Design and Implementation of Fixed Asset Management System for Electric Power Enterprises

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Abstract: Electric power enterprises play a very important role in China's economic development, and their management efficiency will directly affect the increase of enterprise benefits and the improvement of competitiveness. Fixed asset management, as one of the important contents of electric power enterprise management, cannot be ignored. However, electric power enterprise fixed assets have their unique characteristics such as wide application range, large amount of money, and fast update speed, This makes it difficult to manage the fixed assets of power companies well. With the rapid development of science and technology, especially the advancement of computer and network technology, it has become inevitable to carry out information management of fixed assets in enterprises. Therefore, in order to solve many problems in the current fixed asset management of enterprises, developing a fully functional fixed asset management system for power enterprises has become an effective approach. Propose a three-layer architecture framework that separates data access and application, utilizing Asp.net technology and combining SQL Server database on the Visual Studio development platform to implement a solution for asset management in power enterprises. This plan includes four functional modules: asset basic data maintenance, asset arrival information management, requisition information management, and inventory information management. The basic data maintenance module includes the management of asset types, asset suppliers, and system roles; The asset in place information management module realizes the input of asset purchase orders, query and statistics of asset purchases; The requisition information management module includes the input and query of requisition information; The inventory information management module realizes the query and statistics of asset orders and existing inventory. Through collaborative management between different modules, the current asset information status, availability, usage, and inventory status of power enterprises can be effectively changed. Through the research of the project, the workload of staff has been greatly reduced, and manual operations have been replaced with advantages such as speed and accuracy, improving the efficiency of asset management work.

Keywords: fixed asset management, asset availability, requisition management, inventory management, collaboration

1 Introduction

In the society with widespread informatization, in recent years, some famous enterprises in Western countries have proposed quality management theories for fixed asset management, which not only greatly reduces costs but also makes the previously chaotic fixed asset

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management procedures simpler and clearer. Significant achievements and effects have been achieved in terms of company efficiency and management.

Fixed assets of an enterprise refer to tangible assets held for the production of goods, provision of services, rental or management purposes, with a high unit value and a useful life of more than one year. From a physical perspective, the fixed assets of power enterprises mainly include transmission lines, substation equipment, distribution equipment, automation equipment, tools, electronic equipment, transportation equipment, and other tangible assets such as real estate[1-3].

Asset management is a very important task for any enterprise or institution. The quality of asset management directly affects the operational effectiveness and performance of the enterprise. In government institutions, good asset management can effectively prevent the loss of state-owned assets. The fixed assets of power enterprises have their unique characteristics in management: firstly, there are many departments that use fixed assets in power enterprises, including internal direct departments, rural power companies, intermediate custody layers, etc. [4-5]; Secondly, the usage range is relatively large, ranging from suburbs to urban areas, from mountain slopes to flat land, covering every corner of the jurisdiction; Once again, the classification of fixed asset structure in power enterprises is relatively complex, including transmission lines, distribution lines and equipment, measuring equipment and communication equipment, transportation equipment, automation equipment, and so on [6-7]; Finally, the assets of power companies are also reflected in their large quantity. In summary, the fixed asset management department of power enterprises faces significant pressure in asset management work. As a physical carrier for the continuous operation and development of various businesses, fixed assets play a very important role in creating a good business environment, improving competitiveness, and expanding business space for enterprises. Fixed asset management also constitutes an important component of the internal control system of enterprises [8-9]. However, in fact, fixed asset management has not been satisfactorily managed. The traditional fixed asset management approach pursues large and comprehensive, small and comprehensive, with a one-sided emphasis on investment and pooling enterprise resources. The traditional manual accounting method is still used for fixed asset accounting, resulting in outdated management methods and a disconnect between investment and operation. From this, it can be seen that the traditional fixed asset management model is difficult to meet the needs of new forms of business management in terms of both quality and efficiency [10-11]. The manual management method, which is inefficient and costly with a high error rate, has been phased out in this era of informatization.

Fixed assets are the main means of labor for enterprises and the material foundation for the development of the national economy. It signifies the production capacity of an enterprise and the level of national productivity development in terms of quantity, quality, and technological structure. Improving the economic benefits of using fixed funds is not only beneficial for enterprises to increase product output, expand product varieties, improve product quality, and reduce product costs, but also saves national basic construction funds and expands the scale of fixed assets with limited construction funds. It is necessary to strengthen fixed asset management, tap into the potential of fixed assets, protect the integrity of fixed assets, and continuously improve the utilization of fixed assets. According to relevant data statistics, fixed assets account for about 70% of the assets in many power enterprises. Properly managing and utilizing these fixed assets is of great significance and has enormous benefits. As long as we

take technology as the guide, system as the guarantee, strengthen management systems and methods, clarify responsibilities, we will definitely achieve standardized, orderly, and efficient asset management.

The characteristics of fixed assets in power enterprises require us to have industry specificity in development, which is specific to the power system rather than universal to all industries. There are also quite a few financial systems in the market that have fixed asset management functions, but due to their strong universality and weak professionalism, they only provide general asset management and cannot meet the complex management requirements of power enterprises. Fixed asset management in power enterprises is a requirement for the characteristics of power assets. Strengthening fixed asset management is the guarantee for the development of power enterprises and the foundation for ensuring the safe and stable operation of the power grid. So it is very necessary to develop a fixed asset system for power enterprises[12-13].

The main focus of this article is on the management of fixed assets in power enterprises. After elaborating on some concepts of management systems, this paper focuses on analyzing the business process of fixed asset systems in power enterprises, and combines the business characteristics of the system to plan a more detailed system requirement analysis report from a practical perspective. Based on requirement analysis, complete the implementation of specific system functions. In the overall system design stage, based on the business characteristics of the power enterprise, a detailed description is made from various aspects such as practicality, safety, stability, and user interface design.

2 Design Of Fixed Asset Management System For Electric Power Enterprises

2.1 Database conceptual design

The conceptual model is the core and foundation of a database system. The description tool for conceptual models typically uses E-R model diagrams. This model does not rely on specific hardware environments and DBMS. The conceptual design of the database is achieved through E-R diagrams. The E-R diagram, also known as the Entity Relationship Diagram, provides a method of representing entity types, attributes, and relationships to describe conceptual models of the real world.

Entity: entities with the same attributes have the same features and properties, and are abstracted and characterized using entity names and their set of attribute names; Represent with a rectangle in the E-R diagram, with the entity name written inside the rectangular box. The entities of this system include: user, product, order, administrator, and product classification.

Attribute: A property possessed by an entity, which can be characterized by several attributes. Represent it as an ellipse in the E-R diagram and connect it with the corresponding entity using undirected edges;

Relationship: Connection, also known as a relationship, reflects the connections within or between entities in the information world. The internal connections within an entity usually

refer to the connections between the various attributes that make up the entity; The connection between entities usually refers to the connection between different sets of entities. In the E-R diagram, use a diamond to indicate the contact name inside the diamond box, and connect it with the relevant entities using undirected edges. At the same time, label the type of contact (1: 1, 1: n or m: n) next to the undirected edge.

This system has the following entities: assets, administrators, customers, suppliers, orders, salespersons, inventory, etc. The attributes of assets mainly include asset number, asset name, and other information. The actual body diagram is shown in Figure 1.

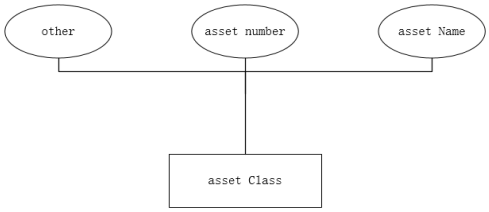

Figure 1. Asset entity diagram.

Some calculation formulas used by power companies in fixed asset management. These formulas can help power companies better manage their fixed assets, improve asset utilization efficiency, and reduce maintenance costs. The following are some commonly used fixed asset management formulas for power companies:

$$X^* * (1 - Y^*)/Z^* = R^* \tag{1}$$

Formula 1 is the fixed asset depreciation formula, where X^* is the original value of the fixed asset, Y^* is the estimated net residual value rate, Z^* is the estimated useful life, and R^* is the annual depreciation amount.

$$X^* - L - T = V \tag{2}$$

Formula 2 is the fixed asset net value formula, where L is cumulative depreciation, T is impairment provision, and V is the fixed asset net value.

$$R^*/A^* * 100\% = S \tag{3}$$

Formula 3: Fixed asset utilization rate formula, where R^* is the actual usage area, A^* is the total area, and S is the fixed asset utilization rate.

$$W^*/(A + 1) = S^* \tag{4}$$

Formula 4 is the fixed asset maintenance cost formula, where W^* is the total maintenance cost, A is the number of repairs, and S^* is the cost of each repair.

The attributes that customers possess include: member number, member name, address, contact phone number, company homepage, member category, consumption amount, postal code, contact phone number, email, and note information. The actual body diagram is shown in Figure 2.

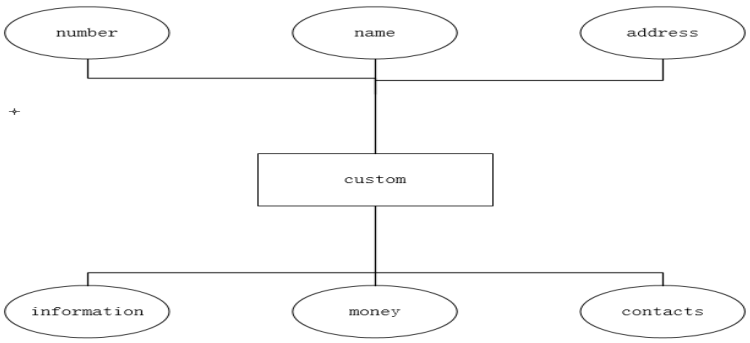

Figure 2. Customer entity diagram

2.2 Structural Design of Fixed Asset Management System

The fixed asset management system adopts a browser/server system (B/S) structure. And this structure adopts a three-layer architecture.

The B/S three-layer architecture divides the entire business into three layers, namely the user presentation layer, business logic layer, and data access layer. Through hierarchical division, achieve logical independence between layers and business independence between modules. The division of three levels is logically based, and there can be various combinations of specific physical divisions. Middleware, as the basic platform for constructing a three-layer structured application system, provides the following main functions: responsible for the connection and communication between clients and servers, and between servers; Implementing Applications and Numbers

Efficient connection of data bases; Provide a platform for the development, operation, deployment, and management of a three-layer structured application. This three-layer structure is independent of each other between layers, and any change in one layer will not affect the functionality of the other layers. In the B/S architecture system, users make requests to many servers distributed on the network through a browser, which processes the browser's requests and returns the user's required information to the browser. And all other tasks such as data requests, processing, result returns, dynamic webpage generation, database access, and application execution are completed by Web Server. With Windows integrating browser technology into the operating system, this architecture has become the preferred architecture for today's application software. Obviously, B/S structured applications are a significant improvement compared to traditional C/S structured applications.

Database Physical Design

The JXC database consists of multiple tables, each named with its corresponding pinyin initials. The design results of each table are shown in the following table, where each table represents a corresponding table in the database. Asset Category Table: includes asset number, asset name, and note information. The asset number is automatically added by 1 in the database and uniquely identifies the asset. It is the primary key of the asset category table and cannot be empty during design. Merely having an asset number is not enough. It is necessary

to have an asset name that corresponds to it. When searching or using it, the asset name should correspond to the asset number.

Table 1: Asset Category Table.

Column Name	Data type	Is it empty	Illustrate
Cplbbh	Int	Not null	Asset number
Cplbmc	Varchar	Not null	Asset name
Cplbbz	Text	Null	Memo

Role permission table: composed of a number (designed solely to distinguish fields), role number, and permission number, the specific permission functions of the relevant users are determined by the role permission number. The number is the primary key, which uniquely identifies a role. During design, this item is non empty, and the role number and permission number are used to assign roles and permissions to each number.

Table 2: Role permission table.

Column Name	Data type	Is it empty	Illustrate
Js_qxbh	Int	Not null	Number
Jsbh	Int	Null	Role name
Qxbh	Int	Null	Authorization number

3 Implementation Of Fixed Asset Management System For Electric Power Enterprises

3.1 The environment for system implementation

The programming platform for implementing the system is Visual Studio2008, and the database is SQL Server 2005,

Use C # for programming language.

(1) Visual Studio 2008 Development Platform

Visual Studio is a development environment launched by Microsoft. It is currently the most popular Windows platform application development environment. Currently, it has been developed to version 10.0, which is Visual Studio 2010. Visual Studio can be used to create Windows applications and network applications on the Windows platform, as well as network services, smart device applications, and Office plugins.

(2) SQL Server 2005 Database

Microsoft SQL Server 2005 is a comprehensive database platform that provides enterprise level data management using integrated business intelligence (BI) tools. SQL (Structured Query Language), also known as Structured Query Language. The main function of SQL language is to establish connections and communicate with various databases. According to ANSI regulations, SQL statements can be used to perform various operations, such as updating data in a database, extracting data from a database, and so on. The vast majority of

popular relational database management systems adopt the SQL language standard. Even though many databases

Developed and extended SQL statements, but included Select, Insert, Update, Delete, Standard SQL commands such as Create and Drop can still be used to complete almost all database operations.

3.2 Implementation of Basic Information Management

The basic information management module includes various basic data processing modules of this system, such as role information setting, permission information setting, salesperson information setting, customer information setting, supplier information setting, warehouse information setting, asset information setting, and so on.

The main functions of each submodule for basic information maintenance are as follows:

Switching user modules: Before entering the system, log in from the login interface. When logging in, multiple login roles can be selected to have different usage permissions;

Permission information setting module: The system administrator uses this module to perform relevant operations on the permission information of different users, that is, to correspond to each jump page based on the data in the backend database;

Salesperson Information Setting Module: System administrators use this module to perform related operations on salesperson information; Customer Information Setting Module: System administrators use this module to perform related operations on customer information, such as adding and deleting customer information;

Supplier Information Setting Module: System administrators use this module to perform related operations on supplier information, such as adding and modifying supplier information;

Asset Information Setting Module: System administrators use this module to perform related operations on asset information, such as modifying the description of asset information;

Warehouse information setting module: System administrators use this module to perform related operations on warehouse information, such as modifying the quantity of warehouses, etc;

Role information setting module: System administrators use this module to perform related operations on role information, such as modifying the corresponding role information;

3.3 Implementation of asset in place management

The main functions of each sub module of the asset in place management module are as follows:

Purchase information query function:

Salespeople use this module to query and sort purchasing information by different fields;

Purchase order entry and modification function:

Based on the quantity of inventory assets, the salesperson performs corresponding operations on purchase orders, such as modifying inventory levels;

Purchase order entry and modification function:

The salesperson performs relevant operations on the purchase order based on the confirmation of the purchase order, such as entering the order;

Purchase order printing function:

The salesperson prints the purchase order based on the entered information.

3.4 Functional testing

Logic functional testing is used to test the logic of a system, mainly targeting the business logic and operational logic of the system. The operation logic check mainly includes: page link check, relevance check, checking whether the function of the button is correct, information duplication, checking deletion function, etc. Taking system login testing as an example, as shown in table 3, describe the functional testing process of this system.

Table 3: Functional testing.

ID	20110607004	Name	System Login
Use case description	System login Enter the system with a valid username and password Page information includes: Page background display User name and password input interface, login system interface after inputting data		
Use case entry	Open IE and enter the corresponding address in the address bar to enter the login page of the system		
Test Case ID	Scene	Testing procedure	Expected results
TC1	Initial page display	Enter from the entrance of the use case	Design consistency
TC2	User name input verification	Enter an existing user	Admin input successful
TC3	Password entry	Enter data associated with username	Input successful
TC4	System login	Click the login button	Successfully logged into the system

4 Summarize

The power fixed asset management system belongs to the B/S structure and adopts a three-layer architecture mode. It mainly consists of four modules: basic information management, procurement information management, requisition information management, and inventory information management. The operation interface is beautiful and convenient for users to operate and use. After a period of research and operation, this system has achieved the following goals:

(1) The system can achieve the normal use and management of four functional modules: basic information management, procurement information management, requisition information management, and inventory information management.

(2) High stability, able to achieve multi-user operation at the same time, even when the system is at its busiest time, it can meet the smooth completion of each task.

(3) It has high security and allows users in the system to set permissions, with different roles having different permissions. The system itself also has the ability to prevent information leakage and human data destruction.

(4) The system has strong efficiency and scalability.

(5) The interface is beautiful and tidy, with simple and convenient information retrieval and functional operation.

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