Original Research Article

Research on the Efficiency of College Property Supervision and Management Based on Big Data Analysis

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Abstract: Based on a study of university campus property supervision and management efficiency using large data analysis, the mechanism and influence of big data in property supervision and management are analyzed. The study builds an efficiency evaluation system and examines data acquisition, processing, information asymmetry, and big data analysis limitations. It proposes enhancing efficiency through conceptual updates, strategy adjustments, system innovation, process optimization, technical support, and talent cultivation. While big data analysis offers significant advantages in management, it also presents challenges and limitations that require scientific management strategies and technical solutions to overcome.

Keywords: big data analysis; higher education institution assets; university campus property; property supervision

1. Introduction

University campus property management plays a vital role in ensuring the campus environment, resource management and service quality. However, the traditional property management methods often face problems such as information asymmetry and low efficiency, which is difficult to meet the increasingly complex management needs of modern universities. With the development of big data technology, it has become a new trend to apply big data analysis means to improve the efficiency of property supervision and management in universities. Through the collection, processing and analysis of massive data, big data technology can find potential problems and optimization space, and provide scientific decision support for property management.

2. Theoretical Framework of Big Data Analysis in Property Supervision and Management in Universities

2.1. The Combination Point of Big Data Analysis and Property Supervision and Management

Integrating big data analysis with property supervision and management involves data collection, processing, and analysis. Higher education institution assets supervision and management includes infrastructure maintenance, environmental health, security services, and energy management. Traditional methods relying on manual records and experience are inefficient[1]. Big data analysis can handle vast amounts of data in real-time using intelligent algorithms and models. Sensors and IoT technology enable real-time monitoring of device status, energy consumption, and environmental parameters, uploading data to the cloud for centralized analysis to identify issues and optimization opportunities. Combining campus service data like maintenance requests, complaints, and satisfaction surveys creates a comprehensive management system. Analyzing this data reveals bottlenecks and weak links, providing a scientific basis for decisions, ultimately achieving intelligent, refined, and efficient property supervision and management[2].

2.2. Mechanism of Big Data Analysis in Property Supervision and Management of Universities

The mechanism of big data analysis in university campus property management involves four key steps:

data collection, data processing, data analysis, and decision support. Data collection forms the foundation, using IoT devices, sensors, and information systems to gather real-time operational, environmental, and service data across campus. Data processing ensures data quality through techniques like cleaning, de-duplication, and normalization, enhancing accuracy and reliability. Data analysis, the core of big data technology, employs data mining, machine learning, and predictive analysis to uncover hidden relationships and patterns[3]. For instance, equipment operation data can predict failure risks, while user feedback data can evaluate service quality and satisfaction. Decision support is the ultimate goal, using visual tools and decision support systems to present analysis results to managers, aiding in scientific decision-making. This allows real-time monitoring, problem detection, and resolution, ultimately improving management efficiency[4].

2.3. Influence of Big Data Analysis on The Efficiency of Property Supervision and Management in Colleges and Universities

Big data analysis significantly impacts the efficiency of property supervision and management in universities by optimizing resource allocation and enhancing decision-making. Real-time monitoring and data analysis quickly identify and resolve issues, reducing downtime and improving equipment utilization. For instance, analyzing surveillance video and sensor data enables intelligent security inspections and rapid anomaly response. In addition, big data analysis can distinguish waste and inefficiency to develop an optimization plan. Energy consumption analysis can reveal the high energy consumption period, and thus formulate cost-saving measures. Comprehensive data analysis aids managers in making informed decisions, such as assessing service effectiveness to guide management optimization. Overall, big data enhances property management efficiency and quality, supports scientific decision-making, and promotes modern management development.

3. Evaluation System of the Efficiency of Property Supervision and Management in Colleges and Universities

3.1. Evaluation Dimension of College and University Campus Property Supervision and Management Efficiency

The efficiency evaluation of property supervision and management in colleges and universities includes several dimensions to comprehensively reflect overall effectiveness. The management efficiency dimension measures the speed and effectiveness of activities like troubleshooting and maintenance response times. The service quality dimension assesses the service level provided, including cleanliness, environmental maintenance, and security services. Cost control evaluates economic benefits, focusing on energy consumption, maintenance costs, and human resources. The resource utilization dimension examines the effective use of resources, such as site and equipment utilization rates, aiming to optimize allocation. User satisfaction surveys reflect teachers' and students' satisfaction levels. These dimensions form a comprehensive evaluation framework, providing a scientific basis for assessing university property management effectiveness.

3.2. Selection Principles of Evaluation Indicators

The selection of evaluation indicators should adhere to four key principles: scientificity, systematization, operability, and comparability. The scientific principle ensures that the indicators have a solid theoretical basis and can objectively reflect the efficacy of property management. Systematization requires the indicators to provide comprehensive coverage of all relevant aspects, thereby avoiding one-sidedness and omissions, ensuring

a complete evaluation. Operability demands that the indicators have clear definitions, straightforward calculation methods, ease of data access, and practical implementation, making the system functional and user-friendly. Comparability is crucial for standardization, allowing for effective comparison across different times and universities, thereby ensuring the evaluation results are universally applicable. Additionally, data availability and effectiveness must be considered to guarantee that the indicators accurately reflect the real situation, relying on reliable data sources. By adhering to these principles, the evaluation system will accurately reflect the efficiency of property supervision and management in colleges and universities, providing a robust framework for ongoing assessment and improvement.

3.3. Construction of the Evaluation Index System

Constructing an evaluation index system is a systematic project requiring consideration of universities' actual conditions and management goals. First, specific evaluation indicators under each dimension must be determined. For example, for management efficiency, indicators like fault handling time, maintenance response time, and daily management process execution time can be set; for service quality, indicators such as cleanliness score, environmental maintenance status, and security service quality can be included. Each index must be scientific, systematic, operable, and comparable. Then, set the index weights to reflect their relative importance in the overall evaluation, using methods like expert scoring and the Delphi method to ensure rational and objective weight allocation. Finally, establish evaluation criteria and a scoring mechanism with specific criteria and calculation methods for each index, ensuring transparency and fairness in the evaluation process. This process forms a comprehensive, scientific, and reasonable efficiency evaluation system for college property supervision and management, enabling objective evaluation of property management effectiveness and providing a solid basis for improvement and optimization.

4. Analysis of the Efficiency Problems of University Campus Property Supervision and Management Based on Big Data Analysis

4.1. Key Issues of Data Acquisition and Processing

In university campus property supervision and management, critical challenges in data acquisition and processing arise from the diversity of data sources and the complexity of data processing. Collecting data is often time-consuming due to the various types involved, such as maintenance records, energy consumption data, and security monitoring information, which are dispersed across different systems. The complexity of processing this data stems from inconsistent formats and varying quality, necessitating extensive cleaning and integration efforts to ensure data accuracy and consistency. Additionally, processing must account for the real-time nature of the data to provide timely information that supports decision-making. Despite the robust capabilities of big data analysis, efficiently acquiring and managing this diverse data set remains a significant hurdle in improving the efficacy of property supervision and management in universities. To overcome these challenges, universities must implement standardized data collection methods and invest in advanced processing technologies. This approach will help streamline the acquisition and processing of data, enabling more accurate and timely insights that enhance overall property management efficiency.

4.2. Information Asymmetry in the Property Supervision and Management of Colleges and Universities

In the context of property supervision management in universities, the issue of information asymmetry is

a significant factor affecting management efficacy. Information asymmetry refers to the incomplete and unequal distribution of information between the school management and the property service providers during the property management process, leading to decision-making errors and reduced management efficacy. Property service providers usually possess detailed information about service implementation, such as maintenance progress and equipment status, but this information may not be timely or accurately conveyed to the school management. The lack of these key pieces of information prevents the management from making scientifically sound decisions, thereby reducing the efficacy of property management. Additionally, information asymmetry is evident in the supervision feedback process, where feedback from students and staff, as direct users of property services, is not fully collected and utilized, resulting in insufficient targeting and effectiveness of property management improvements.

4.3. Limitations of Big Data Analysis in Property Supervision and Management of Universities

While big data analysis offers significant advantages in university campus property supervision and management, its limitations are notable. University campus property management involves diverse data sources, including maintenance records, energy consumption, and security monitoring. Ensuring data accuracy and consistency is challenging, with risks of redundancy, deletion, or errors affecting reliability. Implementing big data analysis requires substantial technical support and capital investment in equipment, software, and storage, which can strain some universities. In addition, managing sensitive data for teachers and students also poses privacy risks. Effective big data application also demands skilled personnel, and the shortage of such professionals in university management complicates its full utilization.

5. Discussion on the Path of Big Data Analysis to Improve the Efficiency of Property Supervision and Management in Colleges and Universities

5.1. Concept Update and Strategy Adjustment

School management must embrace a modern, data-driven decision-making approach, acknowledging the significant potential of big data analysis to enhance management efficiency. Traditional methods, which rely heavily on experience and manual judgment, are insufficient for addressing complex and dynamic demands. Modern management should instead utilize big data technology to achieve precise and scientific management through data mining and analysis. This shift necessitates that managers transition from empirical to data-driven decision-making, leveraging insights from big data to develop targeted and proactive strategies. By implementing real-time monitoring and analysis, schools can promptly identify and address issues related to property management. Adopting this modern approach allows for more effective and timely interventions, ultimately improving the overall management efficacy and ensuring that the school's property management practices are both efficient and responsive to emerging needs.

A key component of this conceptual update is the adjustment of strategies. Schools must formulate property supervision strategies grounded in big data, establishing clear processes and standards for data collection, processing, and analysis to guarantee both accuracy and timeliness. Furthermore, these strategies should prioritize multi-departmental collaboration, aiming to dismantle information silos and foster data sharing, thereby creating a comprehensive property management data system. Effective interdepartmental information exchange significantly enhances management efficiency and helps prevent decision-making errors that arise from information asymmetry. By focusing on these strategic adjustments, schools can ensure that their property

management practices are not only precise and up-to-date but also integrated across various departments, leading to more informed and accurate decisions. This holistic approach to property supervision supports improved operational efficiency and better resource utilization, ultimately contributing to the overall effectiveness of the institution's management efforts.

5.2. System Innovation and Process Optimization

Property supervision and management in colleges and universities requires a robust data management system, clearly defined responsibilities, and streamlined processes to ensure data accuracy and timeliness. This involves setting up standardized methods and procedures for data collection to ensure the reliability of sources. For example, creating clear guidelines for sensor installation and maintenance guarantees the accuracy of equipment data, while implementing a user feedback system provides timely insights into service quality. A comprehensive system for data processing and storage is also essential. It should include standardized protocols for data cleaning, weighting, and normalization to maintain consistency and integrity. Furthermore, defining specific storage locations and establishing access rights ensures both the security and availability of the data. By standardizing these processes, schools can ensure that the data used for property management is both accurate and reliable, ultimately supporting better decision-making and efficient management.

Optimizing processes is essential for enhancing the efficacy of property supervision and management. Through big data analysis, inefficiencies in current processes can be identified and addressed, resulting in improved strategies. In service management, analyzing user feedback can help optimize processes, thereby enhancing service quality and customer satisfaction. Cross-departmental coordination is also necessary, and establishing a robust data-sharing mechanism facilitates efficient information exchange. For instance, by sharing data, security and maintenance departments can swiftly address potential risks, thereby improving overall efficiency. Furthermore, innovation in systems and process optimization lays a strong foundation for the effective use of big data analysis. This approach promotes intelligent and modern property management within universities, ensuring that operations are streamlined and resources are utilized effectively. By continuously refining processes and encouraging interdepartmental collaboration, universities can significantly enhance their property management capabilities, ultimately leading to more efficient and effective management practices.

5.3. Technical Support and Talent Training

To bolster supervision and management, schools must introduce advanced big data analysis technologies. This includes deploying comprehensive data collection systems and IoT devices to facilitate real-time monitoring. Such technologies enable schools to continuously monitor property operations, swiftly identify potential issues, and address them promptly. Establishing a unified data processing and analysis platform is essential. This platform will integrate, clean, and analyze property management data, thereby providing a scientific basis for informed decision-making. For instance, big data can be utilized to predict equipment failures, thus optimizing maintenance plans and reducing downtime. Additionally, adopting cloud computing is crucial. It enhances the speed of data processing and ensures secure data storage, making the management process more efficient and reliable. Furthermore, schools should invest in training staff to handle these advanced technologies effectively. Offering training programs and practical opportunities will help existing staff master data collection, processing, and analysis skills. Recruiting experts in big data, IoT, and information technology will further enhance the technical capabilities of the management team. By combining technological support with robust talent training,

schools can significantly improve their property supervision and management efficiency, ultimately supporting sustainable school development.

Talent development is also crucial in improving property supervision and management efficiency. Schools should focus on cultivating and recruiting professionals with big data analysis capabilities. Offering training courses and practical opportunities for existing staff can help them master essential skills in data collection, processing, and analysis. Recruiting experts in big data, IoT, and information technology will further strengthen the technical capabilities of the management team. Additionally, implementing reward and promotion mechanisms will incentivize continuous skill improvement among staff. Schools can also foster a culture of innovation and learning to keep up with the latest advancements in technology. By advancing both technical support and talent development, institutions can enhance their property supervision management, achieve more refined and data-driven decision-making, and support sustainable school development. These efforts will ensure that the school remains competitive and efficient in its operations, ultimately benefiting the entire educational community.

6. Conclusion

This study provides a comprehensive analysis of the theoretical framework, efficiency evaluation system, and the challenges associated with the application of big data in university campus property supervision and management. It explores how big data analysis can significantly enhance efficiency, optimize resource allocation, and improve decision-making processes in property management. Despite its numerous advantages, challenges such as data acquisition, processing complexities, information asymmetry, and technical limitations persist. By renewing concepts, adjusting strategies, innovating systems, optimizing processes, providing robust technical support, and training specialized talent, universities can greatly enhance the efficiency of property supervision and management. These findings offer substantial theoretical support and practical guidance, underscoring the practical significance and application value for university campus property management, ultimately contributing to the overall improvement of educational institution operations.

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