# Research on Production and Sales Collaborative Management System Based on Big Data

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**Abstract.** This paper aims to address the many deficiencies in the current production management system. In order to improve production efficiency and avoid manual and complex operations and their various defects, based on on-site operation requirements and production management models, a production management platform is planned and developed to support production management processes and modular functions through commercial development platforms, ensuring the flexibility and scalability of the platform; Using RFID electronic tags to bind with devices, combined with GIS geographic information system to achieve device positioning and job tracking, and standardize the job process; Utilize intelligent mobile devices to assist in completing all on-site work activities, and achieve unified and collaborative management among various business departments around the five key production links of "detection, analysis, planning, operation, and acceptance"; Develop 6C monitoring, detection and analysis functions to achieve 6C defect import/retest/rectification, graphical analysis, and meet the requirements of defect tracking digitization and traceability; Establish a production management data center, sort out data resources, segment topic domains, develop data decision analysis and big data application functions, and assist decision-making and production management through intelligent means.

**Keywords:** big data; Production and sales collaborative management system; Power supply; Power supply production.

## 1 Introduction

New terms such as artificial intelligence (AI), the Internet of Things, and big data are the wind vanes of the latest information technology. As the foundation and platform of this series of new technologies, the Internet has made the connections between "people", "people and things", and "things and things" closer, and further improved transaction and production efficiency, resulting in a more innovative industrial model and upgraded value creation model [1]. At the same time, the Internet helps enterprises integrate research and development resources and labor resources worldwide, enabling these resources to be divided and collaborated under the connection of the Internet, transforming the previous research and development and production relationships. And big data, as the medium of communication between people and things in the internet, provides impetus for this process. In the current era of the Internet of Things, data, as the core of production, is increasingly important. Data

directly drives the research direction of enterprises, guiding them to shift from the previous economic development model of material production and material services to the economic development model of information production and information services, thereby greatly improving the productivity of production factors. Artificial intelligence AI, on the other hand, is similar to the human brain in that it summarizes and analyzes data, analyzes certain trends from the data, and leads the direction of research, development, and production [2]. Artificial intelligence, through real-time analysis of big data, perceives new trends and demands in the industry, assists people in scientific decision-making and precise execution, making such implicit data generated in the past production, exchange, and consumption processes explicit. At the same time, the explicit transformation of implicit knowledge such as past technologies, skills, and experiences has promoted the formation of a "data information knowledge decision-making" data intelligent flow loop, representing the development direction of a smart society. In response to their own characteristics and business needs, they have built many management information systems applied to power supply systems, achieving significant results and playing an important supporting and leading role in safety production and operation management. In the new situation of deep integration of the Internet, big data, artificial intelligence, and the real economy, and the comprehensive implementation of the national big data strategy, during the critical period of "accelerating transformation and development with reform and innovation as the driving force" of Shanghai Bureau Group Company, the construction of power supply professional informatization is facing new development opportunities and challenges [3].

## 2 Content of traction power supply production network management platform

The overall strategic goal of the construction of the production management platform is to modernize equipment, informationization of professional management, intelligence of testing and monitoring, mechanization of maintenance operations, and full coverage of emergency forces, research and build a production management platform based on power supply business, with equipment management and production operations as the main line, utilizing advanced technologies such as the Internet, big data, artificial intelligence, Internet of Things, GIS (Geographic Information System), and utilizing modular, efficient and flexible business software to provide production business management support functions, combining data governance, data sharing, and management models. Use data to realize control, management, prediction, decision-making and other functions, provide big data support for operation management and decision-making, and realize the modern management mode of technical resources, equipment information and operation data and the experience of "Internet plus data". The information management platform will ultimately form the "four centers of the platform" (i.e. infrastructure platform, business center, process center, data center, and decision center)[4-5].

### 2.1 Overall technical route

The production management platform is a massive enterprise level application platform. It covers many business subsystems and technical plug-ins, so the overall system architecture is highly required. First, the technical architecture must conform to the technical development

trend. Second, the overall architecture can ensure the progressiveness, flexibility, scalability and controllability of the system[6]. After 20 years of development, web applications have nurtured a large number of technical frameworks and platform products. From the perspective of future platform development, we tend to choose commercial basic support platforms for system development. This way, enterprise application assets can be more secure, and while quickly and flexibly responding to changes in enterprise business, it can also effectively integrate and reuse software assets, reducing the overall cost of software ownership.This system adopts the Java technology route and uses JSP/ScrvIc/J2EE technology. Design with a multi-layer B/S structure.Thus, the system forms an open and framework platform based system.Java technology roadmap: The system development will adopt cross platform technologies based on Java, such as J2EE and EJBs. Java is a widely used network programming language. It is a new computational concept. As a programming language, it is simple, object-oriented, machine independent, and has portability, independence, security, and provides concurrency mechanisms. It has high performance; Secondly, it maximizes the utilization of the network and makes it easy to develop application systems with a three-layer structure (MVC). EJB-based application systems have security, mobility, scalability, and cross platform capabilities.

## 2.2Overall Platform Architecture

The construction of a production management platform is a huge and complex comprehensive system engineering. It covers the operational support of all business departments in the power supply section and the information outlook for the future development of the business. So at the beginning of the planning, create a standardized, collaborative, and mobile enterprise level information integration platform, effectively achieving information integration, exchange, and sharing between production business and other interface systems; At the same time, we will gradually build a business center, process center, data center, and decision-making center step by step, and adopt the implementation strategy of taking small steps and marking and sampling to gradually deepen and cover all production businesses. The construction of the business center revolves around the core business of production management, with equipment records as the center. Manage the entire life cycle of equipment through production processes such as production planning work tickets, maintenance and repair, and defect room question banks. By utilizing mobile internet, Internet of Things, and GPS positioning technology, overcome the impact of time and space, achieve mobile operations and safety control on the production site, and improve the refinement of operation management. Build a process center.

# 3 Design and Implementation of Production Management Platform Software

For production management platforms, they exist in the form of software, so software is the core of the entire system. The design and implementation of the production management platform software mainly includes the operation of production equipment and the design and implementation of production management.

## 3.1 Network Management Platform Management

Functional design: A work ticket is a written order that allows work to be carried out on electrical equipment and systems, and is also a written basis for implementing safety technical measures. Operators need to rely on work tickets to carry out most power outage or non power outage operations, and work tickets are also one of the basis for workload reporting. The work ticket management subsystem can be divided into the processes and functions of the contact network and substation specialties, supporting the management of work ticket issuance, approval, and execution by each specialty. The management of work tickets is divided into contact network work ticket management and traction substation work ticket management. The management of contact network work tickets includes the process of power outage work tickets and non power outage work tickets. The power outage work ticket process issues the first type of contact network work ticket and power outage plan application form, while the non power outage work ticket process issues the third type of contact network work ticket[7].The 6C system includes a high-speed pantograph and catenary comprehensive detection device (1C), a catenary safety inspection device (2C), a vehicle mounted catenary operation status detection device (3C), a catenary suspension status detection monitoring device (4C), a pantograph sliding plate status monitoring device (5C), a ground monitoring device (6C) for catenary and power supply equipment, and a 6C system information comprehensive application (6C data center). The 6C management system mainly focuses on closed-loop management of defects detected by 6C, while conducting statistical analysis of defects. This requirement specification provides a detailed description and agreement on the 6C management functional requirements. Defect issue: Defect records exported from various systems through 6C detection. The 6C management flow chart is shown in Figure 1.
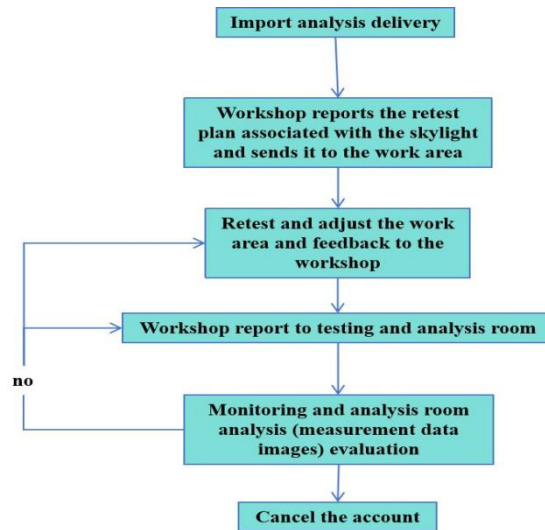


**Fig. 1.** 6C management flowchart.

Identification management is based on identification units such as QR codes and electronic labels. By binding identification to various devices, inspection services are carried out, and dynamic information such as resumes, inspections, and messages are displayed through QR

code scanning. RFID: Electronic label. Also known as wireless radio frequency identification, it is a communication technology that can identify specific targets and read and write relevant data through wireless signals, without establishing mechanical or optical contact between the identification system and specific targets [8-9].

# 4 Analysis of the Promotion and Operation Benefits of Production Management Platform

## 4.1 Social benefits

The server can run on both Linux and Windows platforms; The client does not need to install any software and can be freely used through browsers such as IE and FireFox. After the basic functions of the traction power supply production management platform have been developed, the key business functions have basically passed a round of integration testing, and the pilot work area has been launched for deployment. During the pilot launch period, the original working method of the pilot work area was parallel to the production management system, and the parallel deadline was specified and notified. Each business department cooperates with the pilot launch of the production management system. The pilot work will first conduct trial operation on the following work areas. The original operation mode of the A north connection Contact net work area  remains unchanged and is used in parallel with the production management system; The original operation mode of the City B substation repair work area remains unchanged and is used in parallel with the production management system; Two majors, contact network and traction substation, were selected within the section, each with a work area for production management platform pilot. Starting from the pilot trial system, various communication mechanisms (pilot promotion meetings, problem feedback processes, and special discussion meetings) were established within the section to ensure that the pilot is carried out as planned. Table 1,figure 2 shows the results of the pilot operation.

**Table 1.** Results of pilot operation.

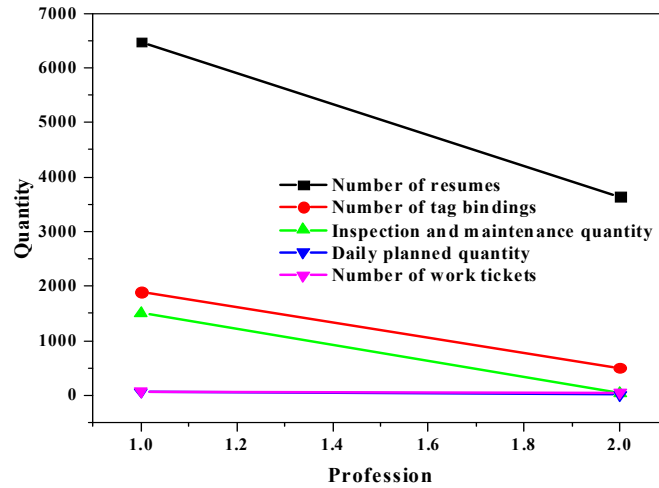| major | workshop | work zone | Number of resumes | Label binding quantity | Inspection and maintenance quantity | Daily plan quantity | Working ticket quantity | Question base quantity |
|---|---|---|---|---|---|---|---|---|
| Touch the net | A north high-speed rail power supply workshop | C north connection Contact net work area | 6473 | 1892 | 1511 | 62 | 70 | |
| Traction substation | B repair workshop | City B substation repair work area | 3643 | 503 | 43 | 10 | 47 | 5 |
| | total | | 10116 | 2395 | 1554 | 72 | 117 | 5 |

**Fig2.**Results of pilot operation.

## 4.2 Safety and Economic Benefits

After the pilot is completed, summarize the pilot promotion experience and promote the use of the traction power supply production management platform to the entire section. The following is the promotion and operation effect of the traction substation profession [10].Table 2 shows the professional promotion and operation effect of the traction substation.

**Table 2.** Promotion and Operation Effect of Traction Substation Specialty.

| serial number | workshop | work zone | Number of resumes | Label binding quantity | Inspection and maintenance quantity | Daily plan quantity | Working ticket quantity | Question base quantity |
|---|---|---|---|---|---|---|---|---|
| 1 | City Q repair workshop | City Q substation repair work area | 1119 | 969 | 194 | 23 | 54 | four |
| 2 | City A repair workshop | City A substation repair work area | 4164 | 1755 | 693 | 46 | 168 | 10 |
| 3 | City W maintenance workshop | W substation repair work area | 4728 | 2564 | 346 | 28 | 71 | 2 |
| | total | | 1 0011 | 5288 | 1233 | 97 | 293 | 16 |

# 5 Conclusion

The main content of this article is to study the production management platform, based on the power supply business, with equipment management and production operations as the main line, utilizing advanced technologies such as the Internet, big data, artificial intelligence, Internet of Things, GIS (Geographic Information System), and utilizing modular, efficient and flexible business software to provide traction power supply production business management support functions, combining data governance, data sharing, and power supply management mode, use data to realize control, management, prediction, decision-making and other functions, provide big data support for power supply operation management and decision-making, and realize the modern management mode of technical resources, equipment information and operation data and the experience of "Internet plus data".

# References

[1] Bin, W. G. , Fan, Z. Y. , Chao, W. , Chuang, W. X. , Jun, M. , & Xiao-Dong, L. , et al. (2021). Multi-level peer-to-peer collaborative optimization of smart energy system based on big data analysis. Journal of Physics: Conference Series, 1965(1), 012145 (9pp).

[2] Dong, J. , Meng, W. , Liu, Y. , & Ti, J. . (2021). A framework of pavement management system based on iot and big data. Advanced Engineering Informatics, 47(2), 101226.

[3] He, L. , Gu, Z. , Zhang, Y. , Jing, H. , & Li, P. . (2023). Review on thermal management of lithium-ion batteries for electric vehicles: advances, challenges, and outlook. Energy And Fuels, 37(7), 4835-4857.

[4] Sultan, D. , Tsunekawa, A. , Tsubo, M. , Haregeweyn, N. , Adgo, E. , & Meshesha, D. T. , et al. (2023). Analyzing the influence of changes in land use and management practices on the lag time of peak flows for tropical watersheds of ethiopia. River Research and Applications, 39(6), 1148-1159.

[5] Seungmin L S .(2023).Hidden target recognition method for high-speed network security threats based on attack graph theory.Journal of High Speed Networks(4),307-320.

[6] Cheng, Z. , Ye, Y. , Huang, W. , Zhang, Y. , & Lan, L. . (2021). Research on power enterprise data model online management decision system based on big data. Journal of Physics: Conference Series, 1802(4), 042096 (7pp).

[7] Wang, Y. , Wang, P. , Liu, Z. , & Zhang, L. Y. . (2021). A new item similarity based on α - divergence for collaborative filtering in sparse data. Expert Systems with Applications, 166(1), 114074.

[8] Tong, Z. . (2021). Application of information system and computer internet technology in integration of geographical indication agricultural products. Journal of Physics Conference Series, 1982(1), 012144.

[9] Gabrielli P A G M .(2023).A Highly Configurable Packet Sniffer Based on Field-Programmable Gate Arrays for Network Security Applications.Electronics(21), 77(2), 17-29.

[10] Fahima K R S S I .(2023).A new method of image encryption using advanced encryption Standard (AES) for network security.Physica Scripta(12), 17(12), 637-646.