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Original Article

Interior Design Innovation Ability with Artificial Intelligence and Virtual Reality Technology

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Abstract - In today's world, artificial intelligence has a very high development potential in the field of interior design. It can be said that future development is inseparable from the addition of artificial intelligence. At the same time, VR virtual reality technology is becoming increasingly widespread in architectural interior design. It changes the traditional methods and concepts of interior design. This article discusses how to enhance the innovation and attractiveness of the interior design industry and stimulate more consumption potential of interior design under the background of artificial intelligence and VR technology. The research of this paper is based on the development status of the decoration industry in Guangdong Province, making full use of artificial intelligence technology to design and construct effective customer preference data. Based on the data supports the creative inspiration of the design. The research results of this paper show that in the process of art design, we should combine the user's preference data to mine design innovation points. Only by in-depth research on dimensional visualization, classifying the source of inspiration, and providing a theoretical basis for design can the inspiration for artistic design innovation be stimulated.

Keywords - Artificial Intelligence, VR, Interior Design, Innovation Ability.

1. Introduction

Today, with the rapid development of the Internet economy, traditional design concepts have been hit and challenged unprecedentedly. The interior design industry is also facing a new research and development stage that must change from perceptual intelligence to active application intelligence. The industry background of traditional interior design and digitization and technological transformation has put forward higher requirements for big data collection and design management of interior enterprises. In recent years, big data and artificial intelligence have promoted independent innovation of enterprises. However, dealing with the innovation and transformation requirements of interior design in the era of big data and artificial intelligence has become a major challenge for the development of the industry. From a disciplinary point of view, artificial intelligence is a part of science and a comprehensive interdisciplinary subject, which includes computer technology, visual technology, auditory technology, mathematics, linguistics, etc. With the development of technology, artificial intelligence has achieved amazing development—the end of the 20th century. In practical applications, artificial intelligence can be combined with big data analysis technology to reason about different problems through data mining, data collection and extraction of effective data. Users formulate corresponding plans and finally come to corresponding decisions with a high degree of humanization and high accuracy.

VR is the abbreviation of Virtual Reality in English, that is, virtual reality, which is mainly an interactive three-dimensional environment technology generated on a computer using a computer graphics system and various control interface devices. With the development of technology and the Internet, VR technology has been widely used in urban planning, interior decoration, product development, cultural relic restoration, real estate sales, tourism teaching and many other fields, becoming one of the three key technologies of urban planning. 21st century. It influences the method of architectural design with its typical characteristics. The use of big data and VR data has greatly promoted the development of indoor information models, driving the development of virtual reality technology and architectural interior design applications.

Interior design is a relatively comprehensive subject, including psychology and design aesthetics. At present, interior design companies at home and abroad have begun integrating interior design into personal intelligent custom design services. Combining interior design with artificial intelligence and selecting design solutions based on customer big data management information is a problem that must be faced. For interior design companies, collecting customer data in the early stage, generating design inspiration, and creating design sketches are still limited to traditional design mode. The demand information generated by big data cannot be directly connected with the design data. Early design inefficiencies, lack of inspiration, and inability to incorporate customer preference data into designs are major weaknesses in the current interior design innovation process. Under the rapidly developing Internet economic environment, new design and management models emerge in an endless stream. In the new era, how to use new technologies to assist the innovative production of interior design and export design products with commercial value is a major problem that needs to be solved in the current research on interior design innovation.

This paper mainly expounds on the relationship between interior design innovation under the background of artificial intelligence and VR technology, combines real and effective customer preference data to customize and activate the creative source of interior designers, and provides a theoretical basis for design through in-depth research on form and dimension visualization. According to the obtained user survey data and demand analysis report, determine the design value positioning target, determine the functional structure of the design, and explore the path to improve the innovation ability of interior design through the design practice process.

Yin (2021) expounded on the transformation process from smart technology to smart aesthetics and analyzed the importance of smart technology to design and development. Chen (2021) analyzed the core direction of art design under the background of artificial intelligence. Lai (2013; 2022) and Li (2019) focus on using new technologies to improve innovative designs that adapt to social development. Han (2020) conducted research on the application of BIM technology in modern interior decoration design. With the popularization of the 5G era, the development of the contemporary design industry needs the help of artificial intelligence and virtual reality technology, especially interior design. Only by combining intelligent technology can the design industry innovate and develop. Xu and Wang (2018); Sun and Zhi (2018); Sun (2018). In order to maintain a sense of freshness in interior design, an important means is innovative thinking, combined with important characteristics of the times, emphasizing the importance of design research methods, especially emphasizing that design must be user-centred in order to ensure innovation (Wang, 2015; Zhao, 2008; Wang, 2010; Lai and Zainal, 2015; Liu, 2017; Lai and Lim, 2019; Lai and Tong, 2021; Lai, 2013: 2020: 2022). Therefore, an innovative approach to interior design is an important factor studied in this paper.

2. Case Study

The intelligentization of interior design is inseparable from the application of intelligent software. The intelligentization of hiccup design is completed based on smart home, which is formed by integrating big data, the Internet and many other foundations. The system adds functions such as Internet automation based on the

furniture of the original residence. Smart interior design not only combines technological innovation but also realizes the standardization and programming of technology. With the integration and development of artificial intelligence and interior design, efficient and convenient tools have been brought to the design, and the interior space also has the beauty endowed by technology. Therefore, interior design should better apply artificial intelligence to space planning and design to achieve better interaction effects.

2.1. Artificial Intelligence Leads Design Innovation

After entering the Internet information age, with the globalization of the market economy and the continuous development of information technology, we understand that among the current successful mass interior brands, the right to define interior fashion trends is gradually shifting from the trendsetter to China. Artificial intelligence technology will play a very important role in the innovative development of interior design (Li, 2019; Lai and Tong, 2021). The birthplace of fashion has the aesthetic level and consumer demand of the public. Art innovation driven by artificial intelligence is conducive to the development and creation of society, Hu (2019). Now China's economic level has been improved in the process of global integration. In the stage of grasping the actual trend of fashion and effective product design, understanding the product design elements and design rules of fashion trends, the research on the influence of artificial intelligence on interaction design is subtle, Qin (2017). How enterprises fit information is a breakthrough in interior design innovation, a fast and accurate entry point to communicate with the product.

2.2. Intelligent Design Method

Under the environment of artificial intelligence and big data, the personalized service of interior design can be summarized into two service directions: intelligent auxiliary design and intelligent matching design, which is also the aspect that interior designers are trying to innovate at this stage. Big data + Internet + intelligence will become the mainstream of the design industry in the future (Hao and Qin, 2016; Lai, 2022).

The intelligent assistant design allows customers to freely choose interior decoration materials, interior decoration styles and colors according to their own preferences, and then the designer completes the interior design. Customers can dress partially or as a whole during the design process according to their preferences. For example, interior design software companies such as Sanweijia and Kujiale in Guangdong customize customer data in real time from the Internet. Their design software includes VR immersive experience content, and customers can use VR equipment as if entering the design. The industry of big interaction design in the era of big data is the main form of the future design industry, Qin (2015). At home, feel the home's decoration style and furniture style in advance. These design companies will also establish a database of customers' personal itineraries and preferences and realize remote online data collection. All data from indoor product orders, raw material selection, and on-site construction to final product delivery have been connected.

Smart collocation design is one of the consumers' most convenient and quick design methods. Aesthetic consciousness has a very important impact on artificial intelligence and innovative design, Qin (2019). The main purpose is to allow customers to find their favorite fashion clothing with the help of a virtual matching function. With the help of artificial intelligence simulation technology and big data matching body shape characteristics, customers only need to add their favorite clothes on the shopping platform to try them on and get the best matching style recommendation.

3. Experiment

3.1. Experiment Purpose

An in-depth understanding of users and creating products that allow users to enjoy the experience are important ways to succeed in interior decoration design. Therefore, appropriate research should be done on the design before building the system. On the basis of a preliminary understanding of system-related theoretical

construction, and the basis of inquiries and research by relevant personnel, it is first necessary to conduct research on target users and formulate research content.

3.2. Sources of Experimental Data The Main Sources of Questionnaire Collection Are:

The staff of the design department of Guangzhou Urban Design Company, the registered art designers of the home improvement website, the post-bar of the cool design forum, and the students majoring in interior design, etc., mainly existing staff, provide free professional talents and students to collaborate and distribute online and offline surveys. 100 questionnaires were collected from online interior designers through Questionnaire Star to ensure that each respondent can complete the questionnaire seriously and with high quality.

3.3. Experimental Implementation

The questionnaire survey of interior designers is carried out in the form of interviews with the purpose of obtaining more useful information. The questions raised mainly come from the characteristics of the designer himself, the classification and status of the works, the extraction of auxiliary tools, etc.

4. Discussion

4.1. Analysis of Questionnaire Survey Results

4.1.1. Feature Information Extraction of Works

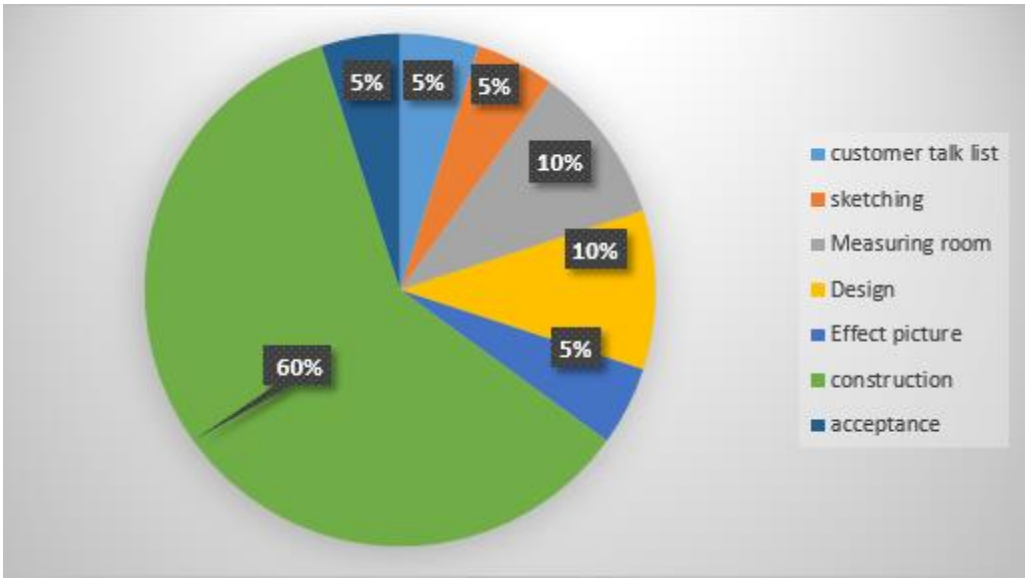

Fig. 1 Time distribution table for interior design projects

The results of the survey on the most time-consuming link in the interior design process are shown in Fig. 1 It can be seen from the picture that during the interior design process, the designer spent a lot of time on the preparation work. However, the preparatory work also took a lot of time and promoted the smooth development of the later design work.

When designing interior decoration, designers are most inspired by home improvement exhibitions and popular design websites, followed by the interpretation of popular trends. It can be seen that interior designers often design interiors based on what they observe. In the context of the era of artificial intelligence, technological innovation helps designers absorb creative inspiration faster.

4.1.2. Design Requirement Information Extraction

In the interior design process, the survey results of designers wishing to use big data software to provide design assistance are shown in Figure 2. It can be seen from Figure 2 that 53.8% of the respondents hope to improve the design scheme through such auxiliary tools. As an aid to VR, sketches and colors, 30.8% of the voters hope to connect with direct customer needs through this function, which means that the design ideas of interior designers need the assistance of tools.

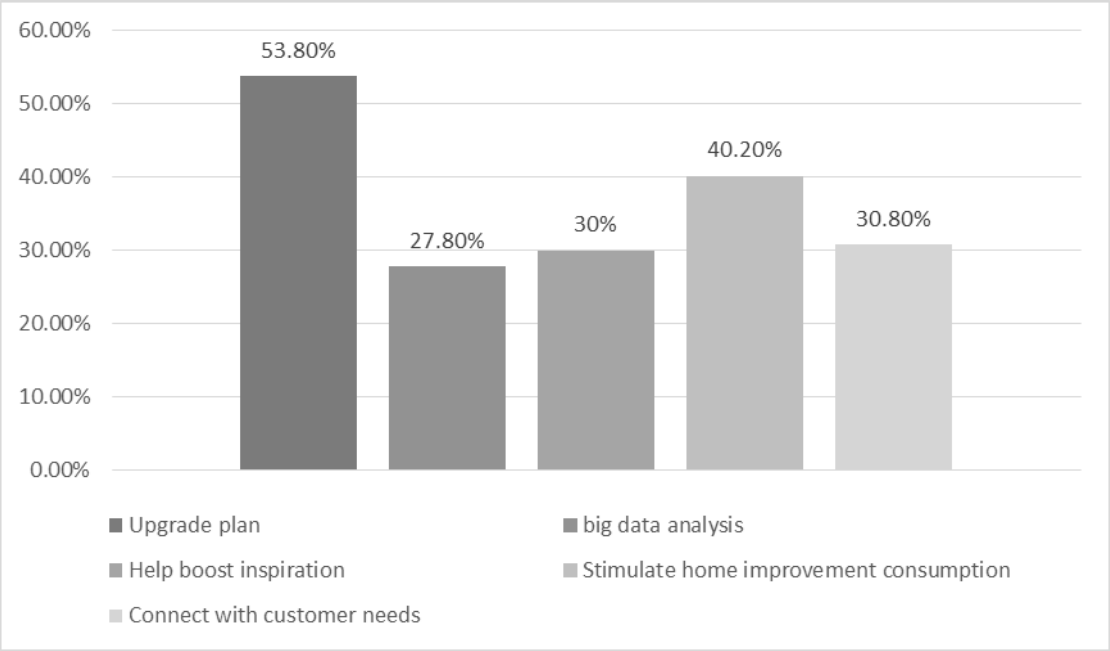

Fig. 2 Survey of needs for using VR software

4.2. Discussion on Artificial Intelligence and VR Technology

Artificial intelligence is very important for interior design. It is a new technology science integrating simulation research, virtual technology and big data analysis. The transformation and development of information and interaction design under the background of big data is a breakthrough in design innovation (Chen and Lu, 2015; Lai and Tong, 2021). The close combination of interior design and artificial intelligence is an inevitable outcome of the era of Internet big data. Now the use of VR technology and artificial intelligence software has run through the finishing and design process. From client negotiation to proposal formulation and modification to construction, VR and artificial intelligence technology are increasingly becoming important technology.

Building materials are the basis of interior design, and modern design has achieved a new leap through artificial intelligence and VR technology. Technology will focus on home improvement design, especially in the traditional design industry (Lu, 2017; Liu and Lai, 2023). Innovations in materials and technologies have always been the subject of interior design research. Through big data analysis, resources are integrated, an interior decoration database is established, and interior decoration materials are associated with major material brands. Quantum thinking is very important to interaction design in the context of artificial intelligence, big data and the Internet of Things, Qin (2018). Good business cycle. Using VR technology, more similar materials and interior structures required for interior design are displayed very intuitively, effectively controlling the waste of building materials and promoting the sound development of the interior design.

VR technology is mainly based on the realization of artificial intelligence programs. The hardware mainly includes display devices such as computers, trackers, sensor gloves, stereo systems, and glasses vision systems. The art of virtual reality will continuously enhance the form of design innovation (Gang, 2008; Pan and Lai, 2023). These devices allow customers to enter an immersive experience. Bring new visual, auditory and tactile experiences, respectively. It has injected new impetus into the creative inspiration of designers.

In the application of virtual technology, VR technology has many advantages. It can reflect and create real indoor situations and visualize indoor furniture, which is unimaginable compared with decades ago, all of which benefit from the development and application of artificial intelligence technology and visualization technology. The application also allows home decoration designers to think better about the design direction. VR technology can allow owners and designers to have a good collision of thinking and strive to achieve a satisfactory design effect for both parties. VR technology plays a very important role in design (Wei and Liu, 2016; Wang and Lai, 2023; Liu and Lai, 2023). This also greatly improves design efficiency. Virtual reality technology can use the computing and image processing capabilities of computers to provide users with tactile, visual and auditory effects of real objects. VR technology is beneficial to show the traditional design a new design style (Wang, 2014; Pan and Lai, 2023). Virtual reality technology can reproduce both the real world and the virtual world. For complex structural construction calculations and schemes, virtual reality technology can be used to establish three-dimensional models of mechanical equipment, surrounding scenes, and structural components, and virtual assembly of the models can be performed to modify the scheme in the visualized environment through human-computer interaction. VR technology will continue to develop and innovate, rapidly changing the design industry around it (Li, 2014; Liu and Lai, 2023). The design concept and the owner's expectations for future home decoration can be virtualized using virtual technology. The impact on the real environment after completion can be investigated—impact, and to evaluate and improve the programme.

4.2.1. Adaptive Fusion Docking

China's interior design is changing with each passing day in the country's economic development. At first, it was a branch of the art design of interior designers. Interior designers use hand-drawn designs. 90 years later, with the addition of computer technology, people began to use software such as CAD 3D, but this software is still built on a two-dimensional plane. Now in the context of artificial intelligence, with the use of VR technology, these technologies continue to innovate to replace the traditional design dark rod, display the design concept in the three-dimensional world, use VR technology to simulate and deepen the design, present the design creativity and results to the customer advance, improve the design efficiency to a certain extent, expand the design the trainer's thinking. With the rapid development of virtual VR technology, virtual VR technology is gradually replacing traditional design methods, making full use of virtual VR technology, artificial intelligence, big data and other technologies to allow users to experience the reality of virtual space to the greatest extent and enhance user experience participation.

In the utilization of big data, the established data resources should be dynamically connected with customer needs as much as possible to ensure the level of data sharing and business openness fully. From artificial intelligence to big data and cloud computing, interior design is also developing from point to surface, from the whole to the overall layout. Internet terminals must be closely integrated with interior design concepts so that the interior design can be closer to the public. Sharing technology with users is the performance of focusing on brand building. For example, there were many portal websites in the past, but they declined because they neglected to share innovations in technical solutions with users. Now eliminated by the market. The same is true for the interior industry, which needs to integrate artificial intelligence and big data, which are innovative and reflect the characteristics of new technologies of the times, to meet the needs of consumers.

4.2.2. The Imagination of VR Technology

The main purpose of interior design is to meet people's home-use needs. There is a very large relationship between the information dimension and interaction design, Qin (2018). While satisfying people's daily life, it also satisfies people's inner spiritual world and aesthetics, combining artificial intelligence technology with the actual psychological needs of users. Combined, the disadvantages of traditional designs are reduced. Minimize the psychological gap between designers and customers, objectively and truly reflect material and spiritual pursuits, and realize the completion of interior design schemes under the background of artificial intelligence. Therefore, under the influence of artificial intelligence, interior design can no longer be dominated by traditional design thinking. The analysis, research and application of VR technology will be popularized rapidly (Fu, 2008; Wang and Lai, 2023). In terms of design innovation, we should break the shackles of thinking, integrate rational thinking and perceptual thinking, and combine science and art. Design thinking is integrated into the interior. In terms of design, the interior design meets customers' needs and fully reflects the design's innovation, culture and modernity.

VR technology can not only present the real world virtually but also create an imagined world. Designers can use this technology to expand their imagination and germinate their own ideas fully. Open data artificial intelligence is based on open data sharing, connecting people, people and machines, machines and power input and output for efficient dialogue. Integrating intelligent design into interior design concepts means that more cross-group needs can be quickly connected to software and hardware terminals. An Internet company in Guangdong designed a VR display app, allowing customers to experience 360-degree virtual reality display effects and a 2-hour quick production customization process. The practice of this business idea shows that when multiple AI systems jointly decide on an outcome, AI technologies can avoid mutual interference. Big data sharing needs to optimize collecting different social, consumption, and graphic information to achieve efficient output. This can be learned from Tencent's social information, and Alibaba has launched an online consumption system. Suppose all merchants are unwilling to open data sharing, whether it is in the field of clothing or other application fields. In that case, it will not be easy to integrate the products of the times into people's lives and design interior designs suitable for various users.

The application of virtual reality technology in architectural design has six advantages. It can embody and create a virtual world, visualize the architectural design, and help architects better verify the design's feasibility and correctness. Virtual reality technology can enable owners and designers to communicate well, enabling people to conduct comprehensive and dynamic inspections of buildings in a virtual three-dimensional space environment. Virtual reality technology can use the computing and image processing capabilities of computers to provide users with tactile, visual and auditory effects of real objects. Virtual reality technology can reproduce both the real world and the virtual world. For complex structural construction calculations and schemes, virtual reality technology can be used to establish three-dimensional models of mechanical equipment, surrounding scenes, and structural components, and virtual assembly of the models can be performed to modify the scheme in the visualized environment through human-computer interaction. The theory and practice of innovation is an eternal subject that requires continuous development (Yan Ping, Zhang Wei, Wang, 2014; Lai and Tong, 2021; Lai, 2022; Pan and Lai, 2023). Virtual reality technology can present architectural planning and design schemes in a virtual way in the real environment. The impact on the real environment, and then evaluate and improve the program.

4.2.3. Immersive Features of VR Technology

The characteristic of being on the scene is that customers have an immersive experience and have a strong sense of substitution for the designer's plan. In VR technology, designers can conceive the virtual production and education of design, allowing customers to break the original two-dimensional plane and enter a new three-dimensional world. The possibility of real experience design and the effect designers want to express greatly

expanded design experience. You can experience the pros and cons of the design firsthand. At the same time, designers and customers can communicate more closely through this system. After breaking through the effect of the two-dimensional plane, customers can be substituted into a brand-new perceptual environment. In a virtual environment, it brings a very real sense of experience. This also greatly improves the designer's innovative ideas. The purpose of innovative interior design is always to return to making the human body comfortable, pleasant and beautiful to wear. The intelligent display of design works is a key step in the design.

4.2.4. Intelligent Interaction

VR technology has strong interactivity, and interactive technology that combines virtual technology with reality is a major feature of VR technology. VR technology can be displayed on a computer through various sensors in this new technology. Generate and synthesize various view sequences through graphics and image processing technology, construct a 3D model for simulation, and then achieve the purpose of direct interaction through VR equipment. Human-computer interaction is a fundamental premise of artificial intelligence. It is very engaging and interactive. The design scheme can also be optimized according to the needs of users. Among them, the sense of participation is the most important feature of VR. Users can actively and intuitively treat virtual environments as real environments, carry out space layout, lighting adjustment, and decoration material selection according to their own needs, and actively participate in the design in real time, saving complicated design work. During the design process and after the user completes the above steps, the designer can make adjustments according to the customer's needs to achieve the original intention of a people-oriented design.

Through the application of VR technology, customers can wear relevant experience equipment to interact with the virtual space designed by designers and feel the design sense of their own home decoration in advance. Design ethics in the information age is very important and will affect the continuous development of the design industry. According to (Wu, 2012; Lai and Zainal, 2015; Lai, 2022), the risk of dissatisfaction greatly improves the success rate and design quality of home decoration design, improves the design level, and makes designers pay more attention to the design itself. The importance of this has greatly stimulated the development of the design industry. After wearing the relevant equipment, customers seem to be in a virtual scene, immersive, touchable, watchable and listenable. As far as the specific performance of the interactive characteristics of VR technology in architectural interior design is concerned, it is mainly to realize the effect of human-computer interaction. Innovation research is related to the background of industry development and will greatly promote the development of the design. Liu (2015) found an interactive relationship between people and the indoor virtual space of buildings. People's feelings can be transmitted to the virtual space in time through related equipment, just as people's touching, watching, hands-on and other actions can be presented in the virtual space. Can feel the dynamics of objects from virtual space. At the same time, inputting customers' preferences and living habits into big data for analysis can better analyze customers' home improvement needs. Of course, analysing big data software must also ensure the data security and consumer privacy required by artificial intelligence.

5. Conclusion

Throughout the development trend of interior design, the transformation of interior design is mainly in the design mode and design concept. Relying on the change of design expression, interior design needs to integrate and develop with a diversified system. The root of design is to help designers understand the needs of consumers, understand the industry's development prospects, inherit the experience summed up in practice by the predecessors, and stand on the shoulders of giants to see the world. With the continuous development of the times, interior design in the era of big data also needs to keep pace with the times. Science and technology in the field of art complement each other with the development of the times. Many domestic and foreign designs in history are the performance of masters. All their works are worth learning from, providing a clear idea for our design innovation. Designers are responsible for the inheritance and development of social aesthetics. Every work

of the designer is not just a simple creation but also contains multiple meanings. To grow into an excellent interior art designer, one must have profound design skills, a strong sense of responsibility and the ability to solve problems. The needs of designers form a good sense of innovation and social responsibility.

Under artificial intelligence and VR technology background, interior design has ushered in new opportunities and challenges. Traditional design forms have been greatly impacted but have also brought new opportunities. The interior decoration industry must be good at making good use of the situation and actively transform in the era of artificial intelligence and big data. In the contemporary era of intelligentization and popularization, interior design has broad development prospects and broad space. In short, in the near future, with the rapid development of science and technology, the cost of virtual reality systems will be lower and lower, and the simulation effect will be better and better. It is believed that VR technology can be better applied not only in the field of architectural interior design but also in other industries in society and is favored by the world. At present, interior design enterprises will continue to change and develop new management models. In the next period of time, the tools of innovative interior design will be gradually popularized and updated, and the improvement of designers' innovative ability will be more effective, making interior design innovation a new fashion trend.

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