Design of Asset Digitalization Management System for Communication Enterprises

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Abstract. Modern enterprise management is developing rapidly, and one of the most important components is enterprise digital management. The rapid development of digital technology has not only triggered the transformation of production mode, but also profoundly changed the business system and value model of enterprises. Communication enterprises generally build large-scale data centers, which are by far the most complex systems in the IT industry. Traditional asset management methods have been unable to meet the requirements of modern enterprise management in the face of U-level IT assets. Offline information communication and manual asset positioning are difficult to meet the requirements of modern enterprise management. This paper introduces the era background of digital development, and expounds the current situation of enterprise digital management. Combined with classification and coding, data model, QR code, RFID technology and other technologies, an *asset digitalization* management system for full life cycle management is designed and optimized for U-level IT assets.

Keywords: communication enterprise · digital management · asset digitalization · RFID · QR code

1 Introduction

2021 is the first year of China's new round of planning. In line with the overall development trend of the world, China adheres to the implementation of the informatization development strategy, builds a digital China, strengthens planning guidance, promotes the digital transformation of the industry, and creates a good development environment for the digital society.

With the outbreak and continuous spread of the COVID-19 epidemic, many enterprises began to shift from offline operation to online self-help, which objectively greatly promoted the process of digital technology and made many enterprises rapidly realize the digital transformation of the Internet; In addition, many enterprises have also rapidly changed their business methods, attached importance to content management, and adopted digital technologies and methods such as live broadcasting to carry out business [1].
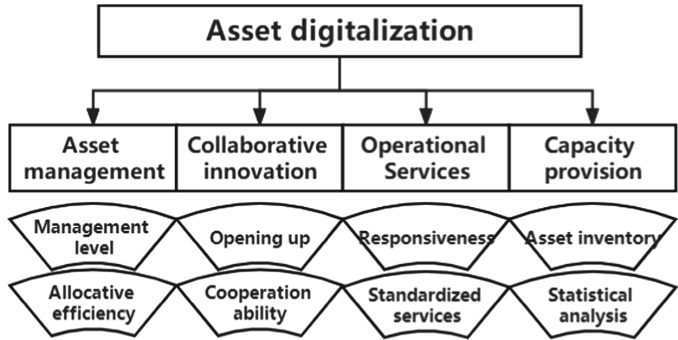
Fig. 1. Requirements for asset digitalization

The rapid development of digital technology has not only triggered the transformation of production mode, but also will profoundly change the business system and value model of enterprises. Enterprises can use digital transformation to optimize, innovate and reconstruct the value system, constantly improve the stock business, achieve efficiency improvement, cost reduction and quality improvement, and constantly obtain increasingly personalized and dynamic value and new incremental space to achieve new high-quality development.

Digital management is an important aspect of modern enterprise management [2]. The survival and development of enterprises are closely related to strengthening the protection of their digital resources. With the help of digital technology, it can meet many needs in asset management, such as realizing the integration, association and classification of scattered assets, comprehensively improving the management level of assets and the efficiency of resource allocation, and realizing the demand of economic management; To achieve convenient and effective inventory of enterprise assets. In terms of operation, it can also comprehensively improve the responsiveness of operation services and the level of standardized services. In addition, with the help of asset digitalization, the statistical analysis of financial indicators of assets is also realized, and the effective release and value creation of assets are realized. Figure 1 illustrates various typical requirements for asset digitization.

This paper first introduces the connotation of asset digitalization and several typical technologies, and puts forward a specific example of asset digitalization system for communication enterprises. Finally, it gives the development trend of asset digitalization.

2   Digital Management

2.1   Asset Digitization

Under the wave of digitalization, asset digitalization is the basis for the development of digitalized management. Mapping huge physical assets and intangible resources into digital assets through digital means can facilitate resource invocation and sharing, and reduce resource waste, reduce costs and increase efficiency through technical means.

The refined management and operation of assets can also enhance the safety, pertinence, timeliness and effectiveness of asset utilization and supervision. Through online asset management process and data visualization, all data can be connected and operation business can be effectively carried out, and various asset classifications and data can be graphically presented to provide strong data support for operation decisions, so as to achieve full process control and supervision. Get through all links and data of asset management, prevent asset loss, and then realize the revitalization of asset value with low efficiency and the overall improvement of asset value, forming a unified asset management system.

Digitalization of assets is a new mechanism and mode, a new rule at the level of operational thinking. With the continuous interaction of data, more and more people participate in the digital platform. The value evaluation of assets in the process of circulation will increase the value and credit of those involved. This is a fission development for both enterprises and users. Only in this way can the platform have value and provide more professional services. The process of asset digitization is to extract information data from a large amount of data generated by asset objects, management processes and management rules, and process the data according to the digital dimension to support digital management.

2.2 Digitalization of Assets and Digital Assets

Assets are the core component of the economy. The emergence of a new asset category often has a corresponding economic and social development background. The order of figures and assets is simply adjusted, but the connotation is very different. Digital asset is the process of transforming digital into a valuable asset, while asset digitization is the process of transforming physical assets into binary numbers in the virtual world. There are significant differences in economic essence, value realization process and accounting methods between the two. Asset digitization is the process of transforming assets in the physical world into digital forms and mapping them into digital space. In a sense, no new assets are created; And digital assets emphasize the creation of data assets, marking the birth of this new factor of production. The meanings of the two are quite different, and it is easy to cause confusion to summarize them with digital assets [3].

2.3 Differences Between Asset Digitalization Management and Traditional Asset Management

Digital management is an important aspect of modern enterprise management. Traditional management methods rely on manual search and retrieval of digital assets or documents to communicate various businesses offline. This usually requires people to participate, resulting in various problems, such as file storage problems, security problems and efficiency problems. In the daily work of asset management, these shortcomings increasingly affect the development of enterprises. Therefore, it is necessary to establish a digital management system for each enterprise to meet its special requirements and enable it to keep up with the continuous improvement of informatization. The differences between asset digitalization management and traditional asset management are as follows:

First, change from tool thinking to digital concept. Traditional asset management focuses on the construction and application of existing systems, systems and processes, and regards the management platform as a simple tool. Digital management transformation focuses on business model and platform operation, and data needs to be regarded as the core production factor.

The second is the transformation from data island to value flow. Digitalization makes full use of information system and new generation ICT technology, and through real-time acquisition of business data, network collaboration, and intelligent application, it opens up enterprise data islands, allows data to flow freely in enterprise systems, and gives full play to data value.

The third is the transformation from empirical judgment to intelligent decision-making. This requires enterprise managers to come out of their original production experience, and through the digital management of enterprise assets, change the concept of decision-making from empirical judgment to data speaking and intelligent decision-making, so as to expand their insight and selection ability of industrial layout.

3   Several Typical Technologies in Asset Digitization

3.1   Classification and Coding

Classification and coding is the cornerstone of asset digitization, the premise of asset management information system construction in the digital era, the basis of asset information input, storage, processing, exchange, query, classification, summary and statistical analysis, and the benchmark of asset allocation, use, disposal, performance evaluation and other whole process management [4].

In actual enterprise management, a series of standards for asset classification and coding can be established, and the thinking and method of "unique coding and multi-dimensional classification" can be used to constantly explore standards that adapt to their own development.

Here is an example. The digital reform and standardization system of Zhejiang Province, China has established a series of standards for asset classification and coding, which belongs to the wide area general local standards and will be implemented on January 10, 2022.

The first part of this series of standards specifies the coding and barcode representation of assets, provides specific rules for the unique coding of assets, and solves the problem of the uniqueness of assets in digital space; The second part specifies the principles, processes and methods, identification forms and applications of multi-dimensional classification and coding of assets, providing guidance for scientific and reasonable classification of assets; The third part specifies the principles and methods of multi-dimensional description of asset card information, the composition and extension methods of attribute items and attribute item dimension labels of asset cards, and provides design specifications for multi-dimensional description of asset information.

3.2   Asset Data Model

Data model is an abstraction of real world data characteristics, which is used to describe the concepts and definitions of a group of data. The physical structure of data is the real

structure in the real world, while the logical structure of data is the logical relationship between data elements.

The asset data model is an abstraction of the characteristics of various asset data [5], including static data and dynamic data. The former describes the functions, attributes, structural design parameters and various specifications of the physical asset ontology; The latter describes various activity records generated during the creation, use and scrapping of physical assets, including asset operation status, maintenance and replacement history, etc. The data model has different ways of expression in different systems. In the design stage, the design unit builds the ontology data model through digital design tools, generates material statistics and construction drawings to guide procurement and construction; In the construction stage, the construction unit generates the construction scheme by using the design ontology data model, and adds the construction activity records to the asset data model; At the delivery stage of the factory, complete the digital delivery of engineering design ontology data, manufacturer ontology data and activity records as well as the activity records of the construction unit according to the management requirements of the factory operation period; In the operation stage, the ontology data such as activity records and asset technology improvement generated by a series of activities such as asset operation and maintenance are continuously updated into the asset model, forming the asset data model of the whole life cycle.

3.3 Equipment Identification

The QR code is an iterative version of the bar code, which overcomes the disadvantage of the small information load of the bar code [6]. For equipment management, the equipment identification code can be used as the only voucher of the equipment, and the equipment identification code is represented by a QR code, which improves the convenience of obtaining equipment information. The life cycle of equipment identification code is like a person's ID card. It is generated before the equipment leaves the factory. It participates in the management of the whole life cycle of equipment from equipment purchase and warehousing, equipment ex warehouse, equipment installation, equipment maintenance, equipment lubrication, equipment return to the factory for maintenance to equipment scrapping. No matter in any link, only scanning the equipment identification code can uniquely identify the equipment.

RFID is a kind of automatic identification technology [7]. It carries out non-contact two-way data communication through radio frequency, and reads and writes electronic tags by radio frequency, so as to achieve the purpose of identification and data exchange. In terms of its use, QR codes are disposable, and RFID has advantages in real-time updating of information, storage of information, service life, work efficiency, security and so on. RFID can more conveniently update existing data and make work more convenient on the premise of reducing human, material and financial resources; RFID technology stores information according to computers, etc., up to several megabytes, which can store a large amount of information to ensure the smooth progress of work; Multiple targets can be identified at the same time, greatly improving work efficiency; The RFID is also provided with password protection, which is not easy to be forged and has high security. However, the price of RFID electronic tags is much higher than that of QR code tags. If they are used in large quantities, the use cost is often difficult to bear.
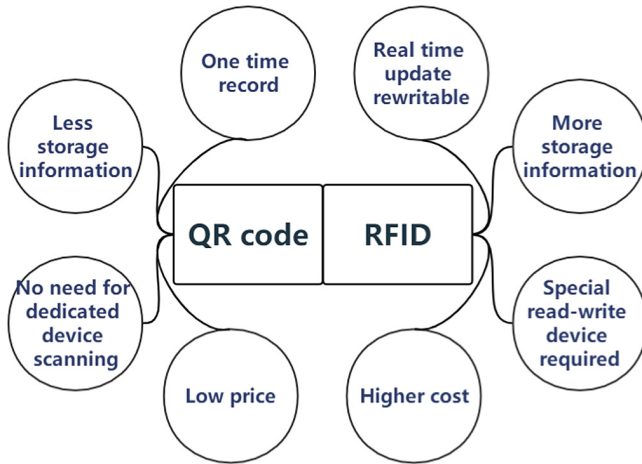
Fig. 2. Comparison between QR code and RFID

They are usually used in combination. Figure 2 lists the advantages and disadvantages of QR code technology and RFID technology in the field of equipment identification.

4 Examples of Asset Digitalization in Communication Enterprises

The data center computer room is by far the most complex system in the IT industry, which covers dozens of professional fields, hundreds of sub industries, and thousands of different brands and types of products. These physical products from different manufacturers and brands are the assets of the data center. U-level assets refer to the IT hardware products installed in the data center cabinet, such as servers, storage, network equipment, etc. They serve as the data collection, processing, transmission and storage functions of the data center, and are the core assets to ensure the operation of the entire data center [8]. Next, taking U-level assets as the object, we will introduce an example of asset digitization system for a small and medium-sized laboratory in a communication enterprise. The system framework is shown in Fig. 3.

The digitalization of assets should first include all kinds of assets into management. The more information saved, the more management functions can be realized in the future. Use classification and coding technology to determine the most appropriate information classification method according to the characteristics of assets or the needs of the enterprise itself. For communication enterprises, most of them are hardware devices. Therefore, classification by device type is the most basic, such as servers, switches, routers, instruments, etc. Due to the different liquidity of equipment, it can also be classified according to the asset attribute. The equipment purchased with the enterprise's own funds can be listed as its own assets, and the equipment leased can be listed as leased assets, while the equipment of other cooperative enterprises can be listed as borrowed assets, trusted equipment, and so on. Each asset should have its own unique asset card, which records the above static information in detail.

One of the major difficulties of U-level asset management is to dynamically determine and track its location and change information. At present, most of them use QR code technology and RFID tag technology together. After the assets are registered, the common information is represented by QR code, and printed paper labels are directly pasted on the surface of each equipment. All other information is stored in RFID tags by virtue of the large amount of information stored in RFID tags and the characteristics of real-time update and modification.

This tag identification system includes three levels of asset basic information, dynamic information and associated information. The unique asset code can effectively identify asset characteristics and reflect the dynamic changes of assets, so as to realize the full life cycle management of assets. Based on this, the asset management system is deeply in line with the actual control needs to achieve the full life cycle control of assets from purchase, receipt/issue, power on/off, change, collection, and transfer. Through the process application, the records include the collecting personnel, project team, collecting cycle, change information, repair details and other information. The strict and standardized management process not only improves the utilization rate of assets and avoids repeated waste of resources, but also controls from the source of assets and solves the problems of inconsistent accounts and materials, unclear assets and equipment, idle waste, virtual increase of assets and loss of assets in asset management. Based on the
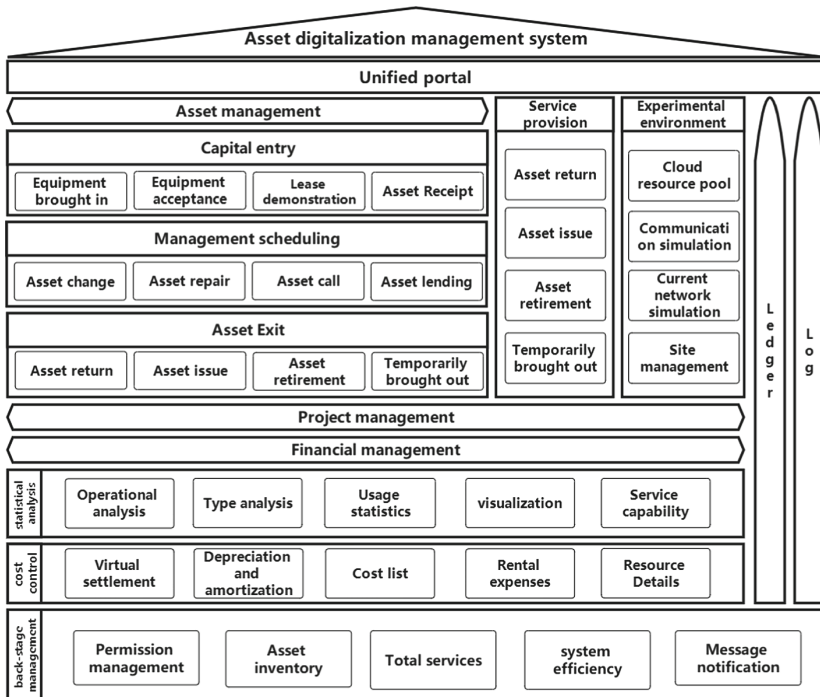

Fig. 3. Asset digitalization system of communication enterprises

digitalization of platform assets, the entire asset management intelligent operation system has formed value enabling output in asset use, project resources, asset operation analysis, capacity service provision and financial auxiliary decision-making, realizing management innovation and refined operation of resources.

Of course, for the information room with a relatively complex operating environment, whether it is a QR code tag or an RFID metal tag, there are certain shortcomings, such as difficulty in scanning and susceptibility to electromagnetic interference. It is difficult to meet the application requirements of accurate positioning and integrated management of u-Position assets. In view of this problem, there are also many solutions. For example, reference [9] proposed an internationally leading way of combining MC-RFID smart tag with QR code to achieve the goal of systematic management of U-level asset space-time information.

5   Conclusion

This paper presents a specific example of asset digitalization in a communication enterprise, outlines the considerations for building an asset data model and the process of mapping physical assets to digital space. The equipment identification method uses QR code and RFID technology as the combination of the main equipment identification methods, and cooperates with the asset management system to complete the management and control of the entire life cycle of assets.

Digitization is the trend of future development, and the digital upgrading of enterprises is an inevitable requirement under the change of enterprise consumption structure, which also brings about the further expansion of the gap of enterprise competitiveness. Integrate technology and business as a whole to drive business value growth and management transformation. The changes and innovations brought about by digitalization include not only the technology, but also the entire industrial chain and even the entire industry. With the development of the times, application fields of digitalization are gradually expanding to government, finance, retail, agriculture, industry, transportation, logistics, medical health and other industries.

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