

Design and Implementation of Safety Production Monitoring Information Intelligent Collection System

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Abstract

Production safety is the basic premise to ensure economic development, but in China's production enterprises have a wide range of characteristics, easy to cause information collection lag and not comprehensive situation. At present, there are many weak links in the work safety information management in China, such as lack of overall planning, lack of basic information sharing mechanism and backward infrastructure. In order to solve the above problems, the author will work safety information system on the basis of the original database, fully integrated with the Internet, big data, blockchain and other technical means to build a comprehensive platform, and government departments, enterprises, social organizations and the public linked together, break the information island, improve management efficiency.

Keywords

Safety Production; Online Monitoring; Data Sharing.

1. Status Quo of Intelligent Collection of Safety Production Monitoring Information

Production safety is the basic guarantee for protecting workers' safety, health and state property, promoting the development of social productive forces and ensuring the basic condition of economic development. Although some achievements have been made in the informatization construction of work safety in China in recent years, it is still in the exploratory stage in general, and there are still the following problems.

1.1. Lack of a Master Plan

Lack of unified planning, implementation of information system, it is difficult to form a unified and effective national work safety information collection and construction policies, norms and technical standards, resulting in the system cannot achieve data exchange and sharing. When safety accidents occur, information asymmetry between various departments and related units makes it impossible to realize effective joint rescue and emergency feedback, let alone early warning of accidents.

1.2. Lack of Basic Information Sharing Mechanism

A unified information sharing mechanism has not been established and a large number of effective information resources cannot be developed and utilized as they should be. The information resources of work safety supervision are limited to the same department. All departments block the business data they have collected for a long time and cannot share the resources with other departments. There is no standardized, all-commanding, universally applicable work safety supervision and emergency rescue information system, no basic resource database and relatively complete shared application system.

1.3. Poor Infrastructure

Safety production information acquisition system architecture research and development and equipment capital investment is less, acquisition infrastructure and equipment and technical management means are weak.

2. Overall System Design

2.1. Design Roadmap

On the basis of basic supervision business and existing data, the intelligent collection system of work safety monitoring information can fully integrate the Internet, big data and block chain and other technical means to build a comprehensive platform. The system is oriented to users at different levels. By associating and sharing relevant data information of government departments, social organizations and enterprises, it provides unified access to achieve cross-department and cross-level information coordination and sharing, and provides instant and accurate information services for daily management of production safety and emergency rescue work [1].

In terms of information sharing, the distributed database of blockchain can be used to effectively connect the data information scattered in different enterprises, different departments and different regions, so as to realize the real-time update and monitoring of basic information and production dynamic information, and to carry out docking and accident analysis for enterprises with production safety accidents. On this basis, by tracking the production dynamics and safe material reserves of all kinds of production enterprises, the safety status of production enterprises is evaluated and disclosed to the public, providing a solid guarantee for promoting the efficient promotion of safety production and preventing safety production accidents.

2.2. System Framework

The system adopts the cloud technology route and is composed of infrastructure layer, blockchain core layer, technical support layer, business service layer and system user layer from bottom to top. The overall architecture of the platform is shown in Figure 1.

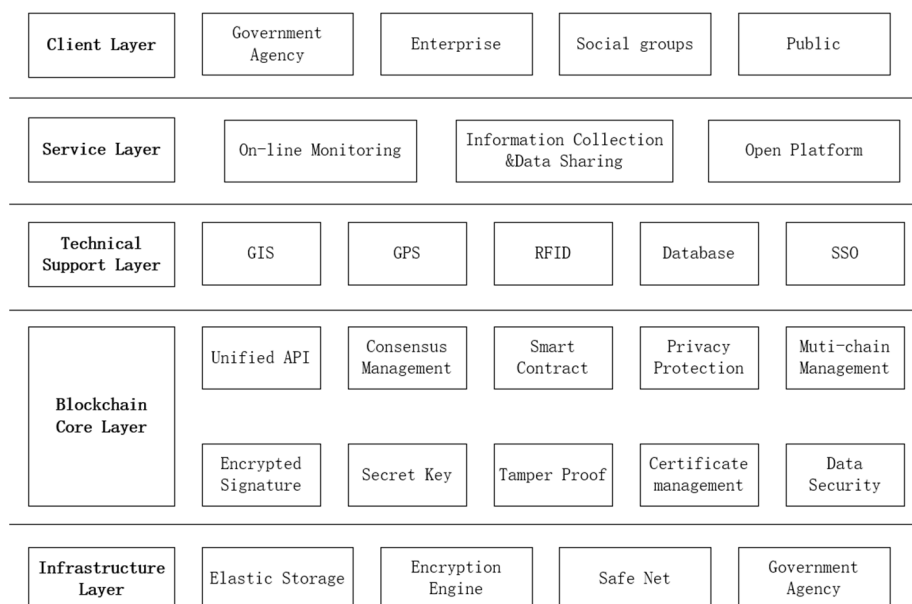


Fig 1. System structure diagram

Infrastructure layer: Different from the purchase of a large number of hardware equipment and site planning in traditional system construction, the emergency management system based on cloud route can save a lot of system research and development costs through distributed cloud storage technology.

Blockchain core layer: this layer is mainly used to collect and store the data of each node in the information chain, and each node records the response, scheduling and other information uploaded or input by emergency management departments or emergency forces at all levels [2]. The system uses public and private key mechanism to each.

The data of each node in the information chain is automatically sorted and connected in series according to the time order, forming the complete information chain of the emergency response of this accident successively. The input information of each block will be synchronized to the whole chain in time, which not only ensures the effectiveness of data update, but also further ensures the immutability and seriousness of system information.

Technical support layer: integrate multiple types of services such as single sign-on and data catalog, effectively reduce the coupling degree of the system, further ensure the universality and expansibility of the system, and provide a unified application support service interface for the business service layer.

Business service layer: it includes online monitoring, information collection and data sharing, and open platform, which is the core component of system application services [3]. Based on the underlying data and on the blockchain layer and technical support layer, this layer provides user access services through PC and mobile terminals, and provides users at different levels with work flow safety production monitoring, accident rescue, safety early warning and daily management services within the scope of authority.

User level of the system: in view of the characteristics of the whole society's concern and full participation, users include government departments, enterprises, social organizations and the public. Corresponding access permissions are set according to the different regions and levels of users, to provide users with information related to production safety management as comprehensively as possible.

2.3. System Association

By customizing the unified application development interface, the system realizes the real-time invocation of data resources between different levels and different departments. Meanwhile, users can also develop and reuse functions such as action evaluation, effect evaluation and information release according to the actual situation. The platform realizes cross-level service sharing and business collaboration through the service bus, and realizes data exchange and information sharing of the business systems of government departments such as fire control, public security, meteorology and water conservancy related to work safety through the data sharing and exchange system.

3. System Functions

The system adopts module customization development to standardize management process and improve management efficiency. As shown in Figure 2, the system includes three modules: online monitoring, information collection and data sharing, and open platform.

3.1. Online Monitoring of Safety Production Information

On-site inspection can be carried out on key areas or installations of production units through explosion-proof mobile terminals through mobile office apps. Inspection results can be transmitted to explosion-proof mobile terminals through short distance RADIO frequency technology and uploaded to the system in real time to keep data synchronization.

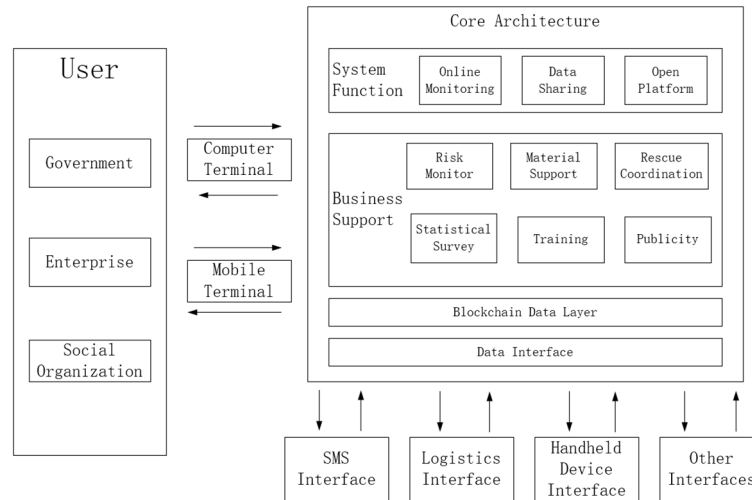


Fig 2. Internal and external correlation structure diagram

3.2. Information Collection and Data Sharing

Establish the sharing mechanism of basic information and connect the safety production data of all production enterprises with the safety production management department. Users at all levels will input personnel certificates, equipment testing and other information into the unified system, and the management system will automatically send timely reminders. Use artificial intelligence technology to make automatic statistics and analysis summary, to realize all kinds of record system archiving, intelligent search. The information resources of production safety between different users can be effectively utilized and the information blockade between different departments can be broken.

3.3. Open Platform

The system has good customization function and friendly working interface; Strong expansion ability, can smoothly connect with the current information system of OA and other enterprises; And has the secondary development ability. The system can bring all kinds of statements in production safety management into unified management, give full play to the system's automatic classification and calculation functions, simplify the report filling content and approval process, improve work efficiency and accuracy, and avoid the omission of manual filling.

In addition to the report, in the process of production safety management system can also be all kinds of data for automatic classification and statistical analysis, intelligence can be realized for all kinds of data between the transverse, annulus compared to the longitudinal comparison and analysis, by analyzing the trend of a large amount of data that can be found abnormal operation in time, for any production safety accident prevention and safety management to provide effective support.

At the same time, the system also has the function of intelligent reminder, regular inspection and detection of all kinds of personnel certificates, equipment and facilities, can realize the regular rectification of hidden dangers found before the expiration of the classification of intelligent reminder, convenient for different user management personnel to prepare in advance; The system can use the SMS reminder function configured to remind the system of to-do and read tasks in a timely manner, ensuring that all approval services can be processed in a timely manner.

4. Implementation Path of Acquisition System

Acquisition layer. The detection layer network and wired/wireless interface are composed of two parts. The main function is to collect equipment operating health status, major disasters and surrounding environment data, as well as power supply system, production system, multimedia system and other safety monitoring subsystem real-time data [4]. Through RFID reader, sensor (temperature, flame, gas, etc.), camera, intelligent terminal, GPS, GIS, 5G and other communication equipment technology, collect the data generated in the production process, including audio and video data, to achieve comprehensive monitoring of personnel, equipment, environment. The wired/wireless interface part is responsible for transmitting the data collected by the network at the perception layer. The wireless network is mainly used in places where it is difficult to deploy. The wireless network with ad-hoc networking, low power consumption and high damage resistance, such as Wi-Fi and ZigBee, can be used.

Data center layer. The data center layer integrates information into the control center system for information processing, data mining and fusion through the wired/wireless interface subsystem [5]. Based on the early warning model and expert knowledge in the database, it identifies and judges the current safety production status to realize intelligent decision making.

Decision makers. The decision-making layer is a comprehensive intelligent system composed of various servers, which has the functions of early warning of safety accidents, accident analysis, accident treatment and rescue scheme [6]. It integrates and processes various underlying data to produce the final report, which is presented to ground safety managers in a more simple and understandable way, and the ground managers make instructions accordingly. The decision application layer adopts the non-text form of graphics and charts to facilitate users to quickly understand the situation and make decisions. Decision application layer system includes accident analysis system, positioning system, real-time monitoring system, expert decision support system, GIS system, network management system and so on.

5. Conclusion

This paper proposes and designs an intelligent collection system of safety production monitoring information based on block chain technology. RFID, GIS, GPS and other technologies are used as comprehensive display Windows to effectively integrate different levels of users and achieve unified management of multi-level users such as government departments, enterprises and public institutions, social emergency forces and the public. The interconnection between internal and external systems can provide efficient decision-making services for the information collection, daily management and accident rescue of production safety, and provide support for the continuous improvement of production safety accident prevention and emergency response capacity, data security, information accuracy and non-tampering.

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