Research on the Application of Intelligent Technologies in Equipment Management of Vocational Logistics Training Rooms

Kater Zheng*

Guangdong Mechanical and Electrical Vocational Technical College, Guangzhou, 510515, China
**Corresponding author:15766385288@163.com*

Abstract: *As the importance of vocational logistics training rooms in education continues to grow, issues such as low equipment management efficiency, untimely maintenance, and underutilization of resources have become increasingly apparent, severely impacting teaching effectiveness. The rapid development of intelligent technologies offers new solutions in this field. Technologies such as the Internet of Things (IoT), artificial intelligence (AI), and big data analytics are widely applied in the logistics industry and gradually provide efficient and refined management methods for vocational logistics training room equipment management. This study analyzes the shortcomings of existing management models, explores key applications of intelligent technologies in real-time equipment monitoring, maintenance optimization, and resource scheduling, and constructs an intelligent equipment management system aimed at improving management efficiency, reducing maintenance costs, and enhancing teaching effectiveness. The research provides theoretical support and practical references for the intelligent transformation of equipment management in vocational logistics training rooms.*

Keywords: *Intelligent technologies; Logistics training room; Equipment management; Internet of Things; Artificial intelligence; Big data*

Introduction

In higher vocational education, logistics training rooms serve as crucial venues for students to master practical operational skills, and the effectiveness of equipment management directly affects teaching quality. Currently, most vocational logistics training rooms rely on traditional manual management models, which suffer from low efficiency, inadequate equipment utilization, and delayed maintenance. With the widespread application of intelligent technologies such as IoT, AI, and big data analytics in the logistics industry, integrating these technologies into equipment management of logistics training rooms has become a matter of significant research interest and urgency. This study aims to explore the application pathways of intelligent technologies in equipment management within vocational logistics training rooms, addressing current management challenges and providing effective ideas and solutions for future intelligent transformation of equipment management.

1. Development and Current Status of Intelligent Technologies in Equipment Management of Vocational Logistics Training Rooms

1.1 Current Status Analysis of Equipment Management in Vocational Logistics Training Rooms

In higher vocational education, logistics training rooms serve as essential venues for practical teaching, providing students with simulated real logistics scenarios to develop their operational skills. These training rooms feature various types of equipment, including material handling systems, automated sorting devices, and warehouse management systems. However, the current management of equipment in these training rooms faces challenges such as low efficiency, untimely maintenance, and insufficient resource utilization.

Traditional equipment management mainly relies on manual registration and periodic inspections, making it difficult to achieve real-time monitoring. This results in delayed detection of equipment failures, adversely affecting teaching progress. Additionally, the lack of scientific management methods

leads to low equipment utilization, with some devices remaining idle for extended periods and not fully realizing their value. Maintenance work is often reactive, with maintenance cycles not adjusted based on actual equipment performance, causing issues like excessive wear or insufficient upkeep. This management approach not only increases operational costs but also reduces the teaching efficiency of the training rooms.

Therefore, introducing intelligent management methods to enhance efficiency and precision in equipment management has become a critical challenge and a pressing issue in vocational logistics training room management.

1.2 Application and Development of Intelligent Technologies in the Logistics Industry

With the rapid development of modern logistics, the application of intelligent technologies in the logistics sector is deepening, presenting unprecedented transformations and innovations. Emerging technologies such as the Internet of Things (IoT), artificial intelligence (AI), and big data analytics provide robust technical support for the digital and intelligent upgrading of the logistics industry. These technologies are widely applied in critical logistics processes, including warehousing, transportation, sorting, and distribution, redefining traditional logistics operation models.

For instance, IoT technology enables real-time monitoring of goods, vehicles, and equipment, while AI algorithms optimize logistics routes, and big data analytics enhance supply chain forecasting and management capabilities. These have become hallmark initiatives for the logistics industry's journey toward intelligence.

1.2.1 Application of IoT Technology

The application of IoT technology in the logistics industry primarily involves real-time monitoring, equipment management, and automation of information flow. Through sensors, radio frequency identification (RFID), and wireless communication networks, IoT can continuously collect data on equipment, goods, and environmental conditions, facilitating remote monitoring, intelligent alerts, and automatic control.

In warehouse management, IoT sensors continuously monitor the storage environment, such as temperature and humidity, ensuring compliance with standards and minimizing losses. This technology eliminates errors and delays associated with manual data entry, improving operational efficiency. In transportation, IoT utilizes GPS positioning and remote monitoring to track vehicle locations and status, optimizing routes to reduce delays and fuel consumption. Moreover, real-time data feedback can automatically alert for equipment failures, minimizing downtime and enhancing reliability.

These technological innovations are driving the digital transformation of the logistics industry and provide effective references for equipment management in vocational logistics training rooms.

1.2.2 Application of AI and Big Data Technologies

Artificial intelligence finds applications in logistics, particularly in intelligent scheduling and route optimization. AI algorithms can accurately predict demand, optimize delivery paths, and schedule equipment intelligently to avoid overloads or idleness. Concurrently, big data analytics deeply excavates equipment usage data to optimize maintenance strategies and enhance management efficiency. By leveraging these technologies, logistics companies not only improve operational efficiency but also offer advanced equipment management solutions for vocational logistics training rooms.

In summary, the extensive application of intelligent technologies is propelling the logistics industry towards intelligence, providing valuable technical support for equipment management in vocational logistics training rooms. Successful applications of these technologies exemplify pathways for the intelligent transformation of equipment management, facilitating efficient resource allocation and optimization.

1.3 Trends in Empowering Equipment Management in Training Rooms with Intelligent Technologies

Amid the rapid development of intelligent technologies, equipment management in vocational logistics training rooms is undergoing a significant technological revolution. First, IoT technology will gradually be applied for real-time monitoring and management of training room equipment, breaking

away from traditional manual management models to achieve comprehensive lifecycle management of equipment. Through the extensive deployment of smart sensors and wireless networks, information regarding equipment operational status, usage frequency, and fault alerts will be transmitted in real time to management platforms, enabling managers to promptly understand equipment conditions and make necessary adjustments.

Secondly, artificial intelligence (AI) and big data analytics will play increasingly important roles in equipment management. AI algorithms can intelligently schedule tasks and predict maintenance needs based on historical usage data and operational parameters, significantly reducing equipment failure rates and extending their lifespan. Through big data analytics, managers can finely manage aspects such as equipment usage efficiency, maintenance needs, and resource allocation, optimizing overall equipment performance.[1]

In the future, equipment management in vocational logistics training rooms, empowered by intelligent technologies, will focus more on automated and data-driven management approaches. As intelligent management platforms continue to evolve, vocational logistics training rooms will gradually realize intelligent scheduling, real-time monitoring, and precise maintenance of equipment, enhancing management efficiency while maximizing equipment utilization. This trend will also drive a transformation in management models, providing robust equipment support and management for practical teaching in higher vocational education.

Overall, the application of intelligent technologies in equipment management of vocational logistics training rooms has become an inevitable trend. By enhancing the precision of equipment management through intelligent means, it not only effectively addresses current management challenges but also lays a solid foundation for future efficient teaching practices.

2. Key Applications of Intelligent Technologies in Equipment Management of Vocational Logistics Training Rooms

2.1 Application of IoT Technology in Real-Time Monitoring of Equipment

The core of IoT technology lies in integrating physical devices with information systems through sensors and network connections, enabling real-time monitoring and remote management of equipment status. In vocational logistics training rooms, IoT technology can effectively enhance the transparency and responsiveness of equipment management, specifically reflected in the following aspects:

2.1.1 Real-Time Monitoring and Feedback of Equipment Status

Through IoT sensors, various equipment in logistics training rooms can transmit their operational status in real time, including temperature, operating hours, and load conditions. Managers can access real-time data through intelligent management platforms and utilize data analysis and visualization tools to understand equipment performance. Compared to traditional manual inspections, IoT technology not only increases monitoring efficiency but also significantly reduces the possibility of human error, ensuring that equipment operates at optimal conditions.

2.1.2 Fault Alerts and Automated Maintenance Notifications

IoT technology can automatically detect potential fault risks in equipment through abnormal changes in operational data. When equipment operating parameters deviate from normal ranges, the system will issue alerts to notify managers and may even automatically generate maintenance tasks. Additionally, based on historical data analysis, the system can predict maintenance cycles, allowing for proactive scheduling of maintenance activities to prevent equipment failures, thereby ensuring the smooth progress of teaching activities.

2.1.3 Data Integration and Intelligence of Equipment Management Platforms

IoT devices achieve data integration and interactivity through a unified management platform, allowing all equipment information to be aggregated for centralized monitoring. Through this platform, managers can uniformly schedule, remotely control, and make timely adjustments based on equipment status data, maximizing management efficiency.

2.2 Application of Big Data Analysis in Optimizing Equipment Management

Big data analysis technology helps managers extract valuable information from equipment usage

data, thereby optimizing decision-making in equipment management. For vocational logistics training rooms, the application of big data analysis can not only enhance equipment utilization but also provide a scientific basis for long-term planning of equipment.

2.2.1 Analysis and Optimization of Equipment Usage Behavior

Through big data analysis, managers can conduct in-depth analyses of equipment usage behaviors in training rooms. For example, they can identify which equipment has high usage frequency, which is rarely used, and the peak usage periods for each piece of equipment. Based on these insights, managers can optimize equipment allocation and usage strategies, ensuring that resources are fully utilized and minimizing waste.[2]

2.2.2 Support for Maintenance Decision-Making

Big data analysis can also support maintenance decision-making for equipment. By analyzing historical usage data, the system can predict potential failure points and maintenance cycles for equipment, helping managers schedule maintenance work more scientifically. Data-driven maintenance decisions not only extend the lifespan of the equipment but also reduce maintenance costs.

2.2.3 Equipment Lifecycle Management and Renewal Planning

Data-driven equipment lifecycle management is a crucial aspect of optimizing equipment management. By tracking and analyzing equipment usage data over the long term, managers can accurately assess the lifespan and retirement cycle of equipment and develop reasonable renewal plans based on this data. Such data-based planning ensures that the equipment in logistics training rooms remains in optimal condition, reducing management risks associated with aging equipment.

2.3 Application of Artificial Intelligence Technology in Intelligent Scheduling and Resource Allocation

The introduction of artificial intelligence (AI) technology has transformed equipment management in vocational logistics training rooms from traditional passive management to proactive intelligent management. AI technology brings greater flexibility and precision to equipment management through data-driven intelligent scheduling and resource optimization.[3]

2.3.1 Intelligent Scheduling and Optimization of Equipment

AI algorithms can automatically perform intelligent scheduling based on equipment usage demands and status. For example, when multiple training rooms simultaneously require a certain type of equipment, AI algorithms can allocate resources rationally based on equipment usage and student needs, preventing overloading or idling of equipment. Intelligent scheduling maximizes equipment utilization while reducing unnecessary resource waste.

2.3.2 AI-Based Predictive Maintenance

AI technology, combined with IoT and big data analysis, enables predictive maintenance of equipment. Using machine learning algorithms, the system can predict potential faults based on historical usage data and current conditions, allowing for proactive scheduling of maintenance work. The primary advantage of predictive maintenance lies in its preventative nature, significantly reducing the occurrence of unexpected equipment failures and enhancing stability and reliability.

2.3.3 Intelligent Decision-Making for Resource Allocation

AI can also assist managers in making intelligent decisions regarding equipment resource allocation. Based on AI analysis models, managers can consider multiple factors such as equipment usage frequency, teaching demands, and maintenance costs to generate optimal equipment configuration plans. This intelligent resource allocation not only enhances management efficiency but also better meets the needs of various teaching activities.

3. Construction of an Intelligent Equipment Management System for Vocational Logistics Training Rooms Empowered by Smart Technology

3.1 Design Principles and Architectural Analysis of the Intelligent Management System

The intelligent management system is a core tool for equipment management in vocational logistics

training rooms. Its design must adhere to several principles to ensure efficiency, flexibility, and scalability in practical applications.[4]

3.1.1 Design Principles

First, the system design should be user-centric, meeting the daily management needs of equipment managers while considering the convenience of teachers and students. Second, the system must possess modularity and scalability, allowing for flexible adjustments and expansions of functionalities in response to the future increase in training room equipment and evolving management demands. Lastly, data security and privacy protection are key focuses in the system design. Real-time uploading and storage of operational data and user activity data must guarantee high security to prevent potential risks from data breaches or system failures.

3.1.2 Architectural Analysis

The architecture of the intelligent management system typically consists of three main components: the front-end user interface, the back-end data processing system, and the IoT access layer. The front-end user interface should be designed as a simple and intuitive operating platform, allowing managers, teachers, and students to access system functionalities according to their permissions. The back-end data processing system is responsible for receiving and analyzing device status data in real time, supporting intelligent scheduling and maintenance management. The IoT access layer forms the foundation of the system, connecting physical devices in the training room to the management platform through sensors and IoT devices, enabling real-time data interaction.

The entire system architecture must ensure compatibility with various models and brands of logistics training equipment. Additionally, the system should support integration with other teaching systems, such as student management systems and teaching resource libraries, ensuring seamless coordination between equipment management and educational activities.[5]

3.2 Functional and Process Optimization Design of the System

Under the empowerment of intelligent technology, the functional design of the logistics training room equipment management system should not only cover basic monitoring and maintenance of equipment but also fully leverage smart technology to optimize and innovate management processes.

3.2.1 Core Functionality Design

The core functions of the intelligent equipment management system include real-time monitoring of equipment, automated scheduling, maintenance management, and data analysis. The real-time monitoring function, enabled by IoT technology, tracks equipment status, records usage conditions, and provides fault alerts. The automated scheduling function utilizes AI technology to dynamically allocate equipment, ensuring optimal configuration of teaching resources. The maintenance management function, combined with big data analysis and AI algorithms, offers predictions for maintenance cycles, fault analysis, and repair records, assisting managers in developing scientific maintenance plans. The data analysis function analyzes historical data and usage patterns to support equipment efficiency optimization, renewal planning, and management strategy adjustments.

3.2.2 Process Optimization Design

Traditional equipment management processes typically rely on manual records and operations, leading to inefficiencies and errors. The introduction of intelligent systems has significantly optimized these management processes. First, through IoT and big data analysis, equipment usage and maintenance needs can be automatically recorded and analyzed, reducing the need for manual intervention. Second, the intelligent scheduling function automates the allocation and scheduling of equipment resources, alleviating the workload for managers. Moreover, the system can dynamically adjust scheduling strategies based on changes in teaching demands, ensuring flexibility and efficiency in equipment use. Finally, the system's automated alerts and intelligent forecasting capabilities allow for proactive maintenance and repairs, preventing sudden equipment failures from disrupting teaching activities.[6]

This optimized management process not only enhances the efficiency of equipment management but also significantly reduces idle time and maintenance costs.

3.3 Prospects and Challenges of System Application

In the future, with the continuous development of IoT, artificial intelligence, and big data technologies, the intelligent equipment management system will gradually achieve comprehensive automation and intelligent management. First, the system will be able to predict equipment usage and maintenance needs more accurately, achieving “zero human intervention” in equipment management. Second, based on the big data analysis capabilities of the intelligent system, managers will gain deeper insights into equipment operational status and usage trends, providing scientific foundations for equipment upgrades and resource allocation. Additionally, as the openness and compatibility of the intelligent equipment management platform improve, the system will be able to deeply integrate with other educational management systems, forming a complete ecosystem for managing teaching resources and further enhancing overall educational efficiency.

Conclusion

The application of smart technology in the management of equipment in vocational logistics training rooms can significantly enhance the efficiency and precision of equipment management, achieving functionalities such as real-time monitoring, intelligent scheduling, and predictive maintenance. This effectively addresses the issues present in traditional management models. In the future, as smart technology continues to advance, equipment management in logistics training rooms will increasingly rely on data-driven and intelligent systems, further improving automation levels and resource utilization efficiency. This will provide a more robust guarantee and support for practical teaching in vocational education. Future research could further explore the optimization of intelligent equipment management platforms and their application in broader educational contexts.

Fund Project

This work was supported by the 2024 Guangdong Education Science Planning Project (Higher Education Special) (No. 2024GXJK1130)

References

[1] Gao Jun. Research on the Application of Artificial Intelligence Technology in Smart Logistics. Logistics Technology, 2024, 47(16): 73-75+79.
[2] Meng Fugang. The Application Effects and Challenges of Artificial Intelligence in Intelligent Logistics. East China Science and Technology, 2024, (07): 38-40.
[3] Xue Xiaowei. Research on the Application of Artificial Intelligence Technology in Modern Logistics Systems. China Logistics and Purchasing, 2024, (09): 106-107.
[4] Zhou Shuzhen. Construction and Development of Smart Logistics Training Rooms in Higher Vocational Colleges: A Case Study of Xiamen Ocean Vocational Technology College. Digital Technology and Applications, 2021, 39(12): 104-106.
[5] Wang Hua. Research on Practice Teaching in Higher Vocational Logistics Management Based on Smart Logistics. Chinese and Foreign Entrepreneurs, 2020, (13): 150.
[6] Liu Shanshan. Research on the Management of Logistics Facilities and Equipment in Higher Vocational Colleges. Farmer's Advisor, 2020, (07): 287.