Research on Effective Management and Control team System of Power Grid Based on Internet Technology

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Abstract. In the safe production and operation of electric power, grassroots teams have undertaken the main work. How to effectively control and control teams is an important issue in the power grid. This paper has designed the mobile internet management technology based on "Internet+" for mobile teams, including mobile operating terminals based on Android. Design and development, large-screen display of work order management and control based on GIS and development of web-side background management platform. The team basic management system is convenient and flexible in managing all links of team basic information. Have good Ground scalability central system to meet the development of various new personalized services, effectively improve the basic management of teams, Scientific scientific level.

Keywords: Grassroots teams, mobile operations, real-time management and control.

1. Introduction
Teams are the most basic organizational unit for enterprises to engage in production and business activities or management, are the cells that stimulate the vitality of employees, and are the starting point for improving the management level of enterprises and building a harmonious enterprise. Today, with the globalization of the world economy, the glorious tradition of team building has been carried forward and carried forward in many enterprises. However, under the influence of the market economy tide and the idea of quick success and immediate benefits, many enterprises have appeared "team indifference" and " In the "weak construction" situation, team construction has been relaxed, and the foundation of the enterprise has been shaken. This phenomenon has aroused great attention from enterprise managers. At present, the construction of team cells of enterprises has attracted great attention from many provincial and ministerial agencies including SASAC and central enterprises. For this purpose, the SASAC issued the "Guiding Opinions on Strengthening the Construction of Central Enterprise Teams" to promote team building to enhance the core competitiveness of enterprises and promote the scientific development of enterprises. Major central enterprises have also introduced relevant measures and systems for team building.

In the safe operation and management of electric power, the arduous work of transmission inspection, substation inspection, relay protection, automation, communication, and safety inspection are all undertaken by grassroots teams. With the improvement of people's living standards, people are increasingly demanding electricity services, and inefficient service often leads to serious complaints.
At present, Xiangshan Power Supply Co., Ltd. has the following problems in team management: (1) Personnel management and control methods are backward, and maintenance personnel leave the unit and are in an unconstrained free working state. They can only rely on consciousness to improve work efficiency. It is difficult for the command centre to objectively evaluate its working status. In order to understand the progress of the work order processing, it is necessary to frequently communicate with the supervisor by telephone, which is relatively inefficient. (2) The work order processing method is backward, manually copy the work records of the inspection and maintenance personnel, and manually enter the relevant system after returning to the unit. This not only delays the closed-loop time of work tasks, but may also lead to misoperations, missed operations, and even frauds, resulting in certain deviations between the relevant business system statistics and the actual situation. (3) The job site and the command centre cannot interact in real time. If new problems are discovered during the inspection or repair process, the relevant photos or video materials cannot be returned in time, and it is easy to miss the first processing. To this end, we study a mobile operation management and control technology based on "Internet+" to facilitate real-time management and control of the work of personnel and the completion of work orders, and improve the quality and efficiency of mobile operations [1].

2. Concept analysis

2.1. The concept of team management
(1) Teams are the basic unit of enterprise productivity. The enterprise is composed of several teams and groups. The level of production efficiency of the enterprise, the guarantee of product quality, the exploitation of potential, and the reduction of consumption must all be completed through the team. The strategy, objectives, policies and tasks of the enterprise's operation and development stage ultimately depend on the team to implement it. The internal reform measures of the enterprise also depend on the team and the staff of the team to achieve the expectations. Therefore, the function and role of the enterprise are actually through each team to achieve this, there will be no enterprise without a team. (2) Team management is the foundation of enterprise management. All aspects of enterprise management must be implemented in teams and groups. The overall picture of enterprise management directly reflected by team management reflects the management capabilities of the enterprise. It is an important task of enterprise management with strong team building and improving team management. (3) Teams and teams are the basic workplace for cultivating employees of the "four-you" enterprises. Teams and teams not only need to produce products, but also talents. The essence of competition among enterprises, quality competition and technological competition is the competition of talents and the competition of human qualities. The construction of a "four-man" staff team can only make the effective enterprise full of vigour and vitality by starting from the team.

2.2. Team management of power companies
The power enterprise is an independent economic unit of the commercial and industrial sectors. It has its own economic accounting system, which produces and sells electrical energy through power systems such as power generation, transformation, and transmission. In the power enterprise, the team is the most fundamental element of the power company. The team can ensure the construction of the power company. The team provides a basic foothold for the safety production and marketing quality services of the power company. The level of team management ability will affect the entire power enterprise. The competitiveness of the team, whether the team construction is good or bad, directly affects the economic benefits and corporate social responsibility. In the modernization construction, the power enterprise system also needs more team building management reforms, advancing with the times, using innovative methods, combining with high technology, promoting the basic management of power enterprises, and playing the role of team construction in the operation of power enterprises.

In recent years, with the development of the national economy, the country's power industry has made great progress. Corresponding to this, with the continuous deepening of computer science and
technology, its field can be applied to the power system, and it is playing an irreplaceable role in the power system step by step. With the continuous advancement of science and technology, power supply companies will transition from production management to operation management. Power supply companies need to ensure production safety, but also need to continuously improve management capabilities, reduce operating costs, and maximize profits. How to improve business efficiency and help decision makers make correct analysis is a problem that power companies must face [2].

2.3. Overview of the three-tier architecture
The three-tier structure is based on the idea of modular program design, and a standard mode of module division is gradually formed in order to realize the needs of decomposing application programs. In the development of relatively large-scale application management systems, the use of three-tier structure development is extremely important. In the development of a three-tier structure system, not only can the encapsulation of object-oriented development ideas be fully reflected, to avoid the guise of object-oriented but still walking on the road of process. At the same time, the introduction of packaging ideas also makes software reuse a reality, which greatly reduces the amount of program code, reduces the work intensity of programmers, and significantly reduces system maintenance work, which is helpful for maintenance and upgrades after the system is delivered. The end result is to save development costs and improve development efficiency. ASP.NET three-tier architecture is divided from bottom to top: data access layer (DAL), business logic layer (BLL) and presentation layer (PL). Figure 1 below is a three-tier architecture diagram.

![Three-tier architecture diagram description](image)

As shown in Figure 1, the application server runs between the browser and the data resource. A simple example is that the customer enters an order from the browser, and the Web server sends the request to the application server for execution by the application server. Business processing logic, and obtain or update the back-end user data, and finally return the final result to the user access interface.

3. System requirements analysis

3.1. System planning
The team information management system should realize the informationization, networking, and modernization of team management, so that the work tasks of team members become relatively easy, and the workload per unit of time can be increased. Realize the digitization of data management, data query informatization, business analysis network, real-time problem solving and paperless office, fully realize the A2 standard of provincial company team construction management. The goal of this project construction is to develop an information system suitable for the team management mode of the Xiangshan branch, which is convenient for maintenance personnel to operate and manage and improve work efficiency. as shown in picture 2.
The user view that needs to be determined by the team information management system is mainly an automatic statistical chart of periodic reports, including basic statistics of team employees, age statistics of team employees, education statistics of team employees, statistics of production team employees, education team statistics of marketing team employees, agricultural power statistics on the educational background of employees in similar teams and groups, and statistics on the skill levels of employees in teams and groups.

3.2. Demand analysis

3.2.1. Analysis of data and data processing needs. From the perspective of data organization and storage design that need to be analysed, different types of data entry and data structure identification management require analysis and data processing together to form a data specification manual.

The content of the data dictionary has 5 parts: data item, data structure, data flow, data storage and handle. A data item is the smallest constituent unit of data. An item can consist of a data structure, the content of a logical data stream described by a data dictionary, storage of data item definitions, and multiple data in a data structure. The analysis of the results of data access operations and data processing requires analysis of various types of data items from the data access and processing of the view, which can be expressed as a data flow graph or various processing service specifications that the DBAS point should support. Data flow graph is a formal data demand analysis technology that uses data items, data storage, data processing, and data flow concepts to describe the processing of data. Data processing requirements analysis results can also be expressed as transaction specifications. The transaction specification includes the following descriptions: transaction name, transaction description, transaction access data item, and transaction user.

3.2.2. Performance requirements analysis. Performance requirements describe how much the system should do. Performance indicators are: 1) Response time of data operations, data access response time, refers to the time when the request is submitted to the database system for the user data operation results. 2) Throughput of the system, the number of database transactions can be completed in unit time by the query of the system. According to the database system benchmark program standard
defined by the Transaction Processing Committee, the system throughput can be expressed as the number of transactions per second. 3) The maximum number of users allowed, concurrent access under the premise of a single user query response time, the system allows users to access the database at the same time at most.

3.2.3. Data automation management needs. Adopt "rapid prototyping method" and "incremental iteration method" to build a benchmark evaluation model for team construction. The "rapid prototyping method" is a method of generating a prototype system through the three-stage software development process of "demand analysis-system design-system implementation". "Incremental iteration method" is a method of incremental development of the system based on the rapid prototyping method and analysis of system requirements to continuously improve the system functions. Through the practice of "rapid prototyping method" and "incremental iteration method", the systematic realization of the benchmark evaluation model for team construction is completed efficiently [3].

In data analysis, index calculation models such as normal distribution and quintile are mainly used. According to the statistical description and distribution characteristics of the indicator data, determine the quantile and score of the indicator data to ensure the objectivity and fairness of the evaluation results. According to the statistical principle, the statistical description of the index data is carried out, and according to the distribution characteristics of the data, the normal distribution and the quintile are used to determine the data quantile. The normal distribution algorithm is shown below. If there is a formula

\[ X \sim N\left(\mu, \sigma^2\right), Y = \frac{X - \mu}{\sigma} \sim N\left(0, 1\right) \]  

(1)

It follows the standard normal distribution, and the probability value of the original normal distribution can be directly calculated by checking the standard normal distribution table. Therefore, this transformation is called a standardized transformation (standard normal distribution table: the standard normal distribution table lists the area ratio in the range from \(-\infty\) to \(X\) (current value) under the standard normal curve). If the random variable \(X\) follows a probability distribution with position parameter \(\mu\) and scale parameter \(\sigma\), and its probability density function is

\[ f(x) = \frac{1}{\sqrt{2\pi\sigma}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \]  

(2)

Then this random variable is called a normal random variable, and the distribution that the normal random variable obeys is called the normal distribution, denoted as \(X \sim N\left(\mu, \sigma^2\right)\), read as \(X\) obeys \(N\left(\mu, \sigma^2\right)\), or \(X\) obeys the normal distribution.

4. System design

4.1. Development environment analysis
1. Web server: IIS6.0. 2. Software development language: C#. 3. Development tool: Microsoft Visual Studio 2008. 4. Development environment: Microsoft .NET Framework 3.5. 5. Database server: Sql Server 2005. 6. Client operating system: Windows 2010. 7. Server operating system: Windows 2003 Server.
4.2. **Overall system design**

4.2.1. **Responsibility management.** The job responsibility management class diagram contains three classes: user class, duty Type class, and duty Detail. Among them, there is a one-to-many relationship between the duty Type class and the duty Detail class. The activity diagram between the various types is shown in Figure 3 below.

![Figure 3. Work responsibility management activity diagram](image)

4.2.2. **Basic data management.** The basic data management class diagram includes device Data class, operate Mainten class, technology Manage class, team Group Manage class, and security Manage class. The timing diagram of basic equipment management is shown in Figure 4.

![Figure 4. Timing diagram of equipment basic data management](image)
4.3. Physical structure design of database table
The physical structure of the administrator information table is shown in Table 1. This table mainly records the user name and login password information of the system administrator.

| Field name | type of data | Primary key | description      |
|------------|--------------|-------------|------------------|
| Id         | varchar      | Yes         | Administrator Id |
| name       | Varchar (100)|             | Administrator username |
| password   | Varchar (100)|             | Administrator password |

The physical structure of the user information table is shown in Table 2. This table mainly records the login user and password of the system login user.

| Field name | type of data | Primary key | description      |
|------------|--------------|-------------|------------------|
| Id         | varchar      | Yes         | User Id          |
| name       | Varchar (100)|             | User username    |
| password   | Varchar (100)|             | User password    |

The physical structure of the work responsibility table is shown in Table 3. This table mainly records the work responsibility related information of the team.

| Field name | type of data | Primary key | description          |
|------------|--------------|-------------|----------------------|
| Zl Id      | varchar      | Yes         | Job Responsibility Type Name |
| name       | Varchar (10000)|             |                      |

4.4. Main function realization
This system adopts B/S architecture and is divided into background server, web page management terminal, mobile terminal and large screen terminal. The background server is developed based on the J2EE framework, and mobile terminals and large-screen terminals are developed using Android. The HTTP protocol is used for the data interaction between the mobile terminal, the large screen, the web page and the server. The server develops a data interaction interface. The handheld terminal and the large screen access the interface through the HTTP protocol to obtain data, as shown in Figure 1.

Figure 5. System configuration diagram
4.4.1. Design and development of mobile operation terminal based on Android. It mainly includes staff and administrator accounts, of which the login staff account has the following functions: 1) View task tickets: After the staff opens the mobile terminal, the main interface displays the names of all the current task tickets that need to be processed, click on a specific job Tickets, you can view the specific work order details. Click Processing to indicate that the worker is currently processing the work order. 2) Closed loop for application tasks: When the staff has completed a work order task (the staff cannot accept the work order due to special circumstances and needs to return the order), fill in the basic information (work content, completion status, photo information, additional task completion ), click Apply to close the loop and let it be reviewed by the administrator. 3) Submit a temporary work order: When the staff receives a call from the customer, fill in the task content (title, task content, contact, location, etc.) in the terminal, click Submit Work Order and hand it over to the administrator for distribution. The staff can also apply for the work order when submitting the work order, and the administrator can give priority to the applied staff when dispatching the work order. 4) Overtime application: When the employee needs to work overtime, fill in the overtime information (overtime type: working day overtime, holiday overtime, overtime, overtime reasons, etc.), and submit to the administrator for review. The login administrator account has the following functions: 1) Issue temporary work orders: After receiving the temporary work orders submitted by the staff, the administrator reviews the contents of the work orders and assigns the work orders to the staff to complete. If the worker who submitted the work order has already applied for the work order, the administrator can assign the work order to the worker first. 2) Closed-loop confirmation: After receiving the closed-loop request from the staff, the administrator checks the completion of the staff's tasks and confirms whether the work order can be closed [4].

4.4.2. Large screen display of work order management and control based on GIS. In order to facilitate real-time management and command, a large-screen display function is designed to display the status information of all staff on duty on the large screen, whether the staff is idle, and whether the task is heavy; the map of Xiangshan's area division is displayed, which roughly indicates the current location of the staff; Scroll to display the issued task ticket and completed task ticket. It includes 1) personnel information display. Display the status information of all staff on duty, whether the staff is free, the name will be green if free, the name will be Gray if you are on leave, the name will be orange if there is already a task, if the staff has a heavy workload, there are already many workers Single, the name is red. In this way, the administrator can understand the workload of each worker on the big screen and allocate the workload reasonably; 2) map display. A large-screen display of Xiangshan’s area division map roughly indicates the location of each power supply station. After the worker processes the work order, the worker’s head is marked in the area to which the work order belongs. In this way, the administrator can intuitively understand in which area of Xiangshan each worker currently works; 3) Task work order scrolling. Display all the work orders that have been dispatched, are being processed, and completed work orders on the large screen, so that the administrator can intuitively understand the completion of the tasks of the day on the large screen.

4.4.3. Web page background management platform development. The back-end web page is mainly used for platform information management and control, and has the following functions: 1) Publish planned work orders: Administrators can post tasks that need to be completed within one week on the web page, administrators fill in task information and time to be completed, and assign them to work personnel. The system will automatically release tasks to the assigned staff at the expected time. 2) Issue temporary work orders: After receiving the temporary work orders submitted by the staff, the administrator reviews the contents of the work orders and assigns the work orders to the staff to complete. If the worker who submitted the work order has already applied for the work order, the administrator can assign the work order to the worker first. 3) Closed-loop confirmation: After receiving the closed-loop request from the staff, the administrator checks the completion of the staff's tasks and confirms whether the work order can be closed. 4) Staff information configuration: The
administrator can configure all staff information in the background, such as name, gender, photo, specialty and other information. At the same time, if the employee asks for leave, the employee flag can be requested for leave on this page. 5) Work order report query: the administrator can view the work order report of each worker in the background, the number of work orders per week/month/year, the number of completed power supplies, the number of uncompleted work orders, the proportion of completed work orders, etc. information [5].

5. System application statistical test
After the system was put into application, the relevant indicators of the grid team system were tested. On the one hand, from the organizational structure dimension, the completion of various indicators of various units, professional rooms, and teams in the form of radar charts is displayed step by step. On the other hand, from the professional management dimension, in the form of ring charts, column charts and tables, according to each major, each type of team, each indicator, show the specific situation of each unit in the province. With the help of multi-level and multi-dimensional graphical display, the core business of the teams and groups can be displayed clearly and intuitively, so that each team can see its own indicator level and gap, and each unit can see the overall level and position of its team construction. Second, each major can see its own management level and shortcomings. Table 4 shows the scores of each team [6].

| Name                  | Weight score | Real score | Scoring rate | Provincial ranking |
|-----------------------|--------------|------------|--------------|--------------------|
| Support Guarantee     | 57.80        | 49.19      | 85.11%       | 12                 |
| Marketing services    | 245.24       | 178.02     | 72.59%       | 14                 |
| Regulate operation    | 204.85       | 177.60     | 86.69%       | 11                 |
| Operation and maintenance | 254.49   | 172.22     | 67.67%       | 11                 |

6. Conclusion
In view of the current problems in the team management of Xiangshan Power Supply Co., Ltd., the team-based mobile operation management and control technology based on "Internet+" is studied to achieve a clear understanding of the team dynamics. Through the large screen, the team leader can intuitively understand the current status of each team member. Work status, you can reasonably arrange the workload of each class member, which is convenient for dispatching class members to work together. To achieve closed-loop management of all task work orders, the monitor can real-time know whether the work has been implemented in time, and at the same time, through the background report, it is convenient for the assessment and management of the team and team, greatly improving the level of control of the team.

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