Word Frequency Data Analysis in Virtual Reality Technology Industrialization

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Abstract: Virtual reality technology is increasingly in demand for economic, social and management applications, with Moore's Law gradually failing, it’s difficult to balance the relationship between realistic needs and advanced technology by relying solely on technological progress, and even falling into the "IT black hole", hindering the industrialisation of virtual reality technology. This paper uses word frequency analysis to extract the four most frequently occurring keywords from current policies, literature and other secondary sources, and abstracts them into four social support concepts: conceptual awareness, education, regulation and finance, to explore the inner connection between virtual reality technology and social support systems through comparison, and to realize the socialization of virtual reality from the perspective of virtual reality. By comparing and exploring the intrinsic links between virtual reality technology and social support systems, the socialization of virtual reality technology is realized from the perspective of virtual reality, thus realizing the socialization of technology.

Keywords: Virtual reality technology; IT black hole; Technology socialization; Social support system.

1. Introduction
It is generally recognized that virtual reality technology derived from the western developed countries in the 1990s. This technology is socialized and commercialized to gradually set up a relevant industrial system. Wang Tongyu, Peng Yuetao et al put forward that its application present immense potential in many fields, such as industrial simulation, urban planning and architectural design, real estate advertising, game engine and network animation, science and technology museum digitization, entertainment industry, virtual studio, etc[1]. Huang Zhan et al further came up with the application mode of simulation technology in decision support. They hold that the computer simulation model can be employed to analyze the government tax rate, innovation return rate, R&D cycle, social network, R&D investment ratio and other factors by constructing "artificial social model" and simulation description of enterprise's technological innovations, so that affect the technical innovation in the overall software industry cluster, thus providing decision support for science and technology policy making[2].

The essence of artificial social model lies in the degree of socialization of technology, that is, to what extent virtual reality technology can reproduce and predict the future social scenario. It is not only a technical problem, but also a social model and consciousness issue. As the "made in china 2025"[3] initiative ushering in the critical stage, it is of great practical significance to further optimize the industrial development environment by reflecting on the problems that may be faced in the socialization of virtual reality technology, with reference to Soros' reveal and criticism on the phenomenon of "IT black hole"
Moores' Law is not a strictly scientific definition. It is indeed a description by Gordon Moore, co-founder of Intel, of how the "technology-triggered technology" phenomenon manifests itself in IT applications. In 1965, Moore published a paper in the journal Electronics, predicting that the quantity of transistors on semiconductors and the overall performance of the chip will double every two years. Hence, the so-called Moores' Law was formulated. In the past 5 decades, it has been found that the relation between the development speed of information technology and the improvement of its application is consistent with this law. Nevertheless, with the depletion of 3D chips and other technologies, it implies that Moores' Law is about to wipe out from the stage of history.

At the social level, the elimination of Moores' Law directly cause that information technology application will no longer be driven by technology advancement, thus the cost problem will become prominent. As the famous Western economist Robert Soro put it—"Computers are everywhere but not in productivity statistics." (1987) In other words, various sectors in the society have invested a great deal of resources in informationization, while it is hard to calculate how much productivity can be raised by informatization to organizations. This is the so-called "IT black hole" issue. According to statistics, American companies invested $100 billion in IT technology in the 1980s, including $800 billion in services. Despite the immense investment, the productivity of white-collar remained basically unchanged for 10 years[4]. A multitude of companies feel like their money is falling into a "black hole". Over the years, the application of immersive interactive technology in China presented dramatic momentum, yet there are various problems, which are mainly manifested in the following three regards. First, in comparison with the development of advanced manufacturing industry abroad, the overall level of modeling algorithm method is relatively low, with much poor repeated projects. Taking industrial design as an example, virtual simulation technology is widely used in the pillar manufacturing industry, such as foundry, automobile, ship and aviation. However, the existing modeling technology in China still largely adopt foreign simulation models and mature algorithms, with lower proportion of homemade core algorithms. Second, lack of independent intellectual property of domestic software platform, R&D costs remain high. In some sophisticated high-tech fields, foreign enterprises have formed standardized and fuzzy core products, constituting international monopoly. For instance, the NI company in the United States is currently the largest supplier of virtual instruments worldwide, the British company Spirent is one of the giants in the field of RF simulation testing[5]. On the contrary, most of the research direction of virtual reality is still in the laboratory stage, whereas they are much the same. Third, the gap between "production-university-research" need to be remedied. Cooperative education is the best way to cultivate innovative and practical talents [6]. However, immersive interactive learning in most universities is only in the initial stage of assisted teaching, ignoring the opportunity to transform technical resources into scientific research projects and social practices.

Virtual reality technology as a typical representative of a next-generation information technology, to lead a new round of technological and industrial change. Its social application and development level symbolizes the socialization degree of a technology, as well as the level of social informatization and even social development. Compared with traditional information technology, the advantage of virtual reality technology lies in its highly simulated social scenarios, which reproduce and predict the present and future situation in social management. As a technology that requires to be socialized, its development is inseparable from the social support system, including ideology, education, supervision, finance and so on.

2. Conceptual Awareness Support System for the Socialization of Virtual Reality Technology

Marxism advocates that social existence determines social consciousness, which at the same time reacts on social existence. Our country is in the crucial period of social structure and economic structure transformation, facing the complex and changeable social environment and contradictions, people's ideology, awareness, value have been challenged by various factors. As a social existence, virtual reality technology is bound to be influenced by certain conceptual awareness. It gives birth to plenty of related consciousness, when under the constraints and influence of some ideological trends, values[7]. Therefore, the consciousness support system of virtual reality technology is based on the interaction between social existence and social consciousness. By changing people's conceptual awareness,
establishing scientific development consciousness and realizing traditional concept transformation, it may satisfy the development needs of virtual reality technology and support its socialization progress. Specifically, the conceptual awareness support system of virtual reality technology mainly includes system idea, innovation idea and so on. First of all, the so-called system concept refers to the systematic way of thinking to understand virtual reality technology, and to apply this comprehension to the social development of virtual reality technology. Through systematic thinking mode and method, the social attribute of virtual reality technology is clarified, and the relationship between the logic of technology development and social demands is handled well, thus laying a solid epistemological foundation for the socialized development of technology. Secondly, guiding virtual reality technology out of the laboratory, realizing the industrialization and socialization of technology call for the support of innovative ideas. The innovation of social concept needs to be on the basis of combining technology application and management change, so as to recognize the significance and urgency of virtual reality technology. By setting up new ideas, building new laws and regulations, creating a new situation, taking virtual reality technology as a strategic resource, connecting with modernization construction, changing the operation mechanism of technology, and activating the potential of industrial development, the organic interaction between informatization and industrialization and modernization can be realized.

3. Educational Support System for Socialization of Virtual Reality Technology

Educational support system is a necessary condition for virtual reality technology to realize sustainable development. By cultivating a large number of talents, it can promote the progress of virtual reality in various related fields and promote the social application of virtual reality technology. In the 13th Five-Year Plan, China explicitly proposed to strengthen "holographic display, virtual reality, big data cognitive analysis......and other new technology foundation research and frontier layout"[8]. This proposal puts forward the concrete request to train the high-quality talents with specialized theory and practice [9]. Furthermore, it is pointed out that the education system can play an active role in promoting the social identity of virtual reality, public propaganda and education. The education system may support the development of virtual reality technology from three aspects: establishing virtual reality talent mechanism, cultivating reserve talents and popularizing virtual reality knowledge for all citizens. Specifically, the education system should train three types of people to further develop virtual reality technology. The first is to cultivate professionals engaged in virtual reality technology and system development. It is the foundation of realizing the localization of virtual reality technology and mastering the core technology. The second is to train talents who undertake project construction, which is the basis for expanding the application field of virtual reality technology and realizing large-scale technology applications. Third, it is to develop macro-management talents for relevant policy formulation, project planning and management. The intensive application and social development of virtual reality technology need a group of complex talents who grasp both technology and management. As the key hub of technology socialization, the training of compound talents is the urgent task of advancing virtual reality technology.

4. Legal Support System for Socialization of Virtual Reality Technology

The legal support system bears the dual function of standardizing technology application and protecting technology development [10]. The legal support system of virtual reality technology is rich in connotation, mainly involves related high-tech identification, intellectual property protection, virtual reality standards and technical specifications, etc. Among them, the policies and regulations relevant to tech identification largely refer to the policy tools directly related to technology research and development. This is the administrative means to guide the socialization of technology and support the industry development. At present, the departments involved in the application and development of high-tech related to virtual reality in China basically include the Ministry of Science, Ministry of Finance, State Administration of Taxation and local identification and management of high-tech enterprises. It should be noted that part of the work of these bodies also involves intellectual property protection. In recent years, as the virtual reality technology is gradually utilized in game, medicine, manufacturing, education and other industries, some enterprises lacking of the awareness of intellectual property protection suffer from technology piracy and imitation. In response, the State Council issued a series of
opinions on accelerating the construction of a strong intellectual property country in this context, and put forward the requirement of "strengthening intellectual property protection in emerging business forms and innovative achievements."[11], combine the requirements of anti-unfair competition law, patent law and trademark law and other laws and regulations, to further clarify the relevant rights and interests of enterprise organizations, so that encourage and protect fair competition and forbid unreasonable contend. It is one of the core tasks of the regulatory support system. The protection of intellectual property rights should also promote technology exchange and compatibility, as one of the main purposes of implementing the standard technical specification of virtual reality. Over the years, Ministry of Information Industry and other departments have launched "Guidance on Speeding up the Development of Virtual Reality Industry (2018)"," Virtual Reality Standardization White Paper (2019)"
[12] and other policy standards. These are remarkable outcome of the regulatory support system.

5. Public Finance Support System for Socialization of Virtual Reality Technology

The socialized application and development of technology cannot be separated from the promotion of financial factors, especially in China's strategic policy of industrialization-driven information development, the role of financial support system is more prominent. The financial system helps to boost the virtual reality technology through various functions. First of all, the finance system provides financial guarantee for the research of virtual reality technology. The research funds, instruments and equipment, experimental materials and the living conditions of the researchers shall be ensured financially. In particular, virtual reality technology research, require a multitude of manpower and sophisticated equipment, it is almost impossible to carry out without immense investment. In modern society, scientific research and development are possible only if the funds are guaranteed. Secondly, the financial system not only supports the research of virtual reality technology in the amount of funds, but also back up the application and development of virtual reality technology from the input "quality". For instance, the national public finance system could subsidize infrastructure construction in backward areas through transfers; the social finance system could expand the diversified financing channels and attract the social capital to invest in the virtual reality technology; the financial system can also realize the successful completion of virtual reality system project and bring into full play the actual benefit through the diversified operation mode. Specifically, through subsidies from the state public finance system, social capital from the social finance system, the implementation of project outsourcing management, and the implementation of return evaluation, the financial system is capable of achieving the social support for the application and development of virtual reality technology.

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