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THE POTENTIAL OF VIRTUAL REALITY AND ARTIFICIAL INTELLIGENCE IN MODELING PRODUCT INNOVATIONS OF VIRTUAL CORPORATION

ПОТЕНЦІАЛ ВІРТУАЛЬНОЇ РЕАЛЬНОСТІ ТА ШТУЧНОГО ІНТЕЛЕКТУ В МОДЕЛЮВАННІ ПРОДУКТОВИХ ІННОВАЦІЙ ВІРТУАЛЬНИХ КОРПОРАЦІЙ

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This scientific article explores the characteristics of modeling product innovations in virtual corporations that operate in online environments (without physical offices). The authors note that the proliferation of virtual reality and artificial intelligence in modeling product innovations for virtual corporations holds great potential. According to the provisions outlined, the article aims to determine the potential of virtual reality and artificial intelligence in modeling product innovations for virtual corporations. The research demonstrates that while the key characteristics of effective product innovations for virtual corporations are shaped by advancements in information processing, organizational dynamics, and the development of production systems, virtual reality, and artificial intelligence tools create the potential for their modeling. The practical significance of the research lies in expanding the knowledge about the impact of VR and AI tools on the processes of modeling product innovations and in shaping opportunities for developing strategies for their effective utilization.

Keywords: information processing, organizational dynamics, development of production systems, targeted orientation.

У статті досліджено особливості моделювання продуктивних інновацій у віртуальних корпораціях, які функціонують в онлайн-середовищі без фізичних офісів. Автори визначають, що поширення віртуальної реальності та штучного інтелекту в моделюванні продуктивних інновацій у віртуальних корпораціях має значний потенціал. Метою статті є визначення цього потенціалу віртуальної реальності та штучного інтелекту в моделюванні продуктивних інновацій віртуальних корпорацій. Для досягнення цієї мети використані методи логічного аналізу та систематизації. У межах дослідження було підтверджено, що ключові характеристики ефективних продуктивних інновацій для віртуальних організацій формуються за допомогою передових досягнень в області обробки інформації, організаційної динаміки та розвитку виробничих систем. Саме інструменти віртуальної реальності та штучного інтелекту створюють потенціал для їх моделювання, сприяючи створенню інноваційних продуктів. За результатами дослідження було встановлено, що потенціал віртуальної реальності та штучного інтелекту в моделюванні продуктивних інновацій віртуальних корпорацій можна представити як категорію, яка за сутнісним охопленням узагальнює наступні риси: цифрова орієнтованість процесу; гнучкість

у моделюванні продуктивних інновацій; віддалена комунікація та співпраця учасників процесу моделювання; крос-функціональність інноваційних команд; фокус на розвиток та спільну координацію процесів. Констатовано, що використання інструментів віртуальної реальності (VR) та штучного інтелекту (AI) в моделюванні продуктивних інновацій може дійсно розширити можливості віртуальних корпорацій через наступні кроки: аналіз ринку та потреб споживачів; створення віртуальних прототипів та тестових версій продуктів та послуг; адаптація до змін у вимогах ринку, взаємодія з розподіленими командами; оновлення та підтримка їх. Практична значущість дослідження полягає у розширенні знань про вплив інструментів VR та AI на процеси моделювання продуктивних інновацій та у формуванні можливостей для розробки стратегій для їх ефективного використання.

Ключові слова: обробка інформації, організаційна динаміка, розвиток виробничих систем, цільова спрямованість.

Target setting. The concept of virtual corporations may seem new, but its roots can be traced back to the time when companies began using telephones and faxes for remote business transactions. However, the virtual corporation's concept, which operates exclusively in an online environment began to emerge in the 1990s with the increased accessibility of the Internet and other digital technologies. One of the most well-known examples of a virtual corporation is eBay, founded in 1995. It created the opportunity for millions of people to buy and sell goods and conduct business without the need for a physical presence in an office or store all over the world. With the development of the Internet and other technologies, virtual corporations have become more prevalent. Today, many companies, especially in the technology sector, function exclusively in online environments (such as Upwork, Netflix, Amazon, and Google LLC). Indeed, this is because this type of organizational structure operates entirely in an online environment, without physical offices or premises, but through independent workgroups and structures. Modeling product innovations in these conditions becomes a challenge because it requires meticulous planning and coordination of the involved workgroups and structures. At the same time, it's worth noting that such modeling is a fully digitized process, encompassing development, testing, and culminating in the transition to mass production of virtual products or services. Indeed, virtual reality and artificial intelligence hold great potential for modeling product innovations in virtual corporations.

Analysis of research and publications. Ukrainian researchers have paid significant attention to the issues of developing innovative activities among economic entities. In particular, Kutsenko T. M. [4], Kalchenko T. V. [2], Kraus N. M., Kraus K. M., and Kryvoruchko O. S. [3] identified the features of innovative activity and product innovation through the prism of the reconstructive development concept.

Shaban K. S., Zozulov O. V., and Limanskiy A. [9] examined the peculiarities of product innovation creation and identified their success characteristics. Oliynyk L. V. specified enterprise innovation management based on product innovation models, highlighting the potential of virtual reality and artificial intelligence in these processes. Indeed, research on modeling product innovations in virtual corporations using virtual reality and artificial intelligence still appears somewhat constrained [7]. Nevertheless, it's a promising area of research, given the significant potential of these technologies in innovative development.

The wording of the purposes of article (problem). The aim of the article is to determine the potential of virtual reality and artificial intelligence in modeling product innovations within virtual corporations.

The paper main body with full reasoning of academic results. There are numerous examples of product innovations implemented by virtual corporations. Among them:

1. Netflix Originals, which comprise films, series, documentaries, and other video content produced or acquired by Netflix's workgroups exclusively for its subscribers.
2. Slack Collaboration Platform, a communication platform facilitating real-time communication for teams, simplifying interactions among colleagues, and easing project management.
3. Upwork Talent Marketplace, connecting freelancers with employers worldwide.

Note that while the list of such innovations is extensive, not every one of them has proven to be effective, namely, in meeting the needs of the market and generating significant profit or other benefits for its developer [1; 4]. A characteristic example is the Google Glass, a wearable computer with an embedded display developed by Google LLC. It offered users a range of functions such as receiving messages, capturing videos and photos, navigation, and more, all of which were displayed on a small screen positioned above one

eye. Although Google Glass had the potential for innovation in areas such as augmented reality and wearable technologies, its functionality did not appeal to the target audience, resulting in a lack of widespread market success. As a result, Google LLC suspended sales of Google Glass in 2015 and shifted its focus from the consumer market to the market for additional devices for industrial and commercial use. Therefore, for virtual corporations, inventing an effective format for product innovation is crucial.

The successful development of innovative products for virtual corporations requires certain key characteristics, such as originality, technological excellence, targeted focus, market adaptability, and strategic alignment. To achieve these, it is important to involve the latest advancements in information processing, including advanced data processing methods, artificial intelligence, machine learning, and data analytics. Additionally, it is crucial to consider organizational dynamics, including advanced principles of organizational behavior and management. Finally, the development of production systems should also be taken into account.

The combination of the outlined directions, according to the specifics illustrated in Figure 1, enables the creation of virtual product innovations, ensuring their effectiveness.

It's important to note that while the key characteristics of effective product innovations for virtual corporations are defined by advancements in information processing, organizational

dynamics, and production systems, virtual reality and artificial intelligence tools create the potential for their modeling. They provide the combination and directed action of the outlined directions above [1].

The potential of virtual reality and artificial intelligence in modeling product innovations for virtual corporations can be conceptualized as a category that inherently encompasses the following features:

1. Digital orientation of the modeling process. The use of digital technologies and online tools enables virtual corporations to effectively analyze data (collecting, processing, and analyzing large volumes of data about consumers, market trends, and competitors [5]), interact with consumers (engaging with their consumers through various channels such as social media, websites, and email [5]), and create innovative products in electronic form (developing and testing prototypes and product models electronically), allowing them to market changes quickly respond.

2. Flexibility in modeling product innovations. It allows virtual corporations to adapt to changes in market conditions, consumer demands, and technological trends.

3. Remote communication and collaboration among participants in the modeling process. Virtual corporations consist of distributed teams and employees who can work from anywhere in the world. Using digital communication tools such as email, chats, video conferences, enables employees to effectively exchange

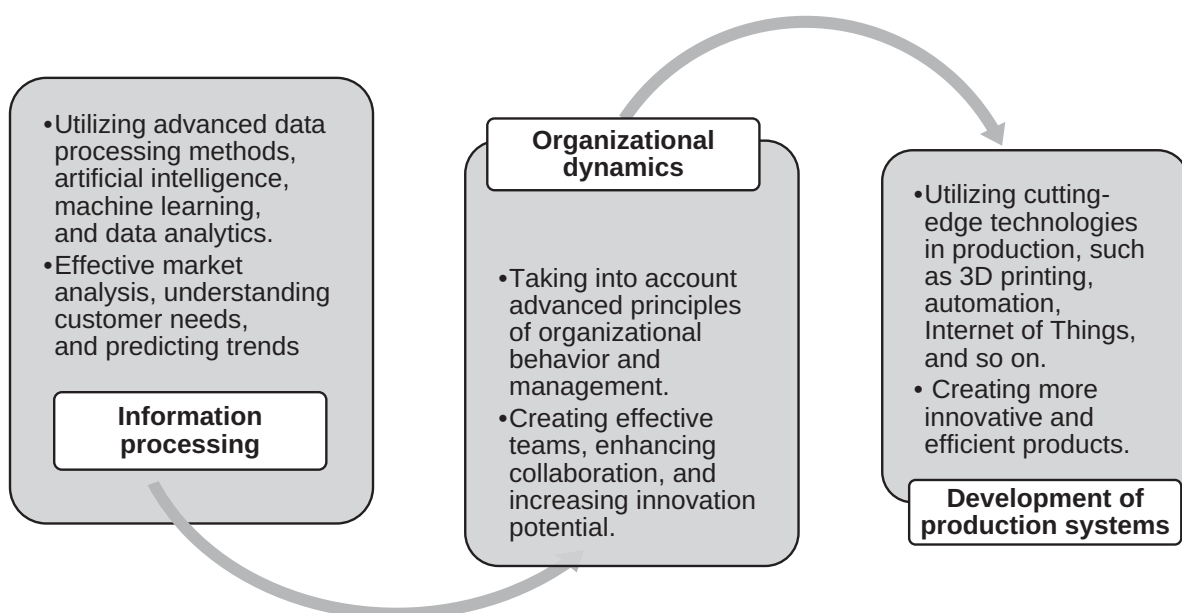


Figure 1. The main directions that enable the creation of effective virtual product innovations

Source: formed based on [2; 3; 5; 7]

ideas, address issues, and coordinate their work regardless of geographical location.

4. Cross-functionality of the involved innovation teams. Virtual corporations typically establish cross-functional teams comprising specialists from diverse fields such as product development, marketing, design, analytics, and others. This integration facilitates diverse knowledge, skills, and experiences, fostering the creation of innovative products.

5. Focus on development and collaborative process coordination. Managing virtual corporations requires appropriate strategic planning and coordination of actions from all involved work groups and structures. The corporation's leadership must develop strategies that align with the digital reality and ensure innovative product development. By utilizing digital tools and data analysis, leadership can make informed decisions and manage product development processes in real time.

The outlined characteristics above collectively reflect the essence of the potential of virtual reality and artificial intelligence in modeling product innovations for virtual corporations (see Figure 2) as they expand the array of opportunities, resources, technologies, and strategies that enable virtual corporations to successfully develop, test, and implement new products or services in the online environment.

Virtual reality and artificial intelligence are both powerful tools that virtual corporations utilize to analyze large amounts of data, make accurate predictions, and develop personalized products or services that cater to consumer needs. By using virtual reality, virtual corporations can quickly create and test prototypes of new products or services, while artificial intelligence automates the management of the process, allowing for faster response times to changes in market demands [1].

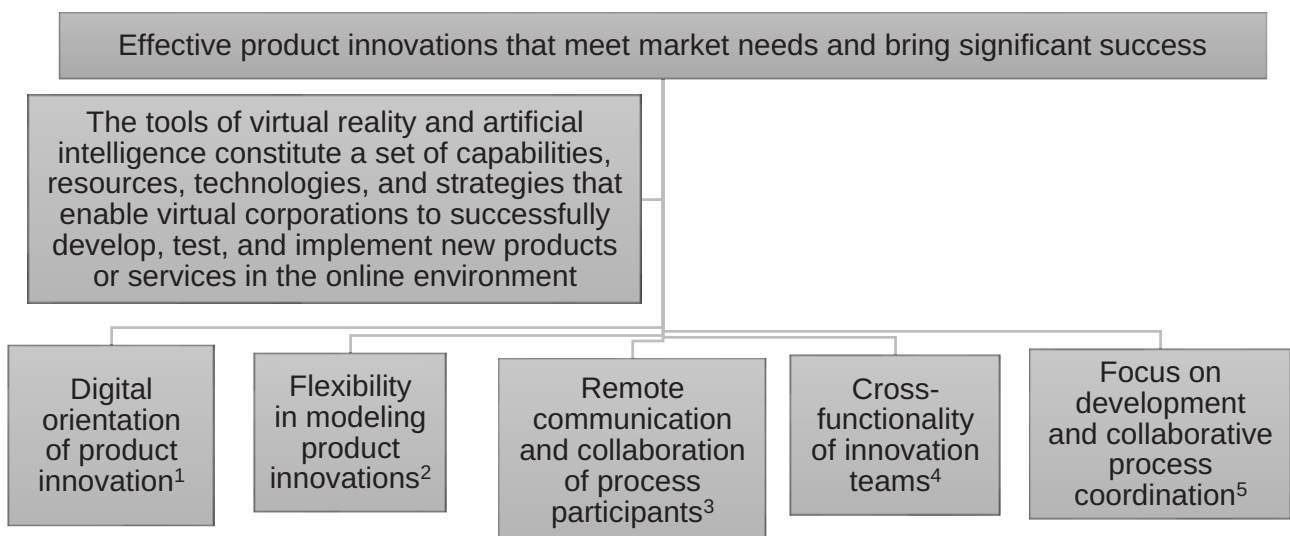


Figure 2. Characteristics that comprehensively reflect the potential of virtual reality and artificial intelligence in modeling product innovations by virtual corporations

Note:

¹ This characteristic implies that an innovative product or service is developed considering virtual prototypes of products, simulating real usage scenarios of the product, and evaluating its functionality and user-friendliness

² This characteristic defines the ability of a virtual corporation to adapt to changes in consumer demands and market conditions during the development and implementing of new products or services.

³ This characteristic defines the effective interaction among distributed teams and employees who work from anywhere in the world (through e-communication tools, shared platforms and tools, virtual meetings and retrospectives, and specialized tools for planning and coordinating work use).

⁴ This characteristic defines the inclusion of specialists from different professional backgrounds and areas of expertise to achieve a common goal or solve a specific problem.

⁵ This characteristic defines the successful operation of virtual corporations, particularly in the modeling product innovations context through continuous updating and improvement of products and services based on consumers' feedback and analysis of results.

Source: formed based on [2–3; 6; 8]

Virtual reality also enables teams to work together remotely, regardless of their geographical location, through virtual meetings and collaboration. The use of artificial intelligence for analyzing consumer needs and market trends allows for the collaboration of experts from various fields to address complex tasks and develop innovative products. Virtual reality and artificial intelligence enable virtual corporations to effectively analyze market trends, forecast demand for products or services, and optimize management strategies and process coordination [5].

So, the use of virtual reality (VR) and artificial intelligence (AI) tools in product innovation modeling can significantly enhance the capabilities of virtual corporations across the six basic steps of creating new product or service models, as outlined in Figure 3.

Let's consider each of these steps according to their general content.

Step 1. Market and consumer needs analysis. Utilizing artificial intelligence for data analysis allows for identifying key market trends and understanding the needs of the target audience.

Step 2. Creating virtual prototypes and test versions of products and services. Virtual reality enables the creation of product or service simulations in a digital environment. With the assistance of artificial intelligence, the functionality and user-friendliness of these prototypes can be analyzed and optimized.

Step 3. Testing and refinement. Virtual prototypes can be tested using user feedback and analysis of their behavior. Artificial intelligence helps identify potential issues and suggest improvements.

Step 4. Adaptation to changes in market demands. Market changes may require swift adaptive responses. Virtual reality and artificial intelligence enable corporations to quickly modify products or services according to new demands.

Step 5. Collaboration with distributed teams. Utilizing virtual meetings and collaborative work in digital environments allows for engaging experts from different locations and fields for joint modeling and development of products or services.

Step 6. Update and support. After releasing the product to the market, virtual reality and artificial intelligence can be utilized for its continuous improvement and support based on gathering and analyzing user feedback.

Conclusions from this study and prospects for further exploration in this area. The study has shown that while the main aspects of successful product innovations for virtual corporations are shaped by the utilization of cutting-edge advancements in information processing, organizational dynamics, and the development of production systems, it is specifically the tools of virtual reality and artificial intelligence that create the potential for their modeling. The following conclusions have been drawn:

1. The potential of virtual reality and artificial intelligence in modeling product innovations for virtual corporations can be represented as a category that encompasses the following essential features: digital orientation of the process; flexibility in modeling product innovations; remote communication and collaboration of process participants; cross-functionality of innovation teams; focus on the development and joint coordination of processes.

2. The use of virtual reality (VR) and artificial intelligence (AI) tools in modeling product innovations can expand the capabilities of virtual corporations through the following steps in creating a model for new products or services: market analysis and consumer needs assessment; creation of virtual prototypes and test versions of products and services; adaptation to changes in market demands; collaboration

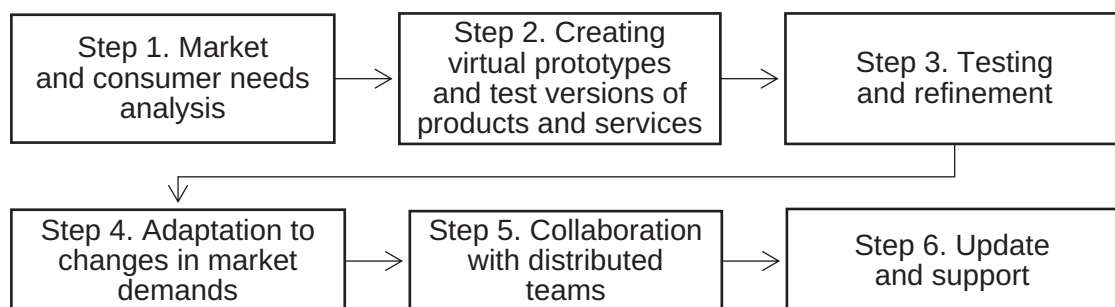


Figure 3. Steps in creating a model of new products or services oriented towards virtual reality and artificial intelligence tools

Source: formed based on [1–2; 5; 9]

with distributed teams; and ongoing updates and support.

The prospects for further research lie in expanding our understanding of the impact of

VR and AI tools on the processes of modeling product innovations and in shaping opportunities for developing strategies for their effective utilization.

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