Analysis of constraints on data management of intelligent platform for smart building in the era of big data

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Abstract. With the rapid development of science and technology in China, data has become the core of various fields and industries. The construction industry is the first to bear the brunt. The merits and demerits of data management can directly determine whether smart buildings are worthy of the term "smart". However, at present, the management level of most intelligent platform data of smart buildings is low, which cannot well adapt to and meet the development needs of smart buildings. Therefore, in view of the problems existing in the data management of the intelligent platform of the existing smart building in the era of big data, this paper conducts in-depth research and exploration, and points out the main restraining factors of the data management of the intelligent platform of the smart building. This paper expounds how to achieve more fine, safe and intelligent management of the data of intelligent platform of smart buildings in the era of big data.

1. Introduction
In July 2015, the General Office of the State Council issued Several Opinions on Applying Big Data to Strengthen the Service and Supervision of Market Subjects, marking that China has entered the design reform stage of using big data for management¹. Smart building is a new era of data fusion technology and intelligent building depth, but the current smart building industry are widespread phenomenon of light focused on construction operations, the structure of the construction period is 1 to 3 years, but the building use fixed number of year for 50 years or even hundreds of years, how to in the construction of the whole life period always meet operational architecture concept wisdom, this is a topic worthy of study².

In order to meet the implementation of the concept of intelligent operation and maintenance, the intelligent platform of the building arises as The Times require. This kind of platform refers to the real-time monitoring and management of scattered and independent intelligent instruments, fire safety data and other data using a unified software interface. Users can view and browse through the browser, and the content can be displayed through the electronic map, animation and other forms of display interface, intuitive display of equipment operating state information and energy consumption and other information, and provide interaction mode.

The emergence of intelligent platform for buildings has injected new vitality into the operation and maintenance management of smart buildings, but also brought new problems. The higher the degree of dependence on the application of building information system, the more data security problems will be, which further urges people to increase the research on the security of data management of intelligent
platform[3]. Due to the large growth of communication operation data, the platform needs to face all kinds of different data, which is a new challenge to the data management of platform system.

2. Intelligent platform and data management

With the continuous improvement of modern information technologies such as BIM, cloud computing, artificial intelligence, mobile Internet, Internet of Things and digitization, the needs of social development are constantly rising, and various intelligent devices in intelligent buildings are constantly increasing.

All kinds of mechanical and electrical equipment are equipped with intelligent control function, and the corresponding software system is also increasing continuously, such as building automatic control, intelligent light control and parking management system[4]. The existence of intelligent platform is to integrate the corresponding system software of buildings for management, and to realize the integrated management and automatic operation and maintenance of smart building. In the next decade or so, with the continuous improvement of information technology, as a product of the development of information technology, the construction of intelligent platform will only become increasingly perfect and have more innovative functions[5]. Figure 1 lists some subsystems of the intelligent platform of the smart building.

![Figure 1. Some subsystems of intelligent platform of smart building](image)

The intelligent platform of smart building emphasized in China is mostly used as an "intermediary", that is, the platform provides basic data management function, and what kind of data is stored on the platform is determined by the function. The platform is not responsible for the standardization of data and the establishment of object association relationship. This form of intelligent platform only plays the role of centralized data storage, and cannot improve the degree of data normalization, data quality and convenience of access[6].

Now, "data management" in the practical sense refers to the supervision of the data processing process as a management behavior. Different from data processing, data management, in addition to the work content of the data processing center, also need to be responsible for data caliber, data input, output management, audit and other work. It covers a wider area and is more complicated to implement [7]. The level of data management is the standard to measure the operation quality and data integrity of building intelligent platform, but it is not the only standard. Figure 2 is the analysis table of intelligent platform architecture of smart building.
3. Constraints on data management of intelligent platforms for smart building

Building operators hope to carry out intensive construction and management of data to realize green energy saving, wisdom and efficiency of data management. Building users hope to intuitively understand and interact with the data, and obtain corresponding information through their own needs, so as to achieve a substantial improvement in residential comfort and real-time guarantee of safety. The emergence of intelligent platform has built a common tie for the two.

In order to promote the wide application of intelligent platform, it is necessary to clarify the key factors that restrict the development of data management of intelligent platform. According to relevant literature review and field experience, the following problems have become the key constraints:

3.1. The information independence of each system of the platform is too strong

With the continuous development of smart building industry, the building data system has become more and more complex and advanced, gradually forming a complete set of data system including monitoring, control and management. These systems include building automatic control system, intelligent light control system, multimedia conference system, parking management system and so on. However, while these data systems can play their unique roles, there are also some problems of insufficient collaborative efficiency. The main reason is that the independence of each data system is too strong, the information model and object identification in each data system are inconsistent, and the information sharing needs to do complicated mapping.

The existing and used data systems are established by various companies or departments according to their own business needs, which are not unified in time and space, even in terms of professional technology. This represents a kind of non-standard, non-standard in management and non-standard in technology. This non-standard directly leads to the difficulty in the smooth data exchange between these scattered data systems, which brings a lot of trouble to the construction operation and maintenance work.

If the data of each system can be integrated, more accurate and complete information can be provided for the decision making of the operation and maintenance management department of the
intelligent building. The significance of the construction of intelligent platform lies in the fact that it is committed to the effective connection between the data system at the technical level and the data system at the management level. The effective integration between the data systems can make the data between the two can effectively communicate, the management information system can also more convenient to obtain the real-time data inside the building, to make the right decision. Decision-making information can also be conveyed to users more accurately and efficiently, providing technical and information support for the fine management of smart buildings.

3.2. Data security is compromised
In the era of big data, when intelligent platforms become an indispensable part of most people's work and life, data security issues also come randomly. Data security has two meanings: one meaning is the protection of the data itself, mainly the confidentiality, availability and integrity of the data. Another meaning is the security of data storage, such as data disaster preparation, regular backup, disk array, etc.

In the process of data management, the user can upload the data, but the user's access authority is not unique, the corresponding data can also be intentionally attacked or unintentionally browses in the form of Trojan virus, hacker attack, service provider login and so on. This can easily lead to leakage of building management information and operation paralysis, which will bring huge economic losses to the managers. For individual users, the harm of hacker attacks is relatively small, but the user information is blatantly put on the Internet for sale of this kind of malicious events have become common. Therefore, how to ensure the privacy security of users and the data security of the whole intelligent platform has become an urgent problem for many managers and users to solve.

The second threat is data loss. The impact of data loss cannot be underestimated. One of the principles of data information security is the traceability of data, which requires that any sensitive operation involving security in the system should be recorded. Smart building has a high degree of digitization and information. Once information loss or leakage occurs, the operation of the whole building and the personal security of users may be affected, and the building will be paralyzed to a large extent [8].

3.3. System complexity rises and information resource allocation lags behind
In order to meet the various needs of residential users, the number of intelligent platform subsystems of smart buildings on the market has increased significantly. In addition, due to the scattered data of various systems, the repeated configuration of hardware and software inevitably occurs, and the resources of the entire configuration cannot be fully utilized, let alone resource sharing. Redundant resources also cause the usual maintenance is very heavy.

The configuration of each subsystem of the intelligent platform is different, and the upgrading and transformation cannot be carried out uniformly, which further worsens the lagging state of information resource allocation. With the arrival of the era of big data, the negative impact of lagging information resource allocation on the data management of intelligent platform restricts the sound and orderly development of intelligent building to a large extent.

4. The solution to the problem of intelligent platform data management
The data management of intelligent platform is one of the key issues related to whether smart building can be recognized by users. It is practical significance and theoretical research value to theoretically analyze the data management problems of intelligent platform and explore effective ways to promote the harmonious development of smart city. According to the investigation, analysis and summary, the solutions to the data management problems of the intelligent platform of the intelligent building are discussed from the following three aspects:

4.1. Solve the data "island" problem
Vigorously researching system integration products and updating the basic configuration of intelligent
platforms. Now the market is full of intelligent platform products, but can really fundamentally solve the problem of data "island" products have not appeared. To improve the scientific research in this field needs the support of the government and the recognition of the society. The building of smart cities is not just a pipe dream, it is the trend of the next few decades. At the same time, increase data connectivity. Data interconnection can speed up the response rate of equipment and greatly improve the efficiency of building operation, but it is necessary to consider that the premise of full data interconnection is to have a strong security guarantee.

4.2. Solve data security issues
On the data management system of intelligent platform, work norms of safety functions and data security accountability system should be formulated. Personnel ability requires that the data security professional personnel can clear the security objectives, and can effectively adjust the functional Settings; In the data transmission, encryption and authentication are used to protect and manage the important data in transmission to avoid the loss and leakage of important data that may be caused in the transmission process; Periodically carry out data replication, backup and recovery to achieve redundancy management of stored data and protect the validity of data. In the process of data transmission and release, the data format and the scope of adaptation should be controlled in order to realize the data security management in the process of data transmission and release.

4.3. Solve the problem of information resource lag
Information resource allocation must give consideration to both fairness and efficiency, and maximize the benefit of information resource allocation while satisfying users' information demand. Smart building industry is the product of the new era, so in the process of intelligent platform operation and maintenance, it is necessary to keep up with the pace of The Times, update each subsystem of the intelligent platform on a large scale in time, keep in line with the market development, and strengthen the platform maintenance, so as to solve the problem of information lag.

5. Summary
Compared with foreign countries, the concept of smart city has entered the research field of Chinese scholars relatively late. In recent years, with the rapid development of BIM, Internet of Things, big data and other technologies, the development of smart city has brought vitality, and the establishment of smart city has also been placed on the level of national strategy. However, with the deepening of the field of smart city, problems have emerged one by one. This paper clearly points out three factors that restrict the data management of intelligent platform: data "island" problem, data security problem and information resource lag problem, and gives corresponding solutions. It is helpful to promote the further development of smart city, but the discussion in this paper is only the tip of the iceberg of smart city construction, and the data management of smart building platform still needs further research and optimization. To truly achieve more sophisticated, safe and intelligent management of intelligent platform data, it requires the participation and thinking of scholars of all sessions.

References
[1] The Central People's Government of the People's Republic of China. (2015) Opinions of the General Office of the State Council on Using Big Data to Strengthen Service and Supervision of Market Entities. http://www.gov.cn/zhengce/content/2015-07/01/content_9994.htm.
[2] Liu ZK. (2019) Analysis on Construction Technology and New Application of Intelligent Building Engineering in China. Home, 16: 74.
[3] Xie L, Zhang QH. (2016) Security Threats and Countermeasures of Intelligent Building System. Intelligent Building, 07: 33-36.
[4] Tang XM. (2017) The Design and Implementation of Intelligent Building Integrated Management Platform. Jilin university, MA thesis.
[5] Eini Roja et al. (2021) Smart building management system: Performance specifications and design requirements. Journal of Building Engineering, 39.

[6] Zhao YL. (2008) Modeling of Next Generation Energy-Efficient Design Software for Buildings and Implementation of Management Platform of BIM Data. BeiJing: Tsinghua university, MA thesis.

[7] Li LJ. (2011) IoT data management and intelligent processing. ZTE Technology Journal, 17(01): 38-41.

[8] Lv B. (2012) Research on Information Resources Allocation in the Context of Regional Innovation System. Wuhan university, MA thesis.