



THE ROLE OF VIRTUAL AND AUGMENTED REALITY TECHNOLOGIES IN THE DIGITAL ECONOMY

Khusanboeva Tursunoy Mukhammadkasimdzhanoyna
Andijan State Technical Institute,
Assistant of the Department of Economics

Abstract

The article analyzes the role of virtual reality (VR) and augmented reality (AR) technologies in the development of the digital economy. Key areas of VR/AR application in industry, education, healthcare and retail are considered. Particular attention is paid to their contribution to improving the efficiency of business processes, reducing costs and creating new forms of interaction with consumers. It is noted that VR/AR technologies are becoming an important element of digital transformation, contributing to the formation of new markets and business models. Further growth of their importance in the digital economy is predicted.

Keywords: Virtual reality (VR), augmented reality (AR), extended reality (XR) technologies, digital economy, innovation, digital transformation.

Introduction

The digital economy is a virtual environment that complements the real reality. Experts from Western countries are unanimous in their opinion that digital technologies will not work unless relations between economic entities and government agencies are established. The process of active informatization changes consumer behavior. Marketing is also gradually and steadily approaching the essence of economic interactions, the main driving force that makes everyone participate in economic interactions - needs. In the digital economy, the management process (through professional personnel) is a computerized interaction management system that carries out large-scale work on the active use of electronic information to meet the growing needs of humanity. For example, it includes forecasting, planning,



organizing, executing, monitoring and coordinating the system's activities. That is, there must be a general comprehensive system for managing the national economy based on collecting and analyzing data in order to develop and implement ways to develop the country. In the long term, the "digital" (electronic) economy can become a tool capable of realizing centuries-old dreams of freedom for people doomed to hard physical labor. Many people will have ample opportunities for creativity, science (both fundamental and applied) and art.

The digital revolution will affect some sectors and countries earlier and more strongly, while others will be affected later and less strongly. The first to embrace digitalization will be the services, media and entertainment sectors, followed by telecommunications companies and banks. But according to the general opinion of analysts and the results of a survey of company executives, digitalization affects each of us to one degree or another. Today, we can identify every entity as belonging to one world or another, but after a certain time, we will no longer be able to make such a distinction for most objects. Similar examples exist today: an IP camera or any other network transmitter - which universe is it a part of? Undoubtedly, they are the essence of phenomena of both worlds. Modern mobile phones store a lot of information: phone numbers, birthdays, photos, passwords and other information. Even if we are not physically connected to our phone, we still feel one with it. It does not take much courage to say that the process of merging the real and virtual worlds has begun and cannot be stopped.

The merging of the real and virtual worlds creates a new hybrid world, in which different laws and rules apply than those we are accustomed to today. From this point of view, it is worth saying that there is no such thing as a "digital" economy that would be separated from the rest of the economy: the "digital" (electronic) economy is an economy that exists in a hybrid world. A hybrid world is a world in which everything in the real world is connected through the virtual world.

It is the result of the fusion of the real and virtual worlds, characterized by the possibility of performing "vital" actions. The prerequisites for this process are low cost, high efficiency and openness of the digital infrastructure.

The transition from digital economy to digital modeling and the Internet of Things can be seen as interaction with the virtual world. Of course, financial relations in the national economy cannot be implemented without digital currency in the form of national cryptocurrency.



Virtual reality (VR) creates completely artificial digital environments into which the user is immersed using special devices. Augmented reality (AR) superimposes digital elements on the real world, enriching the perception of the environment. Both technologies are actively being implemented as part of digital transformation, contributing to increased efficiency and the creation of new business models.

VR and AR technologies are widely used in industry:

- **Design and modeling:** VR allows you to create and test product prototypes in a virtual environment, reducing the costs of physical production.
- **Personnel training:** AR is used for interactive training of employees, providing step-by-step instructions and visualizations in real time.
- **Maintenance:** AR helps technicians diagnose and repair equipment by displaying the necessary information directly on the site.

In the field of education, VR and AR technologies contribute to:

- **Interactive learning:** The creation of virtual laboratories and simulations allows students to conduct experiments without risk to health and equipment.
- **Distance learning:** VR provides the effect of presence in the classroom, which is especially important for remote regions.
- **Increasing motivation:** The use of AR in educational materials makes the learning process more engaging and visual.

In medicine, VR and AR technologies are used for:

- **Surgical training:** VR simulations allow surgeons to practice complex operations without risk to patients.
- **Diagnostics and planning:** AR helps doctors visualize the patient's internal organs and systems for more accurate diagnostics and treatment planning.
- **Rehabilitation:** VR programs are used in the treatment of patients with neurological disorders, helping to restore motor functions.

In the field of trade and marketing, VR and AR technologies allow:

- **Virtual fittings:** Buyers can try on clothes or accessories in a virtual fitting room without leaving their home.
- **Interactive advertising:** AR elements in advertising make it more attractive and memorable for consumers.
- **Improving customer experience:** VR tours of stores or showrooms allow customers to get acquainted with the assortment in a comfortable environment.



VR and AR technologies are the basis for creating metaverses — virtual spaces where users can interact, work, and have fun. Metaverses open up new horizons for social communication, business, and education, shaping the digital economy of the future. According to forecasts, the global augmented reality market will reach \$300 billion by 2024. The introduction of VR and AR technologies contributes to:

- Reduce costs: Streamline processes and reduce the need for physical prototypes.
- Increase productivity: Accelerate staff training and improve work processes.
- Create new jobs: Develop new professions and specializations in the field of VR and AR.

Virtual and augmented reality technologies play a key role in the digital economy, transforming various industries and creating new opportunities for development. Their implementation helps to increase efficiency, reduce costs and improve the quality of products and services. With the further development of VR and AR technologies, even more profound changes in the economy and society as a whole can be expected.

References

1. Trachuk A. V., Linder N. V. Virtual and Augmented Reality Technologies as Factors of State Economic Policy and Competitiveness Growth // Journal of Strategic and Project Management. - 2017. - No. 2. - P. 6-15.
2. Merzlikin N. G. The Role of Immersive Technologies in Improving Labor Productivity Using Augmented and Virtual Reality // Bulletin of the State University of Management. - 2020. - No. 3. - P. 45-52.
3. Sapozhnikova I. V. Use of Virtual and Augmented Reality Technologies in Preparing Students for Organizing Club Activities // Bulletin of TSPU. - 2020. - No. 3. - P. 112-117.
4. Petukhov V. V. Application of Virtual and Augmented Reality Technologies in the Digitalization of Learning // Scientific Journal "Pedagogy and Psychology". – 2021. – No. 5. – P. 89–95.
5. Gans J., Nagaraj A. Economics of Augmented and Virtual Reality // arXiv preprint arXiv:2305.16872. – 2023.
6. Smirnov A. A. Application of Augmented Reality Technologies in Modern Life // Scientific Almanac. – 2024. – No. 2. – P. 56–62.



-
7. Velikoselsky O. A. Possibilities of Distance Learning Using Metaverses // Continuous Education: Problems, Solutions, Prospects. – 2022. – P. 97–101.
 8. Laptev V. A., Andreeva L. V., Gavrin D. A., Egorov P. E. Ecosystem of the Digital Economy // The Great Russian Encyclopedia. – 2021.