Application Research of Logistics Data Visualization in Big Data Era

Zhao Yuanyuan, Fu Honghua

Shandong Yingcai University, Jinan, Shandong 250104, China

zhaoyuanyuan@126.com

Abstract: In the new era, big data visualization technology has gradually become an important technology for informationization and modernization in the field of logistics. Data visualization is based on "big data". Through the practical application of information technology, the intelligent management of logistics is realized. In the functions of human-computer interaction, intelligent early warning and data mining analysis, the efficiency and quality of logistics management are improved. This paper elaborates on the data visualization technology and the specific introduction in the field of logistics, and analyzes the difficulties faced in the application of data visualization technology, which provides reference for better application of data visualization technology in the future.

1. Introduction

Date Visualization refers to the theory and technology of using computer-generated graphics and image processing technology to convert data into scientific images to display images or graphics on screens or other imaging devices, and to perform interactive processing. . Zeng You (2014) through data visualization technology allows users to understand the nature behind the data, so as to make reasonable business decision-making needs and participate in the data visualization mapping process.

2. The meaning of logistics data visualization

Through the use of various types of sensors, business data such as logistics, warehousing, distribution, and inventory are generated, and real-time logistics data is further collected, classified, uploaded, and stored. Through visualization technology, these data are converted into text, audio, image, digital, video and other data. Big data analysis is performed on the basis of these data to meet the needs of logistics work, and finally the obtained results are visualized. Enable logistics operators to get the information they need, simply and intuitively, and make decisions quickly and accurately. Logistics data visualization is not an independent management theory, but a more efficient way of working for logistics managers to achieve their desired goals as quickly as possible. Therefore, the visual operation for improving logistics work and improving logistics efficiency is collectively referred to as logistics visual management.

3. The characteristics of logistics data visualization

3.1 Multi-dimensional design rendering

Through professional statistical data analysis system design methods, clear the indicators and dimensions of massive logistics data, present the relationship behind complex data according to content, theme, method, audience, etc., and integrate and present multiple views on the same platform. The visual image obtained by the user is not an image of a single dimension, but a regularity and connection of the same data in different dimensions. Help users to analyze data from different angles, more accurately extract the true value of data, and ensure the authenticity and effectiveness of the data.

3.2 Instant data interaction linkage

Interactivity improves the sharing and convenience of user management development data information. In the big data environment, data visualization and dissemination is easy to achieve instant communication, and the visualization of the logistics operation can be immediately generated after the data acquisition is completed. Through real-time interaction, each data is interactively linked under different dimension indicators to show the trend, proportion and relationship of data in different time periods, helping users to identify trends and discover the knowledge and rules behind the data.

3.3 All-media multi-platform visualization display

Visibility means that users can display data information in different ways such as graphics, images, animations, etc., and simulate the coexistence mode between different data information. Supports large-screen display functions such as master-slave screen linkage, multi-screen linkage, automatic scrolling, etc. It can achieve ultra-clear output with up to 10,000 resolutions, and has excellent display acceleration performance, supports touch interaction, and realizes warehousing, distribution, and inventory. Synchronous tracking, switching, real-time query and scaling of data such as transportation, to meet the different display needs of users.

4. The realization technology of logistics data visualization

Visualization equipment mainly uses human-computer interaction technology, mainly including stereoscopic display technology and sensor technology. Another technology is Virtual Reality (VR) and Augmented Reality (AR).

4.1 Human-computer interaction system

Through computer systems and input and output devices, the technology that takes scientific and effective methods to achieve human-computer interaction is human-computer interaction technology. The output device or the imaging device is used to provide the user with relevant information and prompts, and the user inputs an instruction to the machine through the input device to solve the problem and find a solution.

4.2 Virtual reality technology

Virtual reality technology, also known as the virtual reality technology, mainly refers to the use of virtual reality devices such as stereoscopic imaging glasses or data sensing gloves to simulate three-dimensional reality, through which users can naturally input information to the computer (such as the rotation of the limbs, the fingers Click, etc., and finally bring a three-dimensional feeling world to the user by watching, listening, touching, and the like.

4.3 Augmented reality technology

Augmented reality technology is a technology that calculates the position and angle of focus in real time and matches the required graphics, images, and models. The augmented reality technology is mainly to further visualize the virtual world of the screen into the real world and be able to Interaction, giving users a more intuitive experience.

4.4 Visualization system platform

The key to data visualization application lies in the construction of the system platform, the realization of big data mining analysis, and data processing to provide decision-making basis for the development of logistics business. The visualization platform combines scientific computing methods with imaging techniques. First of all, the visualization platform needs to have a very high operating rate to meet large-scale data analysis and processing. Secondly, it must have powerful image processing and graphics editing performance, and combine the two to build an image processing platform capable of large-scale data analysis.

5. The application of logistics data visualization in the logistics industry

5.1 Get data, optimize decisions

In the process of logistics management, logistics information, data and other resources are constantly changing. Collecting logistics business information, including cargo information and flow information, through bar code, RFID, camera equipment, sensors and other information collection equipment and systems in logistics operations. State feedback, warehousing process feedback. The visualization system platform integrates, processes, calls, and transmits the collected logistics data, and then delivers, records, and orders new data. Finally, the information is fed back to the operator with a more intuitive image such as image and audio, and the terminal visualization device is used to optimize the logistics operation.

5.2 Real-time tracking of goods

In the logistics operation, the big data visualization technology is used to track the goods in real time, and the goods are in the state of the library and in transit, and the quantity and status of the goods can be accurately grasped. The goods data is always fed back to the terminal, and the data is updated in time. The visualization system will form a new record of the goods, and the virtual image of the goods on the visual model corresponds to the time and position in reality, and the problems appear. Conduct judgments, analysis, and decision making.

5.3 Error warning, processing

In the logistics operation, the visual data platform will become the key technology for error processing. Combining the big data analysis capabilities, using intelligent simulation, digital model and other methods for logistics analysis, the simulation of the steps in the various processes of logistics operations. In the specific operation, the collected logistics data is processed and processed continuously, and the errors that are inconsistent with the prediction scheme are found in time, and the remedial solution is prepared in a targeted manner.

5.4 Network optimization

Constructing a complete and modernized logistics network system is one of the keys to improving logistics efficiency in the current society. Through visualization technology, the dynamic information of each unit in the logistics operation will be displayed on the terminal by images, audio, etc. The layout and information network of logistics facilities such as warehousing and distribution centers can be integrated and optimized.

5.5 Demand forecast

The visualization technology integrates a large number of resources in logistics management, not only optimizes the operation process, but also drives the collaborative processing of information, and the demand forecasting function is further improved under the drive of big data. It can analyze the collected historical data and customer needs. To carry out customer portraits, accurately predict the demand for future logistics, prepare goods in advance, reduce the time of goods in transit, and better meet customer needs.

5.6 Collaborative innovation

Visual application is a comprehensive application of disciplines, which involves computer graphics, image processing, computer-aided design, computer vision and human-computer interaction technology. Through data visualization application, logistics enterprises can realize sales information, inventory information and customer information synchronization and integration with customers, suppliers and other enterprises, which can effectively improve management level, combine synergies with various advantages to promote logistics intelligence. And modernization.

6. Difficulties in the application of logistics data visualization

6.1. Visual technology equipment costs are high

In order to improve the level of visualization and information management in the logistics operation process, relevant high-tech modern technology equipment is necessary, such as RFID, hardware equipment of visual computer system, information collection equipment and basic operation equipment for receiving and feedback information. The acquisition of visualization technology related equipment has increased costs. Over time, the depreciation and maintenance costs of these devices are much higher than the cost of the original operating methods.

6.2 Equipment maintenance supervision technical difficulties

After the logistics data visualization equipment is applied to logistics operations, the daily maintenance and supervision of related visual technology equipment has become an important task. Due to the high price of equipment, it is difficult to purchase in large quantities and the maintenance work is cumbersome. Therefore, when equipment problems occur, the company will try to Maintenance and repair methods are used to restore their use. However, there are currently few relevant professionals. It is very likely that the company will have no backup machines and no maintenance services in the short term, which will directly affect the work progress of the company and may even be affected by the work process. The delay has led to a crisis of trust, so the daily maintenance and supervision of logistics companies face enormous technical difficulties.

6.3 Long employee training cycle

Logistics data visualization technology in warehousing, distribution management and other aspects, but all have direct contact with employees, staff in the daily operations will be widely used logistics visualization equipment to assist in the warehousing operations, picking operations, information identification and other tasks, but employees It takes a certain period of time to conduct visual theory study and practical training before starting work, so as to meet the talent needs of logistics management. The training cycle of employees is difficult to predict. The previous operation methods are relatively simple. Employees can master the operation methods within 3 to 5 days, and the logistics visualization management personnel training will take 1 month or longer.

6.4 Data visualization technology lacks standardization

Logistics data visualization technology is widely used in logistics operation management, but there is still a lack of unified data visualization standards, resulting in a mismatch and incompatibility between data transmission between enterprises and enterprises, enterprises and government departments. Big data brings description and storage challenges, mining and forecasting challenges are different from traditional data. In addition to research and experimentation to develop new data formats, improve data mining algorithm performance, and enhance parallel data processing capabilities, data transmission is required. Storage, calculation, and analysis to standardize data visualization to reduce unnecessary problems caused by non-standardization and improve the accuracy and speed of data processing.

In the era of big data, data collection, acquisition and analysis are faster, and these massive amounts of data will have a profound impact on how people think. With the continuous deepening of logistics development, logistics operation management will superimpose more diverse application scenarios, and more and more technologies will be combined to improve efficiency and expand the scale of benefits. Data visualization will find a breakthrough for the development of logistics industry. Visualization technology has a wider application in logistics management, promoting logistics industry resource integration, demand forecasting, decision-making execution, collaborative innovation, improving customer satisfaction, improving the competitiveness of logistics enterprises, and better achieving long-term development goals.

Acknowledgement

References

[1] Peng Xiaosheng, Deng Diyuan, Cheng Shijie et al. Key technologies of power big data for smart grid applications[J]. Proceedings of the CSEE, 2015(03):503-511.

[2] Cai Ruibin. Application of big data visualization technology in intelligent industry [J]. Electronic Technology and Software Engineering, 2019, 147 (01): 149.

[3] Liao Jianxin. Application Status and Prospect of Big Data Technology [J]. Telecommunications Science, 2015, 31(7): 1-12.

[4] Xing Puxue, Li Qiang, Wei Wei, Yan Jianrong, Li Liguang, Hu Li. Design of intelligent warehouse operation support platform based on big data analysis [J]. Science and Technology Innovation and Application, 2018 (28): 10-15.

[5] Gan Bin, Zhang Mingyao, Wu Kexu, Li Chaolin. Research on the Visualization Management System of Smart Logistics under the Background of Big Data[J].Science and Technology, 2018(04):13-21.

[6] Tang Yuwei. Research on the problem of logistics visualization information platform and improvement countermeasures[J].Logistics Technology,2015,34(15):258-260.