Journal of World Architecture, 2024, Volume 8, Issue 2
https://ojs.bbwpublisher.com/index.php/JWA
Online ISSN: 2208-3499
Print ISSN: 2208-3480

Smart City Rail Transit Operation and Management Information Construction Strategy

Jing Sun*

Chongqing Energy College, Chongqing 402260, China

Corresponding author: Jing Sun, 18584667236abc@sina.com

Abstract: Rail transit is considered one of the safest and most efficient modes of transportation. Ticketing, vehicle dispatching, and passenger flow control during rail transit operations in China have been improving over the years. Smart city construction and intelligent management models has also been increasingly emphasized with the rapid development of information and internet technology. Therefore, it is essential to conduct relevant research and discussions to improve the overall efficiency and quality of urban rail transit operation and management. This article provides an overview of smart city rail transit operation and management informatization, the principles of construction, and the functions of smart city rail transit operation and management informatization. Additionally, it discusses the strategies for the construction of smart city rail transit operation and management information and its development prospects.

Keywords: Smart city; Rail transit operation and management; Information construction

Online publication: May 21, 2024

1. Introduction

As China's science, technology, and economy have been developing rapidly, smart cities have become an inevitable trend in social development. They are used to promote urban development, improve the people's quality of life, and also continuously optimize the operation and management of urban rail transits. Compared with other means of transportation, rail transit offers advantages like high passenger capacity, safety, and convenience, and it has been the driving force of urbanization in China. Therefore, applying more advanced information technology can effectively improve the overall efficiency, stability, and safety of urban rail transit operations.

2. Overview of smart city rail transit operation and management informatization

Rail transit development is affected by various factors, differing from region to region. Areas that are less developed in terms of economy cannot further strengthen the research and development of rail transit construction. Many first-tier and second-tier cities in China have fully implemented subways and light

rails, which can not only significantly improve land utilization but also enhance transport capacity and travel experience. With the extensive application and development of information technology, many cities have gradually informatized rail transit operations. Furthermore, they have also increased investment in the economy and resources. As a result, the quality and efficiency of rail transit operation and management have been improved, further promoting the progress and development of the rail transit industry. However, for underdeveloped areas, smart city rail transit construction cannot be realized due to insufficient investment. Therefore, funds and resources should be allocated to improve the urban rail system in these areas. Applying information technology to operational management can lead to the development of smart cities. Besides, it can also promote the automation and informatization of rail transit operation management [1].

3. Principles of informatization construction for smart city rail transit operation and management

Due to variations in economic and geographical conditions across regions, the development status of rail transit differs significantly among cities. The rail transit systems of first-tier cities like Shanghai, Beijing, and Guangzhou, are relatively mature. With the rapid advancement of information technology, most first-tier cities prioritize the informatization of their rail transit systems. Information technology applications have optimized and enhanced route planning and ticket management in rail transit operations. The primary principle guiding this technology's implementation is practicality, particularly in less developed areas. Capital investment poses a significant challenge in construction and remains a key factor limiting rail transit operation and management development. Therefore, rational resource allocation and timely system optimization and upgrades are necessary to enhance information and resource utilization efficiency. Strategies for smart city rail transit operation and management information construction must align with the unique development conditions and needs of different cities.

4. Information construction functions of smart city rail transit operation and management

(1) Intelligent data collection

Intelligent data collection involves the use of various equipment to input and collect data. This technology has been widely used in the collection of rail transit management signals, allowing the staff to fully understand the impact of rail transit on the external environment during operation. monitoring the external environment is essential to understand its influence on rail transit operations. After collecting, analyzing, and processing intelligent data, it is input into the information system and transmitted accordingly to achieve effective operation and safety management of rail transit. This ensures the safety and efficiency of rail transit operations [2].

(2) Intelligent data integration

After receiving the data transmitted by the intelligent collection system, corresponding sensors are used to analyze and integrate the data. This ensures the unity and effectiveness of the integration of data, which is essential for the next step of work. Parameter data, original data, and decision data are the main components of intelligent data integration. In this process, the intervention and application of relevant parameters can transform original data into parameter data. Additionally, through the influence of relevant parameters, it can also be transformed into decision data. Therefore, by applying intelligent data fusion functions, information technology can be effectively utilized in the operation and

management of smart city rail transit.

(3) Intelligent data mining

After data collection integration, in-depth analysis and research on the relevant data are carried out to understand the data and optimize the services accordingly, thereby improving the efficiency of rail transit operation and management. The data should be analyzed with proper methods to optimize and improve the current urban rail transit system [3].

(4) Data-based intelligent decision-making

Knowledge bases play a crucial role within decision-making systems, as their application enables the full utilization of their characteristics and functions while facilitating effective communication between information systems and humans. Knowledge bases effectively transmit information data through various questioning formats. Reasoning systems should also be included as they actively participate in decision-making processes, enhancing the accuracy of data and ensuring the safe operation of urban rail transit systems.

5. Informatization construction strategy for smart city rail transit operation and management

(1) Clarifying goals

In the informatization of urban rail transit operation and management, it is crucial to define the construction goals, specify the concrete content, and carry out detailed planning and management to enhance overall management quality. Relevant departments should adapt to local conditions, apply advanced technologies, learn from past experiences, and innovate based on the existing infrastructure. Understanding current urban needs is crucial for constructing an information system that integrates with infrastructure development. Through comprehensive management and technological integration, the efficiency and safety of urban rail transit operation and management can be improved [4].

(2) Establish standardized management and unified management

The development of urban rail transit varies across cities in China, influenced by their economic levels and social development statuses. Therefore, it is necessary to establish a standardized and unified management system. The first task in formulating the operation and management model is to identify the existing problems in the development and management of major cities. Secondly, efforts should be made to minimize the costs of urban rail transit construction, operation, and planning to maximize operational efficiency. Additionally, analyzing each city's specific characteristics is essential to tailor standardized operational strategies that adhere to unified standards. A unified business model can help improve operational efficiency and reduce operating costs. While a unified operating model can enhance efficiency and reduce costs, it's important to address potential drawbacks such as limited flexibility and unhealthy competition among operators. Therefore, ensuring fair competition among enterprises is vital. By establishing and refining management systems, a conducive environment for the standardized and integrated development of urban rail transit can be fostered [5].

(3) Increasing capital investment

Investment in equipment is necessary to promote the development of smart cities. Relevant staff must understand the differences between smart transportation systems and rail transit facilities, especially regarding fund allocation. Thus, prioritizing the optimization and upgrading of existing equipment is crucial. Additionally, there should be a focus on nurturing information technology talent and building information-sharing platforms to further advance the development of the rail transit industry.

The monitoring and managing of urban rail transit should also be continuously optimized. Its main goal should be to achieve optimal resource allocation, facilitating steady economic and social development in China. Smart cities rely on information technology to integrate all areas of production and life. Both the construction and operation of smart cities require significant investment, with a focus on continually optimizing and innovating infrastructure [6]. Furthermore, recruiting professional information technology talent and strengthening professional teams are essential to sustain the development of smart cities.

(4) Improving the rail transit operation information management system

Decision-making systems, production systems, and information management systems are important components in the informatization of urban rail transit systems. The core system is the production system, which controls the operation of urban rail transit [7]. The main function of the management system is to supervise and manage various data to promote the application and sharing of data. The decision support system is a unique tool that analyzes and processes management information resources and clarifies operating rules to ensure the safety and rationality of decision-making. In addition, the most important aspect of the rail transit operation management information system is the employees and managers. It is crucial to enhance coordination and management among personnel across different departments. By using the project system as a link to integrate various departmental systems effectively, a complete enterprise operation chain can be established. This approach boosts internal decision-making efficiency and improves decision accuracy [8].

(5) Strengthen equipment maintenance and overhaul

Unreasonable line connections and safety accidents in rail transit can severely impact the lives of residents [9]. Excessive discharge of electrical energy in the power system can overload the lines, leading to high temperatures and even fires. Therefore, in the safety management of urban rail transit operations, maintenance and inspection of facilities must be prioritized. Rational arrangement of pipelines according to scientific principles is crucial to prevent accidents. These facilities are prone to various problems and failures during long-term operation. Some personnel may lack proficiency, resulting in frequent errors. To ensure safe operation, specialized personnel must conduct regular maintenance and inspections and promptly repair any faulty components. Introducing advanced foreign equipment is also necessary [10].

6. Trends in the informatization of smart city rail transit operation and management

People's quality of life and living standards have improved over the years, leading to a drastic increase in urban traffic load. As a result, traditional transportation modes can no longer fully meet the transportation needs of modern society. This has led to the robust development of China's rail transit industry. Rail transit has become the primary mode of transportation for residents. Therefore, it is crucial to adapt to the development trends of modern cities and set clear objectives for its informatization construction. Additionally, utilizing information technology to continuously optimize and enhance the efficiency of rail transit operation and management is essential. This prevents faults or issues during operation, ensuring the smooth and stable functioning of rail transit. Such efforts will drive the continuous advancement of smart city rail transit [11].

7. Conclusion

There is still much room for the development of rail transit management in China. Moreover, due to differences in circumstances across various regions, several issues persist in practical development. Therefore, cities should tailor information construction strategies to their specific conditions, ensuring compliance with relevant standards at all levels. This will improve rail transit's operational efficiency and facilitate the effective advancement of smart city rail transit informatization construction in China.

Disclosure statement

The author declares no conflict of interest.

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