Hindawi
Mobile Information Systems
Volume 2022, Article ID 5677870, 12 pages
https://doi.org/10.1155/2022/5677870

Research Article

Design and Implementation of Enterprise Financial Risk Control Information Management System Based on Big Data of Internet of Things

Daowen Ren[1] and Haiyan Wu[2]

[1]*School of Accounting, Guangzhou College of Technology and Business, Guangzhou 510850, Guangdong, China*
[2]*School of Management, South China Business College Guangdong University of Foreign Studies, Guangzhou 510545, Guangdong, China*

Correspondence should be addressed to Haiyan Wu; 204004@gwng.edu.cn

Received 14 June 2022; Revised 12 July 2022; Accepted 19 July 2022; Published 13 August 2022

Academic Editor: Yanyi Rao

The Internet of Things is a huge network. It is a combination of massive sensing devices and the Internet. In the Internet of Things, a large number of sensing devices are continuously collecting data and sending it to the data center. Data present massive characteristics, forming the big data of the Internet of Things. With the rapid development of informatization and network technology, almost all domestic enterprises have paid more and more attention to the research of enterprise network, informatization, and interactive experience. Under the background of the rapid development of e-commerce, the enterprise financial risk control information management system is bound to become the trend of information development. In the process of system analysis, this paper considers the sustainable development needs of the actual business of the enterprise financial risk control information management system and makes an in-depth study on the management and technology of the system development in strict accordance with the business process optimization and principles of the enterprise financial risk control information management system. This paper proposes to introduce the technology of Internet of Things into the enterprise financial risk control information management system, build the application mode framework of Internet of Things for enterprise asset management, and focus on the in-depth study of key technologies such as data collection and information transmission. The experimental results show that the time cost of sensor clustering is 1% of hierarchical clustering. In the worst case, the time cost of sensor clustering only accounts for 1/14 of hierarchical clustering.

1. Introduction

In recent years, with the development of electronic technology, the operation mode of social production and public services is developing in the direction of intelligence, leading to the development of society. IoT big data is one of the hot spots in the current IoT industry development. The Internet of Things integrates intelligent perception and recognition technology with ubiquitous computing and ubiquitous networks. It is called the third wave of the Internet of Things in the development of the world's information industry after the computer and the Internet. It mainly uses intelligent sensing, identification, and other technologies and uses network communication transmission technology to communicate things. IoT technology is changing the way of life.

With the wide application of Internet of Things technology in enterprise financial risk control information management, higher requirements are put forward for data processing in enterprise financial risk control information management. The traditional enterprise information data processing technology cannot meet the technical requirements. It includes the integration and extraction of enterprise big data based on the Internet of Things, which requires the support of big data technology. After an in-depth investigation of enterprise acquisition systems, analysis systems, and storage systems using the Internet of Things.

Although big data processing technology has been applied to most enterprise processing analysis systems, there are still many problems to be solved. For example, how to quickly process and analyze massive redundant data with low data value density, how to quickly remove redundant data for real-time processing in the face of large-scale data flow, and how to optimize the large table equivalent connection in the existing big data computing environment, starting from the data scenarios and data characteristics of practical applications, this paper proposes some optimized processing methods.

The innovation of this article is as follows: (1) Through the research in this paper, it is expected to establish an enterprise quality information management system for IoT big data. It proposes innovative optimization designs for file systems, big data retrieval, and analysis, and solves the basic problems. (2) The research in this paper can reduce the storage and management pressure of IoT big data. It provides support for further verification, experiments, and applications of efficient storage and management of big data. It also provides new ideas for big data management theory and systematic methods. (3) It has very important theoretical significance and practical value.

2. Related Work

In recent years, big data research on the Internet of Things has become a hot spot for scholars, and more and more scholars are collecting data from factories, hospitals, and stores. When Nobre G C researched the circular economy, it found that cutting-edge technologies such as big data and the Internet of Things have the potential to capitalize on organizational and social adoption of the CE concept. It is becoming more and more common in daily life [1]. Ghallab et al. believes that the Internet of Things is the basic concept of a new technology, which has great development prospects and significance in various fields [2]. Ge et al. conducted a survey of big data technologies in different IoT fields, hoping to facilitate knowledge sharing in the IoT field. He discussed the similarities and differences of big data technologies used in different IoT domains. He suggested that certain big data technologies used in one IoT domain could be reused in another IoT domain. He also developed a conceptual framework outlining the key big data technologies in all the reviewed IoT domains [3]. Babar and Arif believe that the recent growth and expansion in the IoT space offers great business prospects for the direction of the new era of smart cities. The real-time processing of data and intelligent decision-making capabilities pose extensive challenges to the continuous enhancement of multi-faceted urban facilities [4]. Pouryazdan et al. improved the value of crowd-perceived big data by properly motivating users in a mobile crowd-aware system. He found that since data collection is participatory, crowd-aware systems face challenges in data credibility and authenticity assurance. The motivation may be to manipulate perceived data to maximize revenue [5]. Shadroo and Rahmani found that IoT has emerged as a new opportunity in recent years. All the electronic devices

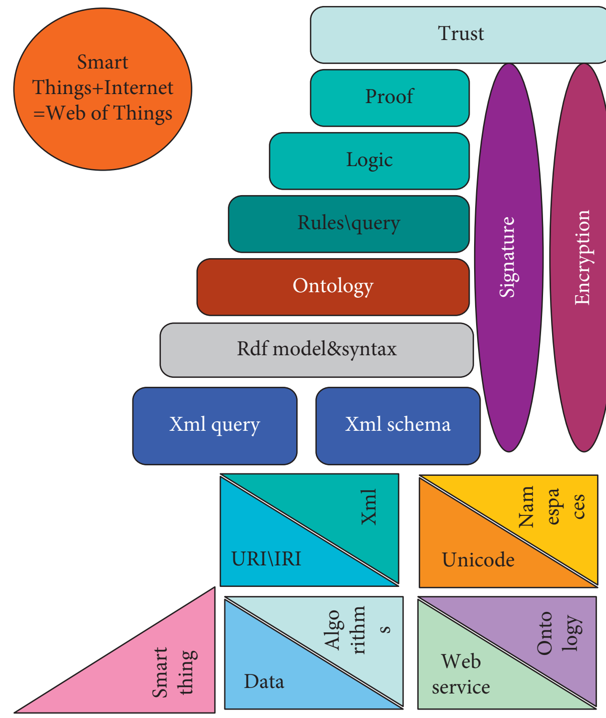

Figure 1: Big data and IoT integration.

around us contribute to daily life. Approaches such as big data and data mining can be used to improve the efficiency of IoT and the storage challenges of large data volumes, as well as the transmission, analysis, and processing of data volumes on IoT. The purpose of his research is to investigate research on the Internet of Things using big data and data mining methods to identify topics that must be more emphasized in current and future research paths [6]. Tong and Sun built a real-time image detection and processing platform using the IoT-based Adaboost framework. This enables real-time image transmission and processing based on different databases. His research found that RT-IDPP proposed for IoT enables image detection and tracking. This method can not only run effectively on different cloud platforms but also meet the real-time requirements in the process of image detection and tracking, ensuring that the image detection rate is higher than 97% [7]. However, the shortcoming of these studies is the uncertainty of data quality, and the calculation and analysis of massive data are very complicated. Therefore, these research data still need to be improved.

3. Methods of IoT Big Data

Big data is used to describe any large amount of structured, semistructured, and unstructured data that have the potential to be extracted into information. Big data extracts large amounts of useful data and information from applications. This is very beneficial and can save costs, improve the efficiency of information collection, and improve the ability to innovate [8]. Figure 1 shows the application of big data integrated with IoT.

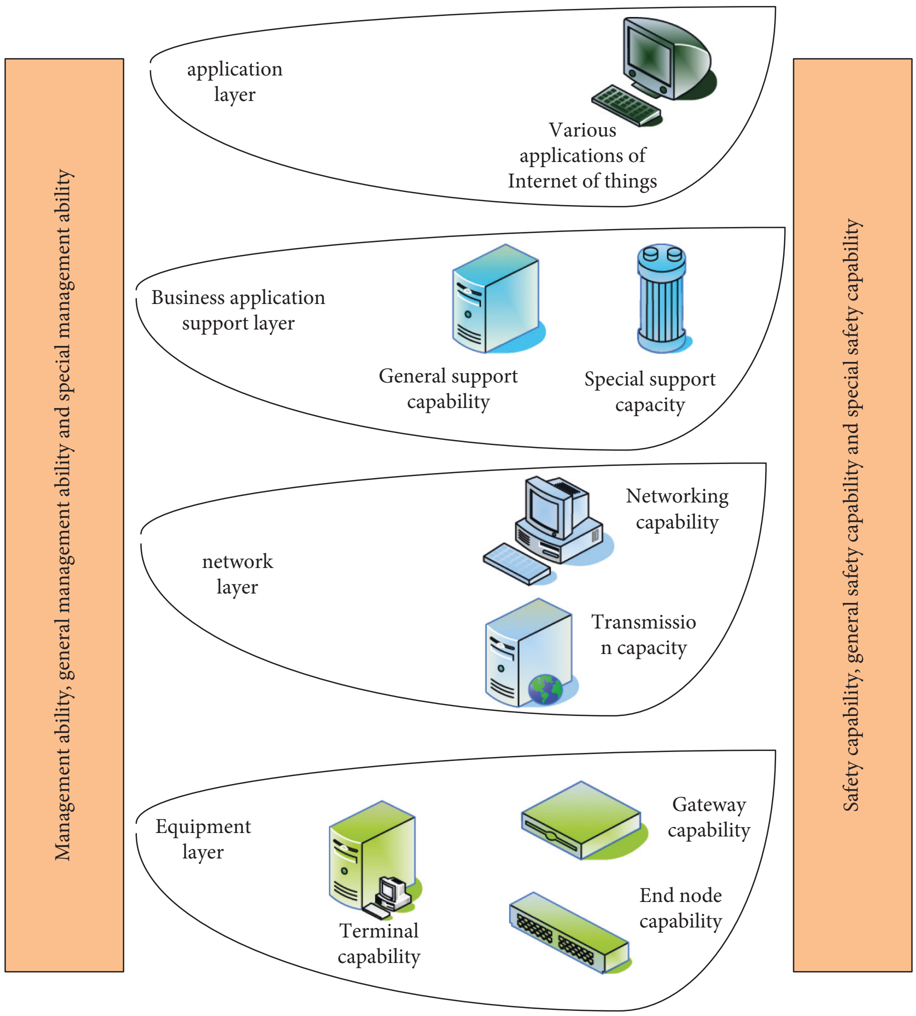

Figure 2: Reference model for IoT.

3.1. Internet of Things. IoT needs to leverage a range of existing or evolving advanced technologies, such as machine to machine communication (M2M), data mining and decision-making, self-organizing networking, security and privacy protection, cloud computing, and sensing and triggering technologies. In order to connect physical objects and virtual objects with each other to provide better services. Therefore, the reference model of the Internet of Things is briefly summarized [9]. It is shown in Figure 2.

The main part of the IoT reference model can be divided into four layers: application layer, business/application support layer, network layer, and device layer. In addition, it also includes cross-layer management capabilities and security capabilities [10]. Among them, the application layer refers to the various Internet of Things applications that users can finally see. The business/application support layer includes general support capabilities and special support capabilities. The general support capability corresponds to the public network support capability, while the special support capability corresponds to the industry private network support capability. The network layer includes networking capability and transmission capability. Networking capabilities can provide control functions related to network connectivity. The transmission capability provides links for IOT services/applications, as well as control and management information for data transmission. Equipment layer capabilities can be logically divided into terminal capabilities, gateway capabilities, and end node capabilities. The terminal refers to the entity directly communicating with the information communication network. The end node refers to the entity that communicates with the information communication network through the gateway.

The Internet of Things is a new mode of communication where objects in the virtual extended world and the physical world are interconnected. It runs a plethora of applications and services and then develops it while having to overcome enormous challenges to make IoT a reality. IoT involves different knowledge domains such as ubiquitous computing, network communication, object recognition, and special data processing [11]. In this context, outliers detected by big data processing are used to select and implement the IOT architecture.

3.2. Big Data Algorithms

3.2.1. Clustering Algorithm. The ability of classical clustering algorithms to deal with big data is limited. In the face of large-scale and high-complexity datasets, using them directly is inefficient or even ineffective. At present, in the era of big data, the problem of clustering large-scale data needs to be solved urgently. At present, in order to improve the scalability and practicability of clustering algorithms, people have proposed several novel clustering ideas to solve the problem of big data clustering based on the reasons for the failure of traditional clustering algorithms [12]. The first is parallel processing, the second is data compression, and the third is data sampling. These three clustering ideas alleviate the clustering problem of large datasets to a great extent. Table 1 summarizes the time and space complexity of classical traditional clustering algorithms.

It can be seen from Table 1 that although the time complexity of the K-means algorithm is linearly related to the dataset size N, the algorithm complexity can be applied to big data. However, in practical application, the algorithm is very sensitive to the selection of initial clustering centers. It also contains NP-hard problems and is not suitable when dealing with large-scale data. The time complexity of the remaining algorithms is nonlinear with N. With the increase of data size, the time complexity will increase more obviously. This not only reduces the quality of the clustering algorithm but also far exceeds the running time of traditional clustering algorithms. Therefore, none of them can directly handle large-scale datasets [13]. Figure 3 is a common big data clustering algorithm. Representative algorithms include cure algorithm, clara/clarans algorithm, and birch algorithm.

3.2.2. Neighbor Propagation Clustering Algorithm. The nearest neighbor propagation algorithm is referred to as the AP algorithm, and clustering is carried out by iteratively updating the representative matrix $R(n, s)$ and the fitness $a(n, s)$, where $R(n, s)$ points from point X_i to point X_k, indicating the representativeness of X_k as the class representative point of X_i, and $A(n, s)$ points from point X_k to X_i, indicating the suitability of X_i selecting X_k as the class representative point. It is based on the moment of similarity of data. The core step of the AP algorithm is the iterative update of representativeness and fitness.

(1) Algorithm analysis. Its formula is as follows:

$$\begin{aligned} &R(n,s) \leftarrow k(n,s) - \max_{s',k.t.s' \neq s} \{A(n,s') + k(n,s')\} \\ &IFn \neq s, A(n,s) \leftarrow \min\left\{0, R(s,s) + \sum_{n' \notin \{n,s\}} \max\{0, R(n',s)\}\right\} \\ &A(s,s) \leftarrow \sum_{n' \neq s} \max(0, R(n',s)). \end{aligned} \tag{1}$$

Then, for any point X_i, its class representative point is X_k, where

$$s = \arg\max_{s} (A(n,s) + R(n,s)). \tag{2}$$

Table 1: Time and space complexity of traditional clustering algorithms.

Clustering algorithm	Complexity	
	Time	Space
K-means	$O(nKt)$	$O(K)$
K-median	$O(n^2t)$	$O(n)$
PAM	$O(K(n-K)^2)$	$O(K)$
Single completelink	$O(n^3)$	$O(n^2)$
DBSCAN	$O(n\log(n))$	$O(n)$

N: total number of objects, K: number of representative objects, and T: number of iterations

The AP algorithm is initialized to $A(n,s) = 0$, that is, each point is equally likely to be represented by other points and to represent other points.

(2) Comparative Experiment of CBAP and AP Algorithms. For the dataset Data Sets A whose size does not exceed 4500, the CBAP algorithm and the AP algorithm are used for clustering, respectively. Figure 4 shows a comparison of the corresponding time curves and the r index.

It can be seen from the comparison between CBAP and AP1 that the CBAP algorithm greatly shortens the natural logarithm of the clustering time represented by the ordinate in the clustering time. When the size of the dataset reaches more than 3000, the time of the AP algorithm is dozens of times that of the CBAP algorithm. According to AP2, the clustering results of CBAP and AP are basically the same (the r index is about 0.97). Therefore, it does not reduce the clustering quality of the original AP algorithm [14].

Based on the good clustering results for artificial datasets, we will continue to apply the CBAP algorithm to cluster some real datasets. Table 2 lists the corresponding A index, B value, R index, and clustering time of the two methods under different real datasets (300 core points are taken in the experiment [15].

As can be seen from Table 2, compared with the AP algorithm, the CBAP algorithm not only greatly reduces the clustering time but also the A index and B value are significantly better than the original algorithm. This is because the selection of core points reduces the proportion of noise points or abnormal data, thereby improving the clustering performance of the AP algorithm on the core set. Therefore, after the clustering results of the core set are mapped to the large dataset, the clustering quality of the large dataset is also improved. This further proves the effectiveness of the CBAP algorithm for clustering big data. If the data points are within the upper and lower limits of the control chart and the arrangement and distribution do not show chain, tendency, periodic characteristics, etc., it can be determined that the process quality is under control. On the contrary, it is necessary to explore the causes and propose solutions.

3.3. Control Chart Method. The control chart method is the main method used in the statistical process control subsystem module. It can determine that the process quality is at a normal level and plays a role in preventing defective products. The process quality is affected by various factors

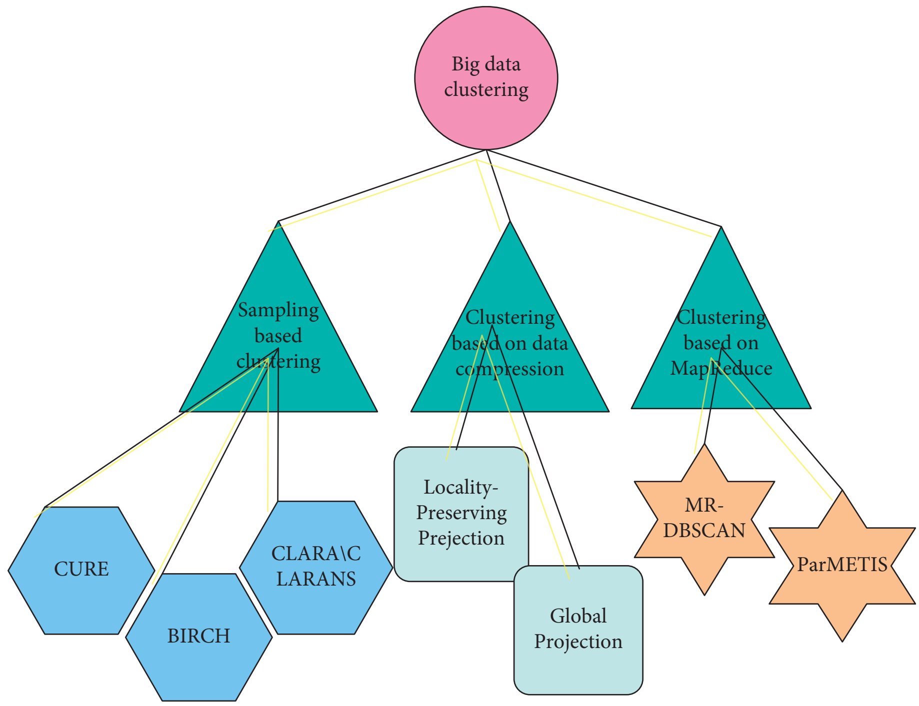

Figure 3: Common big data clustering algorithms.

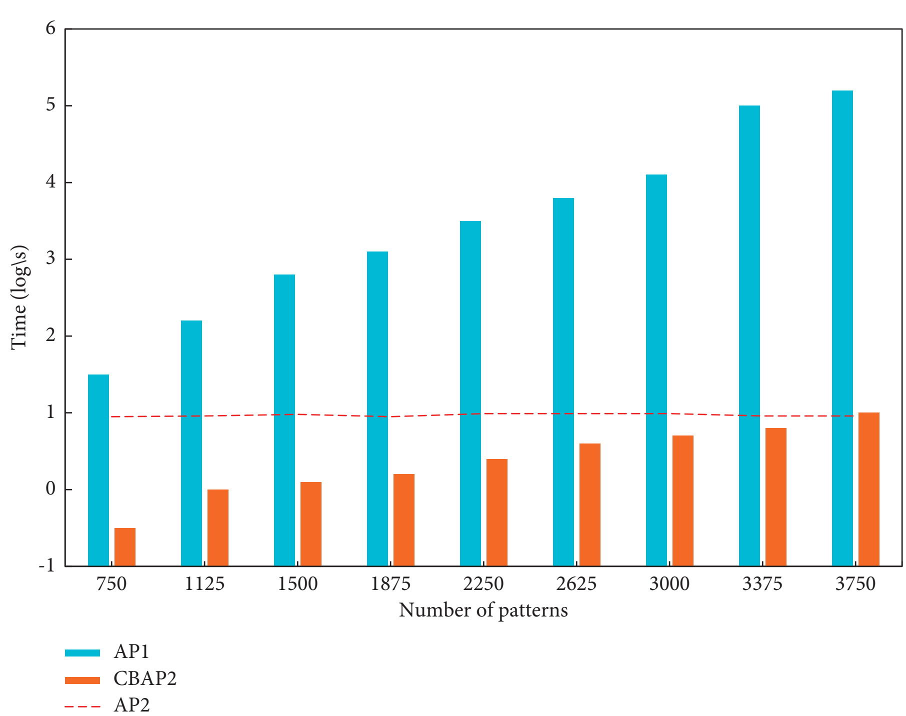

Figure 4: Comparison of clustering time between CBAP and AP and the corresponding *R* metrics.

Table 2: Comparison of the performance of CBAP and AP on real datasets.

Dataset	A-index		B-value		Time		R-index
	AP	CBAP	AP	CBAP	AP	CABAP	
Letter $\{f, i, g\}$	0.721	0.813	0.843	0.909	39.48	2.41	0.922
Letter $\{r, s, t\}$	0.472	0.666	0.618	0.941	39.78	2.73	0.521
Usps {0, 6, 9}	0.711	0.722	0.828	0.986	73.06	17.32	0.842
Usps {3, 4, 5}	0.655	0.725	0.877	0.956	34.52	10.78	0.836

and exhibits random fluctuations and abnormal fluctuations. The smaller the fluctuation range, the more stable the process quality, and vice versa [16].

The calculation principle of the three control lines of the control chart (taking the mean value control chart as an example) is as follows:

$$\begin{aligned} cl_{\overline{X}} &= \overline{\overline{X}}, \\ ucl_{\overline{X}} &= \overline{\overline{X}} + 3\sigma_{\overline{X}}, \\ lcl_{\overline{X}} &= \overline{\overline{X}} - 3\sigma_{\overline{X}}, \end{aligned} \quad (3)$$

where $cl_{\overline{x}}$ is the center line of the control chart, $ucl_{\overline{x}}$ is the upper control line of the control chart, and $lcl_{\overline{x}}$ is the lower control line of the control chart. Among them, the expected value of x is

$$e(\overline{X}) = \mu. \quad (4)$$

The expected value of standard deviation is

$$d(\overline{X}) = \frac{\sigma}{\sqrt{N}}. \quad (5)$$

μ and σ are calculated from the sample data size to get $\mu = \overline{\overline{x}}, \sigma = \overline{r}/D_2$, so

$$\begin{aligned} cl_{\overline{X}} &= \overline{\overline{X}} \\ ucl_{\overline{X}} &= \mu + 3\frac{\sigma}{\sqrt{N}} = \overline{\overline{X}} + \frac{\overline{r}}{D_2\sqrt{N}} = \overline{\overline{X}} + B_2\overline{r} \\ lcl_{\overline{X}} &= \mu - 3\frac{\sigma}{\sqrt{N}} = \overline{\overline{X}} - 3\frac{\overline{r}}{D_2\sqrt{N}} = \overline{\overline{X}} - B_2\overline{r}. \end{aligned} \quad (6)$$

In the formula, $B_2 = 3/D_2\sqrt{N}$ and $\overline{r}$ are the mean values of the sample ranges, and D_2 is obtained from the standard [“Conventional Control Chart” (GB/T4091-2001)] query.

3.4. Dependency-Based Sensor Clustering

3.4.1. Definition of Dependencies. Sensor similarity (SensorSimilarity): Let D and K be two sensor sets, and T_A and T_B be two object sets detected by A and B, respectively; then the sensor similarity of A and B is defined as the intersection of T_A and T_B [17].

$$\text{Sensor} - \text{Similarity}(D, K) = \left|T_D \cap T_K\right|. \quad (7)$$

The calculation method of sensor similarity can facilitate 1 and 2, but this is a time-consuming process. Therefore, a more efficient calculation method of sensor similarity is proposed, which can greatly reduce the computational time overhead of sensor similarity. The calculation formula of sensor similarity is expressed as follows:

$$\text{Sensor} - \text{Similarity}(D, K) = \frac{Jaccard(T_D, T_K)}{1 + Jaccard(T_D, T_K)} \bullet \left(\left|T_D\right| + \left|T_K\right|\right), \quad (8)$$

where $Jaccard(T_A, T_B)$ represents the Jaccard coefficient between T_A and T_B, that is,

$$Jaccard(T_D, T_K) = \frac{\left|T_D \cap T_K\right|}{\left|T_D \cap T_K\right|}. \quad (9)$$

In physical object retrieval, if the access to one sensor D data file will inevitably lead to another sensor K data file access, then we say that sensor A depends on sensor B [18].

It assumes that there are sensor dependencies of $D \longrightarrow K$ and $K \longrightarrow L$ in the sensor set, and according to the transitive relationship of the dependencies, $D \longrightarrow L$ can be inferred. The most important operation in the dependency graph is the initialization of the dependency graph. According to the above formula, S6 and S1 have higher sensor similarity than S8. Therefore, in the clustering process, node S6 will always cluster before S8 and S1. Therefore, as shown in Figure 5(b), we do not need to maintain the dependency between S6 and S8. The initialization algorithm of the dependency graph is shown in Figure 5.

3.4.2. Sensor Clustering. Assuming that the sensor similarity between D and K is not 0, and the sensor similarity between A and C is 0, then

$$\text{Sensor} - \text{Similarity}(\text{D}, \text{K}) = \text{Sensor} - \text{Similarity}(\text{D}, (\text{K}, \text{L})). \quad (10)$$

Proving

$$|D \cap (K \cap L)| = |D \cap K| + |D \cap L| + |D \cap K \cap L|. \quad (11)$$

Consider

$$|D \cap L| = 0. \quad (12)$$

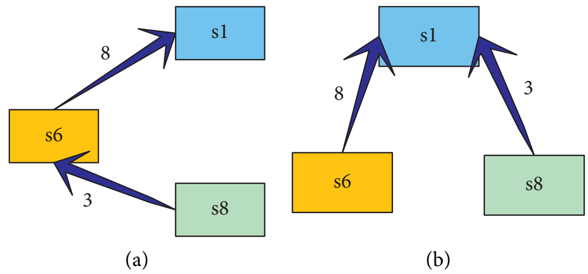

Figure 5: Schematic diagram of the dependency graph simplification process.

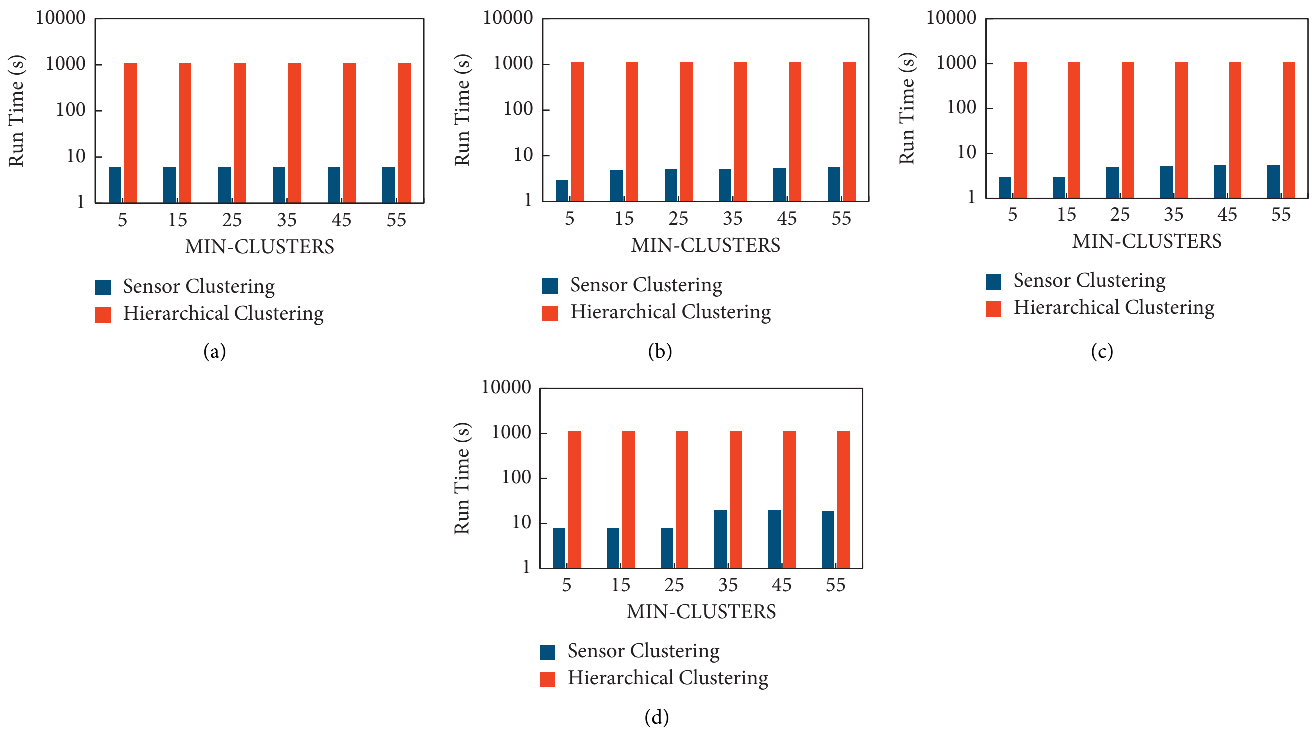

Figure 6: Time cost comparison of clustering algorithms. (a) Trace1. (b) Trace2. (c) Trace3. (d) Trace4.

Hence,

$$|D \cap K \cap L| \leq |D \cap L| = 0. \quad (13)$$

Therefore,

$$|D \cap (K \cap L)| = |D \cap K|. \quad (14)$$

If the root node is merged with a leaf node, the sensor similarity between the root node and other nodes will not be changed. Therefore, the dependent edge connected to the leaf node can be deleted directly. It loops the above steps until the number of clusters reaches the lower limit of the number of clusters. The remaining nodes in the dependency graph represent clusters after clustering, and the merged point set in each node is the sensor set represented by the cluster [19].

The time cost comparison between sensor clustering and hierarchical clustering is shown in Figure 6. The time cost of the clustering process here is obtained by calculating the average time statistics. In the best case, the time overhead of sensor clustering is 1% of that of hierarchical clustering. In the worst case, the time cost of sensor clustering is only 1/14 of that of hierarchical clustering. The experimental results show that the spatial cost of sensor clustering is reduced by 14 times, 20 times, 40 times, 50 times, and 23 times, respectively, compared with hierarchical clustering. Sensor clustering has obvious time overhead and memory overhead advantages [20].

4. Experiment and Analysis of Enterprise Financial Risk Control Information Management System

The main functions of the financial information management system, budget, financial management, cost, planning, fund management, sales, and others, are the main functions of the financial information management system. The main

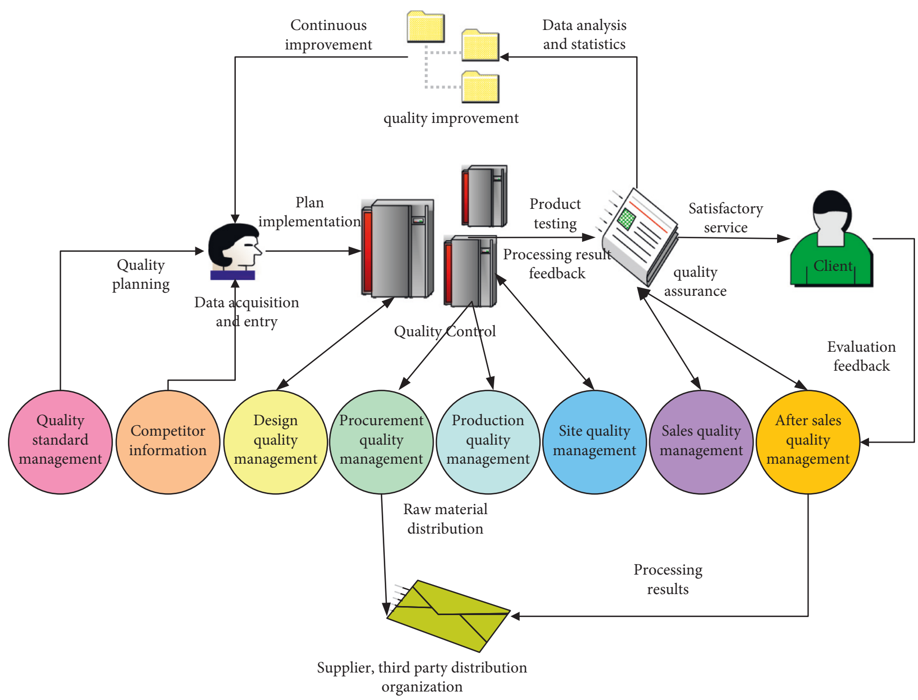

Figure 7: Quality management business model.

functions of the design of enterprise financial management information system are as follows: First, the system can clearly show the flow direction of cash flow; second, the system needs to be able to display the information of financial assets and fixed assets of the enterprise and can analyze and compare them; third, by using this system, the enterprise financial management personnel and accounting personnel can realize the analysis and calculation of various data in the financial system; fourth, the enterprise financial management information system can provide the decision-makers with the basis they need; fifth, with this system, the operation efficiency and financial management efficiency of the enterprise can be greatly improved.

Software to achieve quality management business must implement the whole process of quality management functions and coordinate the relationship between them. It realizes the product quality planning, organization, and coordination of the whole life cycle. Therefore, a software business model is established by the business logic of quality management, quality responsibility, and modern quality management means, as shown in Figure 7.

The software business model consists of eight main business modules. It covers the whole process of product quality and is closely related to the five elements of personnel, equipment, materials, methods, and environment. It involves the entire product life cycle, including product design and development, process confirmation, manufacturing, storage, transportation, and delivery, as well as subsequent customer experience, feedback, and evaluation services. In order to improve the market competitiveness of enterprises and explore their own and product improvement goals, competitor benchmarking information management is added to the model. The software model shows that the whole system is an open system closely related to the external environment [21]. In addition, the four-stage quality management tasks of quality planning, quality control, quality assurance, and quality improvement in the model form a closed-loop loop with the business process. This clearly demonstrates the quality improvement idea of PDCA cycle.

4.1. The Overall Goals and Tasks of the System. The enterprise quality information system is a modular and componentized system platform constructed by integrating contemporary advanced quality management concepts, technologies, and tools. It can make full use of computer network resources and optimize the configuration and utilization of internal resources of the enterprise according to the unique application environment and business process of the enterprise. It enables suppliers, various departments of the enterprise, distribution agencies, and customers to form a coordinated operation as a whole. The top-level data diagram of the quality management information system is shown in Figure 8.

4.2. Creation of Database Tables. The creation of the data table must strictly follow the three normal form (3NF) of the data, and the relationship between the entities should be optimized according to a unified standard. This lays the foundation for building a high-quality database. In the first normal form of the database, the data table requires a primary key, no duplicate records can appear in the database, and each field is atomic and cannot be further divided. The second normal form of the database, and the second normal form is established on the basis of the first normal

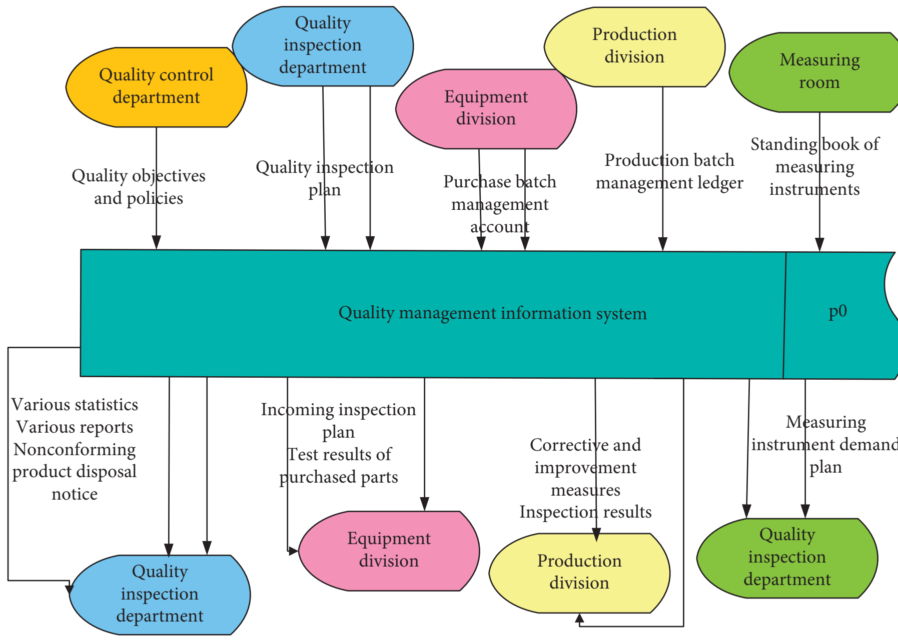

Figure 8: Top-level data diagram of the quality management information system.

form. It requires that all non-primary key fields in the database completely depend on the primary key and cannot generate partial dependencies, and it requires that union queries be used as little as possible. The third normal form of the database is based on the second normal form. It requires that non-primary key fields cannot generate transitive dependencies on primary key fields [22]. According to the entity attribute relationship diagram in the previous section, the design of the system data table is obtained. Tables 3 and 4 show some of the data tables.

4.3. Integration Testing. System testing emphasizes interaction, so this paper tests the combination of interrelated modules. It repairs the defects obtained by testing in the software and continues to perform regression testing until the specification is met. To illustrate this point, three associated modules of the system are selected for integration testing. The test report is shown in Table 5.

It can be seen from Table 5 that the integration tests are carried out on the software's basic management, production quality management, design quality management, and sales quality management. It is found that the interfaces between the modules can interact normally, and the behavior log of the addition, deletion, and modification of the database can be recorded, so the assembly system basically meets the design requirements.

5. Discussion

The modern era is an information age, and big data is the key word of this era. Through the integration of big data and the Internet of Things, human society has reached an unprecedented level of intelligence. This brings unprecedented convenience to people's production and life. This is the trend of the times and has broad prospects. Massive IoT sensors generate a large amount of sensory data every day, so IoT is considered to be one of the most important big data sources in the future.

With the improvement of modern enterprise financial management requirements, computer technology has also been more applied to enterprise financial management and has had a great impact on all aspects of the enterprise, such as accounting methods and processes, job division in the financial department, storage forms of accounting information and data, etc. It has changed the traditional financial management mode from manual service and paper bookkeeping to unified software management, greatly improving the efficiency and accuracy of financial work, saving labor time and costs, and creating more benefits for enterprises. In view of this, this paper makes a detailed analysis and research on the enterprise financial risk control information management system. Based on the theory of enterprise financial risk, this paper analyzes the business process, related technology, and system architecture of the enterprise quality management information system. It can be predicted that with the passage of time, the application of the Internet of Things will promote the further development of the data space and form a huge Internet of Things big data. Therefore, the big data of the Internet of Things is of great significance to the design and implementation of the enterprise financial risk control information management system.

This paper mainly introduces the concepts of big data and the Internet of Things, as well as big data clustering algorithms. Collecting data of enterprise quality information through this method, this paper briefly introduces the integration, management, and technical framework, etc., in data processing. When big data is integrated into the Internet of Things, it is bound to improve the

Table 3: Process quality statistics table.

Listing	Data type	Length	Is it empty	Primary key	Interpretation
Id	Char	12	Not null	Y	Product number
Sno	Varchar	6	Not null	N	Station number
Pname	Varchar	20	Not null	N	Product name
Property	Varchar	20	Not null	N	Quality characteristics
Worker	Varchar	8	Null	N	Operator
opperationDate	Date	8	Not null	N	Processing date
Situation	Char	2	Not null	N	State
Mno	Varchar	12	Null	N	Set number
Measurement1	Double	(8, 2)	Null	N	Measured characteristic value 1
Measurement2	Double	(8, 2)	Null	N	Measured characteristic value 2
Measurement3	Double	(8, 2)	Null	N	Measured characteristic value 3
Measurement4	Double	(8, 2)	Null	N	Measured characteristic value 4

Table 4: Quality act data sheet.

Listing	Data type	Length	Is it empty	Primary key	Interpretation
Dno	Char	12	Not null	Y	Document number
Date	Date	8	Not null	N	Upload date
Dname	Varchar	20	Not null	N	Document name
Content	Varchar	50	Null	N	Content description
Url	Varchar	40	Not null	N	Access path
Quantity	Char	4	Null	N	Quantity
Introduction	Varchar	8	Null	N	Brief introduction

Table 5: Software integration test report.

Number	Module name	Module interface description	Pedagogical operation	State	Result
1	Module and login interface	Authorized authentication	Registration, authorization, password modification, and record viewing	Complete	Pass the test
2	Design quality and production quality management module	Standard information can be seen on the control interface	Modify structural parameters	Complete	Pass the test
3	Sales and after sales quality management	After sales receiving information prompt	Submit sales quality issues	Complete	Pass the test
4	Site quality management and homepage	Questions and data can be displayed on the home page	Add problem description	Complete	Pass the test
Test conclusion	The assembly system basically meets the design requirements				

intelligence of human production and life. Its application can involve almost all aspects, such as the medical and health industry, network enterprises, advertising and marketing industry, financial services industry, and so on. Therefore, a good grasp of the big data of the Internet of Things is indispensable for the future realization of the enterprise financial risk control information management system.

6. Conclusions

The financial department of an enterprise is a comprehensive economic information management department. An important component of the big data design enterprise financial risk control information management system is the financial information management system, which is not only a centralized reflection of the enterprise's business status but also the most direct means to supervise the implementation of the national financial system. With the rapid development of the Internet of Things, it has driven the rapid attack of the information industry. The amount of data is growing explosively, and the data structure is becoming more and more complex. Financial informatization means that financial personnel improve the business process of enterprise management through modern technical means and build a supporting enterprise financial management mechanism to fully tap the information potential of the enterprise's financial resources, so as to ensure that the enterprise's information resources can be fully utilized, promote the overall financial management level and efficiency of the enterprise, and ensure the efficient and low-cost development of various business activities of the enterprise. It will help enterprises better achieve their financial goals and even the overall strategic goals. Based on the characteristics of manufacturing quality management and the laws of product formation, this paper applies Internet of Things big data to research and develop the enterprise financial risk control information management system, realizes the networked management of product quality, standardizes the business process of enterprise quality management, and enables enterprises to establish a perfect quality system. By understanding the concepts of the Internet of Things and big data, the enterprise quality management system model is established by using the clustering algorithm, control chart method, and sensor clustering of dependency. The business process of enterprise quality management is sorted out, and the system applies integration testing on the business logic structure. Due to the increasingly complex production mode of manufacturing enterprises, the number of quality related parties is gradually increasing. Therefore, the research content of this paper needs to continue to think and explore, and the enterprise financial risk control information management system should be further refined and improved. If an enterprise wants to be in an invincible position in such a competitive environment, it must grasp the financial information timely and accurately, correctly analyze the development prospect of the enterprise, and make reasonable scheme decisions in time. In today's information age, only with modern management methods can we reflect the business status and operation of an enterprise faster, better, more truly and effectively. In today's complex and rapidly changing market, only computers can quickly, objectively, comprehensively, and accurately make detailed data analysis.

Data Availability

This article does not cover data research. No data were used to support this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

This research was financially supported by the Special Project of the Normal University important fields of Guangdong province in 2021 (2021ZDZX3015), the Doctoral project of Guangzhou College of Technology and Business (KABS202102), the Project to Improve Research Capacity of Key Construction disciplines in Guangdong Province (2021ZDJS123), and "University-enterprise Cooperation Laboratory of Digital Intelligence Accounting" of Guangdong Quality Engineering Construction Project in 2021.

References

[1] G. C. Nobre and E. Tavares, "Scientific literature analysis on big data and internet of things applications on circular economy: a bibliometric study," *Scientometrics*, vol. 111, no. 1, pp. 463–492, 2017.

[2] H. Ghallab, H. Fahmy, and M. Nasr, "Detection outliers on internet of things using big data technology," *Egyptian Informatics Journal*, vol. 21, no. 3, pp. 131–138, 2020.

[3] M. Ge, H. Bangui, and B. Buhnova, "Big data for internet of things: a survey," *Future Generation Computer Systems*, vol. 87, no. OCT, pp. 601–614, 2018.

[4] M. Babar and F. Arif, "Smart urban planning using Big Data analytics to contend with the interoperability in Internet of Things," *Future Generation Computer Systems*, vol. 77, no. dec, pp. 65–76, 2017.

[5] M. Pouryazdan, C. Fiandrino, B. Kantarci, T. Soyata, D. Kliazovich, and P Bouvry, "Intelligent gaming for mobile crowd-sensing participants to acquire trustworthy big data in the internet of things," *IEEE Access*, vol. 5, no. 99, pp. 22209–22223, 2017.

[6] S. Shadroo and A. M. Rahmani, "Systematic survey of big data and data mining in internet of things," *Computer Networks*, vol. 139, no. JUL.5, pp. 19–47, 2018.

[7] Y. Tong and W. Sun, "The role of film and television big data in real-time image detection and processing in the Internet of Things era," *Journal of Real-Time Image Processing*, vol. 18, no. 4, pp. 1115–1127, 2021.

[8] J. Shao and X. Cheng, "Retracted article: sea level height based on big data of Internet of Things and aerobics teaching in coastal areas," *Arabian Journal of Geosciences*, vol. 14, no. 15, pp. 1450–1465, 2021.

[9] S.C. Research, "On investment decision-making model from the perspective of "Internet of Things + Big data"[J]," *Future Generation Computer Systems*, vol. 107, no. Jun, pp. 286–292, 2020.

[10] Z. Cui, Y. Cao, X. Cai, J. Cai, and J Chen, "Optimal LEACH protocol with modified bat algorithm for big data sensing systems in Internet of Things," *Journal of Parallel and Distributed Computing*, vol. 132, no. OCT, pp. 217–229, 2019.

[11] S. F. Ochoa, G. Fortino, and G. Di Fatta, "Cyber-physical systems, internet of things and big data," *Future Generation Computer Systems*, vol. 75, no. oct, pp. 82–84, 2017.

[12] G. Knieps, "Internet of Things, big data and the economics of networked vehicles," *Telecommunications Policy*, vol. 43, no. 2, pp. 171–181, 2019.

[13] A. Kumari, S. Tanwar, S. Tyagi, and N. Kumar, "Verification and validation techniques for streaming big data analytics in internet of things environment," *IET Networks*, vol. 8, no. 3, pp. 155–163, 2019.

[14] R. J. Martis, V. P. Gurupur, H. Lin, A. Islam, and S. L. Fernandes, "Recent advances in big data analytics, internet of things and machine learning," *Future Generation Computer Systems*, vol. 88, no. NOV, pp. 696–698, 2018.

[15] B. Jan, H. Farman, M. Khan, M. Talha, and I. U. Din, "Designing a smart transportation system: an internet of things and big data approach," *IEEE Wireless Communications*, vol. 26, no. 4, pp. 73–79, 2019.

[16] B. H. Al-Qarni, A. Almogren, and M. M. Hassan, "An efficient networking protocol for internet of things to handle multimedia big data," *Multimedia Tools and Applications*, vol. 78, no. 21, pp. 30039–30056, 2019.

[17] M. Babar, F. Arif, M. A. Jan, Z. Tan, and F. Khan, "Urban data management system: towards Big Data analytics for Internet of Things based smart urban environment using customized

Hadoop," *Future Generation Computer Systems*, vol. 96, no. JUL, pp. 398–409, 2019.

[18] H. Ma, S. Yu, M. Gabbouj, and P. Mueller, "Guest editorial special issue on multimedia big data in internet of things," *IEEE Internet of Things Journal*, vol. 5, no. 5, pp. 3405–3407, 2018.

[19] K. Anna and L. Carson, "Emerging trends, issues and challenges in Internet of Things, Big Data and cloud computing," *Future Generation Computer Systems*, vol. 87, no. OCT, pp. 416–419, 2018.

[20] S. A. Shah, D. Z. Seker, M. M. Rathore, S. Hameed, S. Ben Yahia, and D. Draheim, "Towards disaster resilient smart cities: can internet of things and big data analytics Be the game changers?" *IEEE Access*, vol. 7, no. 1, pp. 91885–91903, 2019.

[21] A. Ed-Daoudy and K. Maalmi, "A new Internet of Things architecture for real-time prediction of various diseases using machine learning on big data environment," *Journal of Big Data*, vol. 6, no. 1, pp. 1–25, 2019.

[22] M. Alam, T. Wu, F. Ullah, and Y. Chen, "Editorial: securing internet of things through big data analytics," *Mobile Networks and Applications*, vol. 24, no. 4, pp. 1265–1268, 2019.