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A Study on the Integration of Experiential Teaching in Marketing Education within Vocational Colleges: Pedagogical Strategies and Practical Pathways

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Abstract: ***With the development of social economy, the population of cities is increasing, and there are also more and more problems in urban planning, construction, management, and other aspects. At the same time, the new generation of big data information and communication technology is continuously developing and improving, and gradually integrating with various levels of society. Big data visualization technology is also widely used in the practical work of urban planning industry.***

Keywords: Big data visualization technology; Smart city construction; Urban planning.

1. INTRODUCTION

Amid rapid socioeconomic development and accelerated urbanization, cities worldwide are experiencing significant population growth, which has in turn exacerbated the complexity and multiplicity of challenges associated with urban planning, construction, and management. These challenges include but are not limited to land use optimization, infrastructure carrying capacity, environmental sustainability, public service allocation, and emergency response efficiency. Traditional planning methodologies, often reliant on static surveys, periodic censuses, decision-making, are increasingly insufficient to address the dynamic, multidimensional, and large-scale nature of contemporary urban systems. In parallel, the new generation of information and communication technologies—particularly big data, the Internet of Things, cloud computing, and artificial intelligence—has undergone rapid evolution and is progressively permeating various sectors of society. Among these technological innovations, big data visualization has emerged as a transformative tool with substantial application potential in the field of urban planning.

Big data visualization refers to the graphical representation of complex, high-volume, and heterogeneous datasets through interactive interfaces, geospatial mapping, real-time dashboards, and multi-dimensional analytical models. Unlike traditional statistical charts or static maps, modern visualization techniques enable planners and policymakers to perceive hidden patterns, monitor dynamic changes, simulate future scenarios, and communicate insights across disciplinary boundaries with enhanced clarity and efficiency. In the context of urban planning, these capabilities are not merely supplementary but increasingly central to evidence-based and participatory decision-making processes.

The integration of big data visualization into urban planning practice manifests across multiple dimensions. In the phase of urban analysis, visualization tools facilitate the synthesis of diverse data sources—such as mobile signaling data, point-of-interest (POI) information, satellite imagery, social media check-ins, and sensor networks—to generate high-resolution representations of urban spatial structure, population mobility, land use mix, and environmental quality. During the planning design stage, 3D visualization and virtual simulation technologies support scenario modeling and impact assessment, allowing planners to evaluate alternative schemes in terms of traffic flow, sunlight exposure, disaster resilience, and aesthetic coherence. In the subsequent phases of urban construction and management, real-time visualization platforms enable dynamic monitoring of project progress, infrastructure operation, and public feedback, thereby supporting agile governance and adaptive management.

Moreover, big data visualization enhances public participation and collaborative governance. By translating technical planning languages into intuitively understandable visual formats, it empowers citizens, community organizations, and non-expert stakeholders to engage meaningfully in urban decision-making. This

democratization of information not only improves transparency and accountability but also fosters social learning and consensus building.
Despite its considerable promise, the application of big data visualization in urban planning is not without challenges. Issues pertaining to data quality, interoperability, privacy protection, algorithmic bias, and institutional capacity remain salient. Furthermore, the effective utilization of visualization tools requires interdisciplinary competencies that integrate urban theory, data science, and graphic communication—an expertise still nascent in many planning institutions and educational curricula.

In summary, this paper examines the progressive integration of big data visualization technology into the operational practice of the urban planning profession. It argues that visualization constitutes not merely a technical instrument but a paradigm-shifting epistemic medium that reconfigures how urban problems are perceived, analyzed, and resolved. By elucidating current applications, evaluating enabling conditions, and identifying persistent constraints, the study aims to contribute to both the theoretical discourse and practical advancement of smart, sustainable, and human-centric urban development in the big data era.

2. OVERVIEW OF BIG DATA VISUALIZATION TECHNOLOGY

The concept of big data visualization first appeared abroad, and Jim Thomas defined it as presenting certain information in a visual form on the screen through images. People can understand these data in a very short amount of time, greatly reducing the difficulty of understanding the data. With the development of cities and technology, big data visualization technology has become an indispensable technology in the field of big data analysis applications.

3. TYPES OF BIG DATA APPLIED IN URBAN PLANNING

The application scope of big data technology in urban construction and planning is relatively wide, and the required data is also complex and diverse. For example, data visualization technology is integrated with disciplines such as architecture and widely applied in the field of urban planning. Firstly, in terms of transportation planning, the application of big data technology in urban transportation has been around for almost 20 years. For example, in the early 21st century, the location data of buses and the use of bus IC cards were both optimized using big data technology in the transportation system, thereby promoting urban transportation planning. Nowadays, the application of big data visualization technology in urban transportation planning has become more important. For example, using some visualization analysis techniques can make the planning and construction of cities more intuitive, making it convenient for relevant personnel to understand the traffic operation status of various streets in a city at different times, and then refer to and apply traffic flow data in urban planning.

In general, people tend to focus on air and water pollution in cities. However, in urban environments, noise pollution is also an important pollution factor. The intensity of noise not only has a significant impact on the environmental quality of the entire city, but also has a great connection with human daily life. In China, the Hong Kong Special Administrative Region has completed the drawing of noise maps for the first time. In the following decade, the Hong Kong region has been continuously improving and optimizing noise maps, leading to further development of noise maps. However, in mainland China, although noise maps began to appear in 2008, the road traffic noise map of Beijing in 2009 was the first to appear. In addition, the visualization technology of big data also has great application space in urban form and structure big data, especially with the popularity of smartphones, it has entered people's daily lives and become an indispensable technology in people's daily lives. For example, there are open data on the Internet, mobile phone signals and other structural forms, urban form and structural big data.

4. URBAN PLANNING MODEL AND TECHNOLOGY BASED ON BIG DATA VISUALIZATION TECHNOLOGY

4.1 Visual Analysis Model

Generally, visual models complete tasks related to data processing through three processes. Firstly, the raw data is analyzed and processed, comprehensively classified and filtered, and stored in its entirety. Then, the stored data is subjected to simple processing, and visualization technology is used to integrate the data together. Finally, the data

and visualization techniques are mutually transformed. If any problems arise during the final processing, the big data analysis system will promptly correct and provide feedback, thereby obtaining effective visualization data. In the process of visual analysis, the first step is based on human-computer interaction. The purpose of visual analysis is to provide services to users, and it is necessary to conduct in-depth analysis of their specific needs in order to identify and understand the actual scene according to the requirements of the application during the visual analysis process.

4.2 Big data visualization technology in urban planning

The visualization technology of big data includes three main research contents: visual analysis, scientific visualization, and complex information visualization. Among them, the most basic is visual analysis, which refers to the use of a series of analysis techniques to extract and transform data, extract useful information from it, and gain a deeper understanding of complex problems, laying the foundation for subsequent applications. For example, in urban planning, visualization technology and interdisciplinary technology play an important role in cross fusion. Firstly, in urban transportation planning, in addition to GPS positioning technology, it also includes the combination of geographic information system technology and computer technology. For example, in urban planning and design, the integration and research of geographic spatial urban rail routes are first conducted, and then computer technology is used to comprehensively organize the collected data to improve the city's transportation and road operation planning.

4.3 Application of Big Data Visualization in Urban Planning

4.3.1 Application of Transportation Big Data:

Through big data technology, route scaling can be achieved in urban transportation planning. This technology has been widely used in several major cities, such as subway systems and tourist maps, and has been adopted by many people. This also means that big data visualization technology can be fully developed in these fields. Specifically, in the visualization of transportation data, expanding the focus paths selected by users to prevent map distortion, and utilizing path scaling techniques to improve usability and accelerate problem solving, can create a better urban transportation and tourism environment.

4.3.2 Applying big data visualization technology to urban noise pollution issues:

As mentioned earlier, visualization technology is also widely used in the field of environmental protection. When cities are affected by noise pollution and other issues, we can use visualization techniques to draw noise maps and obtain the noise status of various areas in the city, as follows [3]:

In response to the above issues, based on big data visualization technology, the main research object is the noise generated during vehicle driving, and the simulation experiment of traffic noise is conducted to improve the noise recognition ability during vehicle driving. Subsequently, the noise simulation results, receiving point locations, and measured environmental noise data are imported into the geographic information system platform software. Through the form of maps and combined with computer results, the overall noise situation is plotted. In addition, in this map, certain buildings and other information in the city can be clearly seen, which enables the noise map to be presented not only on the plane and land, but also to mark the contour lines of the noise map. On the one hand, it improves the value information of the noise map, and on the other hand, it provides better reference performance.

5. THE CHALLENGES FACED BY BIG DATA IN THE APPLICATION OF SMART CITY PLANNING

Big data has a wider range of applications in future smart city planning, but there are still many problems, mainly in three aspects: the first is the low level of data sharing, and the second is the shortage of professional talents. The third issue is the lack of corresponding safeguard measures.

5.1 Information sharing needs improvement

Firstly, in the future process of urban construction and development, science and technology are essential, especially in the construction of smart cities, which requires the development of information technology. Therefore, it is necessary to strengthen information sharing, so that information can be fully utilized, and promote

the development of smart cities. Looking at the whole country, although Beijing and Shanghai, two first tier cities, have begun to attach importance to the sharing of information resources and are committed to the interconnection of information resources in various aspects of urban planning work, there are still problems in some individual data aspects that cannot be fully shared. Moreover, in some second - and third tier cities in China, the level of information sharing is even lower. This has resulted in a large amount of information that cannot be shared among multiple information resources in the city, making it difficult to fully utilize these information resources.

5.2 Lack of professional data processing talents

Big data is an emerging field, theoretically speaking, it developed relatively late, and the talents it cultivates are relatively young, with few corresponding reserve talents. Moreover, big data technology has a close relationship with other disciplines. Talents who possess big data technology must not only have knowledge of big data itself, but also have knowledge in statistics, architecture, geography, and other fields. Therefore, overall, China lacks professional data processing talents, especially compound talents, which poses significant challenges to the future planning of smart city construction and the application of big data visualization technology, which is not conducive to the development of urban construction. In addition, due to the lack of specialized data talents, it is also not conducive to applying big data visualization technology to urban planning in some small and medium-sized cities, so as to make it play its due role. Although there are already versatile talents, these talents still tend to choose to develop in first tier cities. Finally, due to the construction of smart cities, the gap between first tier cities and small and medium-sized cities may further widen.

5.3 Unstable data security guarantee

In the construction of smart cities, more reliance is placed on big data. However, big data itself also has certain insecurity and instability, which poses certain obstacles to the planning and construction of smart cities. Specifically, there are still several issues with the security of big data at present.

One is about security. Big data is a new technology, and its development is far from perfect, especially the connection between big data and the Internet, so many data will be leaked when they are used, and big data is also needed in urban construction. Especially in certain cloud computing fields, while providing convenience for urban construction and data storage, it also brings greater risks of information leakage. Therefore, the insecurity of big data technology has become an important obstacle to the construction of smart cities.

Secondly, there is insufficient regulatory strength. Although some departments in China have already regulated the construction and application of smart cities, due to the short time since the emergence of big data and the fact that smart cities are a new concept, a sound regulatory mechanism has not yet been established at the regulatory level. On the one hand, the system is still in the process of development and expansion, and on the other hand, there are still some shortcomings in the management of the staff. For example, in the regulatory construction of smart cities, many relevant personnel only inspect the final results without sufficient supervision of the process. Although various relevant departments have put forward many opinions and policies to promote the construction of smart cities, and higher-level leaders have also made certain instructions, most of these opinions are opinions and ideas, which have not risen to the level of laws and systems, resulting in some defects and loopholes in the implementation of smart cities, and the implementation effect is not strong.

6. CONCLUSION

In summary, big data visualization technology plays a very important role in the construction of smart cities, especially in the fields of transportation and noise pollution, with enormous development potential. However, in the process of applying big data in smart city planning, the challenges it faces cannot be ignored. For example, information sharing still needs to be improved, there is a lack of specialized data processing talents, and data security is unstable. This requires continuous research by relevant personnel to make up for the shortcomings of big data in the field of smart city construction planning, so that big data visualization technology can play a greater role in the process of smart city construction.

REFERENCES

[1] Shaodong Ruan, Faqi Yan. Application of big data visualization technology in smart city planning [J]. Urban Architecture, 2022 (18): 19.

[2] Yongchong Yang, Liang Li. Exploration of Visualization Technology for Geospatial Data in Smart Cities [J]. Surveying and Mapping Bulletin, 2017 (8): 4.
[3] Ling Peng. Research on Visualization of Smart City Pulsation Based on Spatial Big Data [J]. Geographic Information World, 2016, 23 (1): 7.