual and real life for the Japanese. They were able to accept smart society without any obstacles. In the future, this smart society in Japan will undoubtedly create a smart world for Japanese society.

Key words: Japan, Society 5.0, artificial intelligence, Internet of things, smart methods.

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SMART қоғамдағы жапондық жаңа цифрлық технологиялар перспективасы

XX ғасырда модернизацияланған Жапония XXI ғасырда әлемдегі ең қарқынды даму үстіндегі елге айналды. Америка Құрама Штаттарынан кейін экономикалық тұрғыдан екінші орынды алған Жапония технологияның биік шыңын көрсетуде. Одан бөлек, әлемнің кез келген даму шыңдарында да өз қабілетін жетілдіріп, бірнеше мыңдаған тарихын қалыптастырып, құндылықтарын сақтай білген ел болып табылады. Технологияның қарқынды өзгерістері, дамуы, қоғам мен адамның күнделікті өміріне де өзгерістер әкелді. Жапондық цифрлық технологияның мүмкіндіктері мен кем тұстары көрсетіліп, смарт қоғам құрудағы Жапонияның рөлі айқындалды. Сонымен қатар Society 5.0 тенденциясын тек бір бағытта ғана емес, әртүрлі салалардағы айқын тұстарын зерттеу. Оған мысал ретінде, IoT, AI, робототехника сияқты аса құнды витртуалды көмекшілер көрстіледі. Жапония ақылды қоғамның негізін бастаған ел бола отырып, бірнеше елдермен тығыз қарым қатынас жасай отырып, олардың да тәжірибелеріне сүйеніп, жұмыс атқарды. Яғни Қоғам 5.0 технологиялары қартаюға, халықтың азаюына және ірі табиғи апаттарға байланысты мәселелерді шешу үшін таптырмас күш болып есептелінеді. Ақпараттық қоғамнан ақылды жапондық қоғамға өту жапондықтар үшін виртуалды өмір мен шынайы өмірді баланста ұстауға әсерін тигізді. Бұл қоғамды жапондықтар алдыңғы орындардағы дамыған мемлекет ретінде қабылдау еш кедергісіз орын алды. Болашақта Жапониядағы бұл смарт қоғам смарт әлемді құратыны сөзсіз.

Түйін сөздер: Жапония, Society 5.0, AI, IoT, смарт әдістер.

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Перспектива японских новых цифровых технологий в «умном» обществе

Япония, модернизированная в XX веке, является динамично развитой, перспективной страной в XXI веке. Япония, занявшая второе место в экономическом плане после Соединенных Штатов, демонстрирует высокий уровень технологий. Кроме того, это страна, которая смогла улучшить свои способности и сохранить свои ценности даже на пике развития мира, сформировав несколько тысяч историй. Быстрые изменения и развитие новых технологий принесли изменения в наше общество и повседневную жизнь людей. В данной статье представлены возможности и недостатки японских цифровых технологий, а также их роль Японии в создании умного общества. Вместе с этим, были изучены четкие точки тренда Общества 5.0 не только в одном направлении, но и в разных областях. В качестве примера показаны ценные виртуальные помощники, такие как Интернет вещей, искусственный интеллект и робототехника. Япония, будучи страной, заложившей основу умного общества, тесно сотрудничала с несколькими странами, опираясь на их опыт. То есть технологии Общества 5.0 считаются незаменимой силой для решения проблем, связанных со старением, сокращением населения и крупными стихийными бедствиями. Переход от информационного общества к более умному японскому обществу оказал влияние на сохранение баланса между виртуальной и реальной жизнью для японцев. Они смогли без каких-либо препятствии принять смарт общество. В будущем данное умное общество в Японии, несомненно, создаст умный мир для японского общества.

Ключевые слова: Япония, Общество 5.0, искусственный интеллект, интернет вещей, умные методы.

Introduction

If we introduce the main aspect of the article with historical features, Japan is a modernized country, that is involved in the Western model. If we take in consideration to the fact that the values of the West have not bypassed Japan, we are able to notice the advantages and disadvantages. To start with, he learned new things in terms of economic development. However, it was hard for the Japanese people, who keep their values, to change the culture and social life. This is shown in history as a single victory of the Japanese, and it represents the highest point of smart society today. Turning to the smart society, the Society 5.0 trend is based on digital infrastructures, platforms and services. These are defined as smart technologies such as artificial intelligence (AI), robotics, the Internet of Things (IoT) and blockchain, as well as augmented and virtual reality or robotic process automation. These technologies accomplished a point of great social and economic opportunity in Japan (World Economic Forum, 2019). The modern smart world is facing a wave of great changes. The trend of digital transformation is unstoppable and will fundamentally change many aspects of society in different areas, such as public administration, industrial structure, employment and personal life. In this new era, globalization and the rapid evolution of digital technologies such as IoT, AI, big data analytics, and robotics, such as Next Generation Robots (NGR), will accompany significant changes to society (M. Kakegawa, 2017). The Society 5.0 trend has been proposed as the future society that Japan looks forward to in the fifth major stage of science and technology. It's called Society 1.0 Hunting and Gathering, and it shows people's ability to get to know nature. Society 2.0 is called adaptation to agriculture and is characterized by the appearance of making people work. Society 3.0 is presented as a modern society, and the fruits of people's work are defined. Society 4.0 is considered as the datasphere. At the most important part, smart technologies allow us to communicate more easily and quickly with people all of the world. Consequently, intelligent devices are able to do more and more. For instance, in Japan, smart washing machines can intelligently determine the most effective combination of detergent amount, wash cycles and spin to ensure a good wash. Distributed systems, which include a local network and a telecommunication station, are able to optimize electricity in the neighborhood, thus allowing us to save energy use and consumption and use a fast Internet network. Mobile payment systems enable us to order and pay in advance.

Continuity of topic selection and purpose and objectives

The main purpose of the study is to show the perspective of Japanese new digital technologies in

the Smart society. To achieve this goal, the following tasks were set:

- describe the relative progress of Society 5.0 in Japan;
- Regulation of quality of life in the future of digital society;
- showing the main aspects of the globalization of AI, IoT, robotics;
- As a conclusion, determine the influencing factor on human society.

Methodology of scientific research

The following methods are used to fulfill the tasks during the research: description method, collection and analysis of literature sources, comparative-descriptive, content-analysis, structural-functional. New sources and literature from the International Journal of Social Science and Humanity were used as the main material used in the research, showing examples not only of Japan but also of other European countries. In addition, by analyzing the SMART SOCIETY: A BUILDING BLOCK OF SMART WORLD material as a source, it was possible to identify the weaknesses by showing the strengths of the main block. M. E. Gladden, Who will be the members of society 5.0? If the source Towards an anthropology of technologically post-humanized future societies describes who will be the members of the Japanese smart society, the literature Digital transformation and digital competence from the practice of Education for Democratic Citizenship and Human Rights Education describes the ways of a smart society in digitized Japan not only in one field, but in several fields. In addition, in the article Leading the Way: IoT Innovation in Japan and the World, Japanese scientist Sasaki showed the role of IoT and AI in society and the factors affecting Japan.

Results and discussions

Smart technologies on the way to creating Society 5.0

AI	artificial intelligence presents stimulating human knowledge through machines which supports them think and behave like humans; artificial intelligence plays an important role in making society smarter. Artificial intelligence is involved in improving human labor efficiency and regulating factors that affect the workforce. Nowadays, the volume of information produced by both humans and machines is a major factor in human ability to perceive, interpret, and solve invisible complex problems. (A. Krizhevsky, I. Sutskever, and G. Hinton, 2012).
IoT	The Internet of Things deals with the programming and systematization of various existing elements. Many models include connected devices, smart home security regulations, healthcare regulatory aspects, cybersecurity measures and more. (Yogesh Kumar Meena and Aditya Trivedi, 2014).
Deep learning	Deep learning is simply algorithms that work like the human brain. It provides deep knowledge by working like a human brain. (Yogesh Kumar Meena and Aditya Trivedi, 2014).
Augmented Reality and Virtual Reality	constant use of this data in the form of text, illustrations, sound and various improvements. Computer reality suggests a more immersive experience in the physical world. This assumes a completely artificial digital environment. Virtual reality is also helping to make society smarter. (A. Krizhevsky, I. Sutskever, and G. Hinton, 2012).
Wireless Networks	a fast, simple and economical system that works between nodes and works wirelessly around our home or office. It also opens up possibilities to connect buildings up to several kilometers (Alberti, A. M., 2012).
Software Defined Network (SDN)	it was proposed as a program management method in order to simplify the deployment of new applications and services, as well as to regulate network performance. It is designed to be held in a closed form, without being used in an open form. (M.E. Gladden, 2019).
Cloud Computing	Provides the provision of various types of management via the internet. From programming and systematization, it delivers everything through the cloud, ensuring the timely and secure collection of data and resources of a structured organization ((A. Krizhevsky, I. Sutskever, and G. Hinton, 2012).

Today the «Society 5.0» concepts based on the «world of robots», which is very similar to the world of fairy tales, is becoming the next stage of the development process of humanity up to today. At the first stage, people engaged in hunting and found the necessary food from nature with their own strength and hard work, and in the second stage, they planted crops and raised livestock. In the third period, the industrial sector developed, paying special attention to the production of household items. Fourthly, in the

current period, the information distribution system has developed, and the Internet and digital technologies have become an integral part of all spheres of life. Now let's answer the question of how the impact of the smart society on the Japanese took place, what will be the step towards the future: Society 5.0 was originally created to provide economic benefits to the people. Its purpose is to provide goods and services to people in need at the right time and in the right amount, thereby contributing to human well-being. In Japan, the implementation of Society 5.0 was considered not only to facilitate/improve the lives of its individuals, but to benefit the entire population. The goal of the Society 5.0 process is to meet the needs of a wide range of social infrastructure to ensure easy access to high-quality services for all types of people to live safely and comfortably. Society 5.0 technologies are used to solve problems related to aging, population decline and major natural disasters (S. Buyukgoze, E. Dereli, 2019). The concept of Society 5.0 in Japan includes the realization of certain goals, such as:

• Development of solutions against the aging of the world population.

• Making sure virtual and real worlds can work together.

• Using the Internet of Things (AI) with society in mind.

• Making decisions against natural disasters and environmental pollution (Keidanren (Japan Business Federation), 2018).

Society 5.0 is:

• Bringing personal principles to the forefront through reforms.

Each person is different in terms of race, gender, age, etc., as well as their ability to live a comfortable, healthy, safe and personal lifestyle.

• Delivering new values through reforming companies

It is the realization of a new society and economy by digitization and reforming business models, promoting productivity by supporting innovation and globalization.

• Creating the best future by solving social problems

It is an attempt to realize a rich and powerful future to solve many problems such as population decline, rapid aging of society and natural disasters. The goal of the project is to contribute to solving problems on a global scale by spreading new businesses, services and processes around the world (Science, Technology and Innovation Cabinet Office, 2019). In addition, Society 5.0 will make a significant contribution to the solution of vital problems, such as early detection and prevention of natural disasters using automatic aerial vehicles and surveillance radars, and ensuring a high level of security through the use of sensors and tools based on artificial devices. Society 5.0 will enable innovations in artificial intelligence, cyberspace, the Internet of Things, and big data. Much more information is obtained from sensors in cyberspace than in physical space. This big data is analyzed with the support of AI and the results are presented to the public and used for the benefit of the society. In other words, objects and systems communicate with each other in cyberspace, and the results obtained through AI are used for the benefit of society. All these innovations presented by Society 5.0 aim to transform society from a technology-oriented world order to people-oriented one through innovative and human solutions to social problems (Artificial Intelligence & Me:, 2020).

Japan can offer several interesting and many sided projects related to the development of artificial intelligence:

- In 2016, NEC(Nippon Electric Corporation) established an artificial intelligence laboratory together with the National Institute of Advanced Industrial Science and Technology of Japan. The goal of the three-year project is to achieve and rank the achievements of the United States and China in the development of artificial intelligence.

- In 2017, SoftBank launched an incubator for the development of artificial intelligence. The incubator fund is $55 million and is intended to support small and medium-sized promising companies in the early stages of research.

- Internet advertising agency CyberAgent is developing an artificial intelligence-based system for advertising in cooperation with Japan's Meiji University.

- Toshiba has created an analytical system based on artificial intelligence. This system is used by the company in its factory in Japan and allows to identify the causes of defects in the production process, to analyze the problems and their consequences.

- The artificial intelligence software developed by Hitachi enables the creation of work instructions for employees based on the analysis of big data.

- Hitachi is partnering with Kyoto University to develop artificial intelligence to solve traffic congestion.

- Keio University and UbicMedical are working on devices that can objectively assess patients' psychological symptoms through facial expressions.

- The optimal combination of anticancer drugs is developed individually for each patient at the Institute of Medical Sciences of the University of Tokyo.

Japan has a number of research laboratories and centers dedicated to artificial intelligence. The three most important of them are:

• The Continuous Innovation Network (Ci-Net), Universal Communication Research Institute (UCRI) under the National Institute of Information and Communication Technologies (NICT);

• Aeronautical Information Publications (AIP) of the National Research and Development Agency (RIKEN);

• Artificial Intelligence Research Center (AIRC) at Japan's National Institute of Advanced Industrial Science and Technology.

From the established list, RIKEN takes the highest place, its work has a huge distinction in the development of artificial intelligence. RIKEN, the National Research and Development Agency, is Japan's largest comprehensive research institution known for its high-quality research in a variety of scientific disciplines. Founded in 1917, originally as a private Research Foundation, RIKEN has grown rapidly in size and scope, today encompassing a network of world-class research centers and institutes throughout Japan. That is, if we show the place and important aspects of artificial intelligence in Japanese society: it is possible to show simple everyday examples. For example, devices and networks for video (Youtube or Netflix), when using smartphones (fingerprint and face detection), and communication with virtual assistants (Siri, Alexa, Google Assistant and various chatbots), tracking anyone's address through geolocation , see weather forecasts with Google Search. All these are special features of artificial intelligence. Artificial intelligence has great potential in solving complex problems by replicating the processes that occur in the human mind. Simply put, machines learn to recognize patterns, distinguish objects, classify them, and make predictions based on observed trends through the given examples (Marco Oberosler (CCI, ed.); Elisa Rapetti (DARE, ed.), 2019).

In addition, if we pay attention to several forms of this smart society with artificial intelligence of the future of Japan: (H. Sasaki, 2016)

Procurement of personnel. Knowing the needs and preferences of a specific client, the artificial intelligence system provides an individual selection of goods or services. The same approach is used to increase engagement through targeted advertising, where users are shown personalized offers based on product previews and purchase history.

Virtual assistants. Usually with voice and speech recognition, the app helps you perform everyday tasks like managing your calendar, ordering food delivery, hailing a taxi, checking the weather or searching the web. Sometimes these assistants work as chatbots that are trained to communicate in a human-like manner using a process called natural language processing (NLP).

Autonomous vehicles. A self-driving vehicle (sometimes called an autonomous or driverless vehicle) is a vehicle without an operator equipped with a suite of sensors, cameras, radar, cloud services, GPS and control signals, as well as AI that allows it to navigate between destinations. AI is also used in Maps to predict traffic and calculate routes.

Face recognition. The face recognition system is a technology capable of matching the human silhouette to the face database by accurately identifying and measuring facial features from a given image. Such systems have been used by governments and private companies for user identification, authorization, and video surveillance. However, recently there have been concerns about the security of personal data.

Medicine. AI in medicine is used to diagnose patients and guide treatment decisions. Nowadays, we can detect early signs of many diseases with advanced models based on medical data. Modern smart technology can predict the spread of infectious disease by analyzing data from hospitals, laboratories, and even surveillance cameras.

Agriculture. Artificial intelligence technologies such as computers, robotics, and machine learning applications can identify emerging pests and target them with herbicides or remove them mechanically. It is also possible to analyze the composition of the soil, identify nutrient deficiencies and balance them with precise mixing. Thus, sustainable agriculture can produce high yields of high-quality crops using fewer resources, helping to solve the problem of hunger.

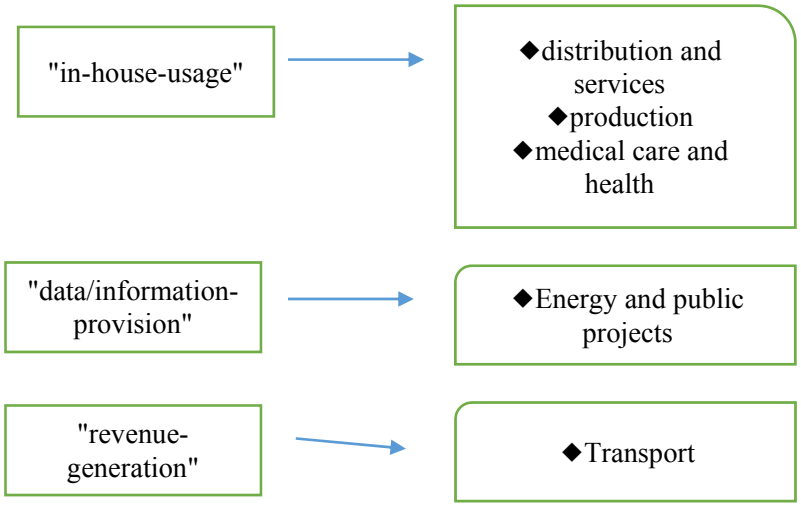
Climate. Having good data is essential for building models and predicting impacts on climate and ecosystems. Data sources can be drone images or underwater audio recordings that support wildlife monitoring. Automatically collected data from various sensors can be used to predict floods, forest fires and other devastating natural disasters.

Art. Contrary to what many people think, AI is not limited to scientific applications. It can be used to create works of art. Of course, this is nothing but human creativity. However, AI can use algorithms to detect patterns and repair corrupted images, remove unwanted elements from backgrounds, and

even create new images based on given text or other images.

Education. In education, artificial intelligence can be used to provide personalized learning experiences based on student test results and tracking activities in learning management systems. In this way, each student in the classroom can receive a personalized selection of learning materials and a set of activities that match their strengths, needs, skills and interests.

The role and normal state of artificial intelligence can be seen through its permanent objects in society. Smart society, digitization, high tech, artificial intelligence, internet of things are all achievements of Japanese developed society. Therefore, its culmination, future, steps of development can be clearly seen. In addition to artificial intelligence, the Internet of Things can be identified as a well-known example. Today, the Internet of Things (IoT) has a prominent place in high-tech industries. The introduction of small sensors into devices opens up a new digital world. It has been of great benefit to visualize changes that have been overlooked until now. One example is the implementation of IoT technology in manufacturing processes. Visualization of all material flows on the conveyor is becoming more efficient than ever. Another example is the emergence of new Internet of Things-related products and services in consumer markets, which are expected to hold great promise for the future. Consequently, many high-tech firms seek to develop cutting-edge technologies and offer new products or services related to the Internet of Things. IoT innovations can be divided into three main types based on their contribution to enterprises and organizations. The first is "in-house-usage", where a company uses data to support its core business, such as manufacturing or marketing. The second is the "data/information-provision" type of data/information-provision, where data is distributed externally to benefit society at large, and the last is the "revenue-generation" type, where digital products and services are created to generate income. In order to determine the prevalence of these three types, 144 cases (overseas) containing not only data related to Internet of Things, but also «Comprehensive List of Big Data and Internet of Things 2015-2016» were analyzed.



Source: H.Sasaki, Leading the Way: IoT Innovation in Japan and the World

Figure 1 – Directions for IoT innovation considering the use of big data.

Қорытынды

Figure 1 shows the results of the correspondence analysis of these three types and seven domains. Medical care and health care, manufacturing, distribution and services are planned for internal use, energy and public projects for data/information, and transportation for revenue. This means that a variety of relationships between these three types of IoT innovations are expected to emerge in the near future, enabling digital devices such as smart devices and terminals to be connected to consumer-oriented services. That is, the characteristics of the smart society in Japan began at this time, and the characteristics of

the Internet of Things and artificial intelligence were differentiated (H. Sasaki, 2016).

Conclusion

Overall, Japan can handle such big changes and can develop the brand at the same time. Japan, which was modernized at the time, preserved its national values and was not left behind in terms of social, cultural, historical and political aspects. That is why such a smart society is not limited to one direction. The goal of Japan's Society 5.0 trend is to meet the needs of a large-scale social infrastructure to provide easy access to high-quality services for all types of people to live safely and comfortably. We have already shown that Society 5.0 technologies are used to solve problems related to aging, population decline, and major natural disasters. Because Japan is an aging country, it does not mean backwardness. The stages of its implementation and distribution are different and not uniform. Therefore, the Japanese smart society cannot be compared with the previous four societies. Further, the prerequisites for the development of a smart society are clearly demonstrated by artificial intelligence, the Internet of Things, blockchain, and robotics. But it also has some special features. For example, Japanese scientists believe that artificial intelligence can bring many advantages to solving problems, in many cases surpassing human abilities. But we must also be aware of the limitations of artificial intelligence, which he concluded cannot be more than that. For example, artificial intelligence is not capable of true creativity, its function is to make predictions and create content based on previously viewed data. it cannot go any further, always staying within the general limits of the original data set. Creativity is what makes people unique. Human power and ability cannot be replaced by technology. And the Internet of things, as mentioned above, worked in seven directions and concentrated in one direction. This is the beginning of a wave of modernization (upgrade).

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