Application of modern modeling methods: virtual technologies in the era of digitalization and their role in modern companies

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Abstract. The main research issue is the use of modern modeling methods: virtual technologies in the digital age and their role in modern companies. The aim of the study is to determine the degree of demand for virtual technologies in the modern market as an informational benefit of industrial purposes. Thus, we can talk about significant prospects for increasing the attention of both business structures and social institutions to the implementation of virtual reality technologies in their business processes in order to increase business efficiency and attract attention to innovative solutions.

1. Introduction
The concept of "virtual technology" has emerged in the economy recently. At present, virtual technologies represent a form of service reflected from a material object, namely [1]: they act as an economic resource, which is complex in nature, has lost its material form completely; they have extensive public zones of production and consumption; in the process of providing a creative individualized service online, the supplier and the consumer simultaneously participate; the production and consumption of this "virtual technology" may not coincide in time; it is directed on satisfaction of informative needs of economic agents in various branches and spheres of activity connected with development of business processes. [1-6]

2. Materials and Methods
The peculiarity of "virtual technologies" allows for a number of features to attribute them to atypical, unconventional methods. We believe that the grounds for this are the following:

- The result of virtual economic activity [7,13-15] is not embodied or embodied in documents that can be stored on tangible media. The reification of virtual methods in documentary, machine-readable forms, stored as paper copies and on machine-readable media, for example,
microfilms, makes them suitable for storage (in bibliographic, video, audio, film libraries and archives) and transportation (on media or by telecommunication means).

- In the process of consumption laid the possibility of storage and transportation by electronic means.
- Modern means of information and communication communication provide the opportunity to provide various virtual services without direct personal contact between the consumer and the manufacturer, i.e. in the "online" mode. This leads to a high degree of differentiation of virtual technologies due to the personification and individualization of demand for them, as well as the emergence of new, non-standard services;
- High speed of capital turnover in the process of production and virtual technologies gives advantages to business in this sphere and is a consequence of a short production cycle.
- The specificity of the organization of production of virtual technologies is that the suppliers of this type of services are mainly small and medium-sized enterprises of various profiles [8-14]. Their small size and high mobility provide ample opportunities for flexible response to changes in market conditions, which is very effective in the local market. [10-14]

In spite of the fact that virtual technologies retain all signs of non-productive activity, are directed to various objects of service [14-18] for the purpose of change of their condition or behavior, they differ from other services by a number of additional characteristics which follow from specificity of creation and rendering of this type of services.

Usually, the main sphere of creative activity of the individual (collective) is associated with significant intellectual capital [18] and with the realization of this capital in the form of intellectual products or in the form of spiritual values. The content of intellectual capital is determined by the specifics of its functions, namely [7-10]: the presence and progressive development of intellectual property; the formation of a creative type of thinking of employees and managers of the organization, which is formed and implemented by the main models of reproduction in each particular economic system and their totality; the predominant formation in this system of capital of the intellectual center, covering the entire set of assets of the organization.

Virtual technologies, in our opinion, should be considered as an economic resource. Usually an economic resource is understood as a "stock" of productive forces, which determines the process of production and all subsequent links of reproduction - "flow". The involvement of resources in economic turnover, their development turn resources into factors of production, into an active, active element of productive forces [5].

Virtual technologies have common features similar to other economic resources, and a number of features arising from their information specificity, which is reflected in the radical nature of their action on the growth of labor productivity and its efficiency.

We define the features of virtual methods as an information economic resource:

- unlimited and inapplicability are characterized by "rarity", namely the availability of this type of service to any number of users;
- inexhaustibility and rapid growth with the development of society. It can be concluded that in the process of using the virtual reality does not disappear, but remains. We note the growth of virtual technologies with the help of local application features and accumulated experience;
- the circulation of material goods in itself does not add wealth to peoples, the circulation of virtual technologies in itself increases the resource potential of society;
- virtual technologies act as a complementary resource in relation to traditional factors of production, can replace them to a large extent, reducing the relative and absolute requirements for material resources;
• the lack of self-reliance of virtual technologies as an economic resource, the inability to completely replace material and human resources represents a certain potential, manifested only when combined with other resources;
• it is complex in nature, i.e. their production and distribution requires support work and maintenance of a number of material components.

Thus, virtual technologies play a leading role as creative services in the development of the knowledge economy. It is necessary to state that the active impact of virtual technologies on service facilities is manifested with different degrees of inertia in different time intervals, because the effects of virtual technologies can be manifested both in the form of a primary specific impact on economic agents in a relatively short period of time, and in the form of negative or positive historical consequences caused by the process of producing virtual technologies.

3. Results and Discussions
Extensive public areas of production and consumption of virtual technologies are associated with the informatization of all business processes prevailing in such areas as business, science, health, higher professional education, financial activities.

Informatization of business processes has a number of features:
• information affects the efficiency of production without increasing the physical resources of traditional;
• information acts on the subjective factor of production-man, his character and abilities;
• information accelerates the reproduction process by reducing the periods of production and circulation [3].

Virtual methods are immaterial and uncertain in form and final content. Their individualization can lead to a multivariate multidimensional nature of its creation, provision and delivery to the end user.

It is necessary to note the different degree of demand for virtual technologies in the modern market, which is caused by the following condition: goods and services produced outside the effective demand are unclaimed by society. Consequently, a number of virtual technologies relevant to the social system are not transformed into the effective demand of modern markets. Such technologies include promising research for society with a long-term payback period exceeding the critical period of profitability of market investments. The only customer and buyer of such virtual technologies can be a society that has financed its future. Thus, the assessment of the use value of virtual technologies and their demand may change over time.

It is necessary to define virtual technologies as an information good for production purposes, which indirectly satisfies human needs, participating in the production process and influencing its result, thereby becoming a factor of production. Due to the fact that information goods are easily replicated (the cost of copying information is much less than the cost of its original creation), it can be argued that the more widespread the good, the lower the cost of each copy and at the same time higher its value to users.

The economic foundations of the information technology era are based on the fact that the value of information products derives from their multiplicity. The spread of information technologies brings a huge positive external effect for users who started using them earlier.

A characteristic point in the process of providing a virtual creative individualized technology is that in the "online" mode, the supplier and the consumer simultaneously participate. The introduction of the customer into the system of providing virtual technology allows him to monitor the work of the organization in real time and coordinate all actions: from the editing of the project to its provision. Without interactive contact, virtual technology cannot be effectively used or consumed.

In this case, the consumer should be considered as an active participant in the process of producing the necessary value for him, which will be influenced not by the size of the production assets of the organization, but by his internal ability to respond to the client's request.

As initiators of creation of virtual technologies can act:
customers and users of these technologies, who formulate their requirements for the quality of services online and have the opportunity to adjust their functional properties and parameters if necessary;

- internal intellectual potential, which is looking for a way out in the independent generation of new ideas, without which they simply can not exist. The degree of demand for these spontaneous types of virtual technologies can be determined by the market economy is very ambiguous, that is: the production and consumption of this technology may not coincide in time, which is caused by the intellectual nature of the studied service; the main specificity of virtual technology is its information and communication component. Virtual technology aims to meet the informative needs of the knowledge economy. We introduce the concept of "informative need", under which we will understand the need to obtain and process information of a certain orientation necessary to the consumer intangible means of production-specialized knowledge.

The availability of products using virtual technologies can become a unique trade offer, highlight the company on the market, will allow to build a non-price competitive strategy.

So virtual interactive textbooks are today the most interesting and promising trend in the education system.

Virtual technologies, as well as the use of augmented reality effects allow you to demonstrate the essence and content of abstract concepts in a new simple and understandable way, very clearly in relation to the visual image. It is difficult for a person to understand how different forces act on a moving object, how and why the chemical properties of a substance dictate a particular outcome of the reaction, how a flat drawing model looks in real life, the terrain schematically depicted on a map, how certain blocks of the scheme of information processes lead to the final result and why changing places will lead to a different result. All these factors can be easily, simply, clearly explained with the help of three-dimensional operating virtual models. This brings the learning process to a qualitatively new level. Of course, the presence of such educational and methodological developments bring educational companies to the position of innovative leadership in the industry.

Moreover, business companies can also effectively develop and apply virtual models to train staff, for example, regarding safety rules. It is not always advisable and in General it is possible to conduct frequent training of personnel behavior in emergency situations on the ground, this is due to the need for downtime, loss of time and money. In addition, employees understand that the danger is conditional and are skeptical about the need to break away from production tasks. All this reduces the effectiveness of training. And imagine if it is possible to work out different variants of fires, technical accidents and other situations on the virtual model of the enterprise. The model will allow each employee to feel the seriousness of the situation and personally make decisions. At the same time, no one will suffer, even if the original decisions are wrong. Also, virtual reality has serious prospects from the standpoint of training new employees.

However, in the market it is impossible to see serious offers of textbooks with virtual and augmented reality, there are only prototypes, fragments, concepts. What is the reason for the inactive use of technology in education? There are several. First of all, of course, the lack of sufficient experience, the difficulty of understanding the methodology of developing these products from the main manufacturers of textbooks-authors and publishers. The authors of textbooks are used to think with text, exercises, abstract concepts. We have already learned to pay attention to testing, video content, competence approach. But to come up with a virtual world or a limited part of it, to register the plots of situations in different variations and the like under the power of units. There is a strong personnel shortage in this area.

Also, developers are stopped by the high cost of creating a textbook in combination with a limited solvent demand for educational services. Because of the need to attract a large number of highly qualified specialists, the cost is really significant. However, the development of technology over time will ease the severity of this issue. Virtual models are also easily scaled and transformable.
That is, once developed model of industrial, public, office building can be used repeatedly in different combinations.

Well, there is a nuance associated with a more complex use of the virtual textbook, the need for additional equipment — glasses, joysticks, platforms to simulate movement. However, these difficulties will eventually be overcome. Already now on the market there are economical options for equipment.

Interregional public organization "League of University Professors" within the framework of the project national Institute of higher school development conducts research and development in the field of application of virtual technologies in education. There are already first results. This area is considered the most promising and will be actively developed at the present time.

Another striking example of virtual models are BIM (Building Information Modeling) technologies, which are understood as the development and optimization of a digital model of a building or infrastructure object, including elements of engineering support and transport systems.

Information modeling of the building, as an independent direction, appeared in the 1970s and very soon became a widespread approach to the design, construction, operation of the building at all stages of the life cycle. Given the fact that we are talking about all stages of the life cycle of the structure (object) that is relevant is the combination of BIM technology with PLM (Product Lifecycle Management) systems, which allow for combining, in fact, two separate approaches to the creation of digital models, to integrated technology, ensuring minimization of costs, primarily to maintain the infrastructure in working condition.

It is from the possibility of minimizing the cost of maintaining infrastructure, primarily transport, as it may not seem strange, will largely depend on the depth of the economic crisis and the prospects for an early exit from it or their absence. The crisis into which various States will plunge with the changes that are currently observed in the world economy. It is obvious that China, for example, will have to bear much more significant unit costs for maintaining its highways, airports, high-speed Railways in working order than, for example, Angola, with all the inaccuracy of such a comparison from a formally scientific point of view, of course. As a result, the share of the national budget that the two States will be able to allocate to the development of the new, and not to maintain the existing will be, in percentage, different. And not in favor of China.

The solution of this problem, the relevance of which has a steady tendency to increase, is impossible without a flexible approach to its solution through the use of an integrated version of various modern information technologies.

The optimal approach is to work with both BIM-technologies and PLM systems, based on the use of modern achievements of discrete mathematics, the best way to formalize in the form of graph-theoretic structures specific problems from different subject areas for further work with them.

Given the impossibility of obtaining an optimal solution to problems of super-large dimension in any other way, except by a complete search of all solutions to identify the optimal, which is unacceptable from the point of view of practical use, it makes sense to refer to the developments obtained by scientists in the USSR since the 1960s in the field of discrete mathematics, and based on its tools related disciplines.

Useful in solving practical problems of BIM technologies in conjunction with PLM systems is the use of approaches of characterization analysis [8], based on obtaining the optimal solution of the problem without actually iterating over the options for its solution. This approach is based on the calculation of the so-called forbidden figures available in the model A corresponding to the current state of the system under consideration when converting it to the model B corresponding to the type of system that meets the optimal solution of the problem.

4. Conclusion

Summarize, we can talk about significant prospects for increasing the attention of both business structures and social institutions to the introduction of virtual reality technology in their business processes in order to increase the efficiency of activities and attract attention to innovative solutions.
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