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Intelligent platform design of electricity charge recovery business system based on business collaboration

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Abstract. In order to meet the actual business process and customer demand of electricity charge recovery management, this paper designs and develops a electricity charge recovery management system based on J 2 EE. It adopts the latest information management concept in the software development process, and introduces the software development technology MVC mode into the functional module development and design of the system. The development language of the system software adopts Java, the development tool adopts Eclipse, and adopts SpringMVC lightweight development framework to complete the coding design of the system functional modules. According to the specific characteristics of each functional module, the business logic interface of the functional module is determined, and the various business operation interfaces are called to complete the functional operation according to the requirements of the user page. Put the data display part into the view module, and the background database is also called through the control module. The modules can access and operate through specific interface examples, which greatly reduces the coupling between the modules and improves the maintenance efficiency of the system functions. Finally, the system function is tested through the QTP tool, and the JMeter tool is used to test the load performance of the system. The final test results show that the system can better meet the management needs of local power supply companies, realize the sharing of system data, reduce the management cost of the company, and effectively improve the electricity recovery management efficiency and service quality of local power supply companies.

Keywords: electricity charge recovery; Business system; Power supply company; Web development

1 Introduction

With the increasing scale of China's power enterprises and the increasing number and types of electricity customers, the challenges and risks faced by power enterprises have become increasingly severe. This includes both internal and external risks in power enterprises. The risks of the power recovery management system mainly include unpaid fees from electricity users, and unpaid fees from the closure of electricity companies[1]. This phenomenon poses great challenges to the operation of power enter-

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prises. Therefore. It is necessary to investigate and analyze the business situation of such enterprises in order to provide support for the electricity fee recovery work of power enterprises, thereby reducing the occurrence of various bad debts. In order to ensure the smooth implementation of electricity fee recovery management by power companies, it is necessary for power companies to promptly identify and predict the risk of electricity users' arrears, and to stop power supply services to high-risk users as soon as possible. For power companies, the recycling of electricity bills is crucial. If the normal recycling work cannot be successfully completed, it can not only affect the operating income of the enterprise, cause serious economic losses, but also greatly increase the management costs of the power company, affect the normal operation of the residential power grid, and cannot provide a solid guarantee for the electricity demand of residents and enterprises[2]. By analyzing the current status and problems of electricity fee recovery management in prefecture level power supply companies, a comprehensive analysis is conducted on the electricity fee recovery process of power companies, and the information platform for electricity fee recovery management is constructed[3-4].

2 Design of electricity charge Recovery Management System

Electricity charge recycling management is an important daily management practice for local power supply companies. The quality of its recovery management of electricity charge directly affects the operating efficiency and company development of local power supply companies. The electricity charge recovery management and control system belongs to modular application software in functional structure, and the architecture design of the system includes two aspects: system network topology design and system functional logic design.

2.1 Network topology

As an important part of the informatization construction of the electric charge recycling management of local power supply companies, the electric charge recycling management platform of this power company mainly adopts the B/S mode Web architecture, that is, the business operation access is carried out through the browser. Specific system network topology design [5]. The internal network equipment of power companies includes switches, routers and other equipment. The user operation of the system is mainly accessed through the internal private network of the power supply company. The server package of the system includes web server and background database server. These servers are protected by firewalls. The data accessing these servers adopts HTTP and HTTPS protocols, and the client and server can be safely isolated by firewalls.

2.2 Functional logic structure

In the functional design of electricity charge recycling management system of power supply company, MVC modular hierarchical structure is adopted to separate the front

end, business logic and background data of the system, thus reducing the coupling between system functional modules and improving the stability and reliability of the system. The MVC pattern divides the system into three levels: model, view and controller. In the development process of the system, the view layer is the User Service Layer, the model layer is the Business Logic Layer, and the control layer provides a unified call interface for various business logics, such as the call of related database operations of the Data Access Layer. User Service Layer. This layer mainly completes the display of operation interfaces of various functional servers and provides various operation interfaces for users. With B/S mode, users can perform various Web page interactive operations only by logging into the system through a browser. Business Logic Layer: business logic layer. The business logic layer of the system mainly deals with various business logics, providing users with interfaces for processing various business logics. This layer consists of various functional components. At the same time, the system publishes these functional interface components through the Web server [6]. Data Access Layer: data access layer. The data access layer of the system refers to all kinds of data in the background database and the interfaces to access these data. This layer includes various data manipulation components and file manipulation components.

2.3 Basic data management and analysis

The basic data management function of the system is mainly to complete the daily management and maintenance of the data required by the system. The associated data include meter reading section, meter reader and electricity meter users. From the case diagram of basic data management, it can be seen that the basic data management function needs to provide the basic maintenance and management of the information of electricity meter information, meter reading section information and meter reader information for the system business personnel. The sub-modules include sub-modules such as information management of meter reading section, basic information management of electricity meter, management of meter reader basic information management, query information and information submission. Among them, the information management of the meter reading section mainly completes the basic information setting operation of the meter reading section, provides the salesman with operational interfaces such as adding, deleting, changing and checking the information, and stores the data into the background database. The basic information management of the meter is mainly to complete the operation of setting the basic information of the meter, connect the meter information with the electricity user one to one, and store the data in the background database. The basic information management of the meter reader is mainly to complete the setting operation of the basic information of the meter reader, and associate the meter reader with the meter reading section one-to-to-many, and store these data into the background database. Information query provides users with basic query function; information submission provides basic information collection and input interface for information collection personnel, and saves these data to the background database according to the information specification of the power supply company.

2.4 Application function design

The power marketing business system of the power supply bureau is divided into four levels: province, prefecture, county bureau / sub-bureau and business station (station), which realizes the business guidance and control from the superior to the subordinate through the network. Users can handle electricity marketing business through interconnection, telephone or at all levels of business hall. At the same time, the power marketing system of the power supply bureau based on the J 2 EE framework is closely combined with the MIS, OA, GIS and GPS system. The system manages and analyzes the data through the MIS system, and then notifies and transmits the index tasks through the OA system. The GIS system is used to locate the geography and the line, and to assist in generating the power supply scheme, the path map, etc. In addition, in this system, GPS is mainly used in the emergency repair positioning and site survey work, can fully control the field work, facilitate scientific management, improve work efficiency.

2.5 Detailed system design

Basic data management: The basic data management of the system is mainly to manage the information such as meter reading section, meter reader and meter user. Management of reminders: The system's dunning management function module manages the query of the arrears list of electricity charge, the management of the person in charge of dunning, the maintenance of dunning strategy and the summary of dunning situation. Arrears risk management: The function module of arrears risk management is mainly to manage the arrears risk of electricity users. From this kind of structure, it includes application for adjustment and dbclass. Stop and resume power management: The management function module of power outage and power resumption mainly manages power outage management, power resumption management, power outage application query and power resumption application query. This class structure includes outagem anagement, recoverym anagement, appli cationofrecoveryquery and dbclass. Management of liquidated damages: The management function module of liquidated damages involves operations such as suspension and cancellation of liquidated damages, amount statistics, configuration and work order query. This kind of structure includes defaultpaym entstatistics, liqui dateddamnages and dbclass. System management: The system management function module mainly manages user management, database management and log management. The system management class consists of userm anage. authm anage. loginfo and dbclass.

3 Results and analysis

3.1 System function test

The test of the system mainly uses QTP test software to automatically test each functional module of the system. Complete the functional test of the system by writing the script of the system test case. The specific process is shown in Figure 1.

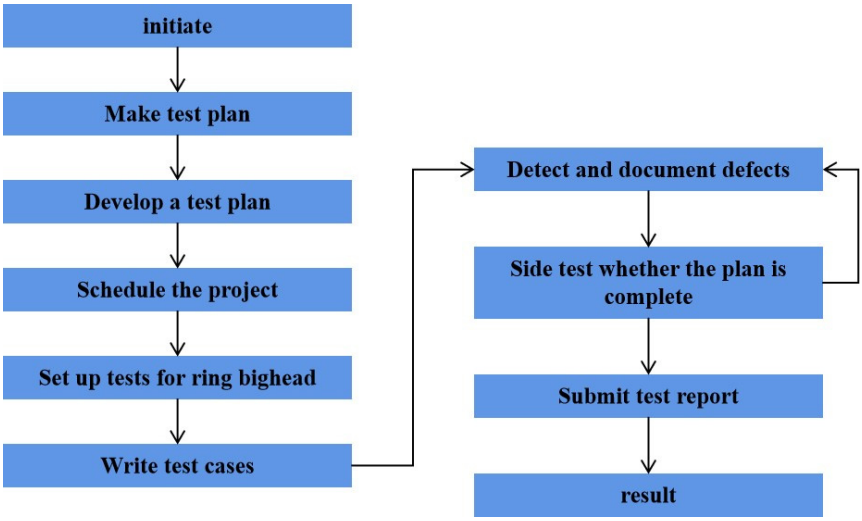

Fig. 1. Test flow chart

The test plan mainly describes the specific methods used in the test to achieve the actual effect. The test plan is the execution time node of the test plan, and the test progress describes the execution progress of the test. The testing methods in this paper are mainly manual function testing (black-box testing), interface tool testing (black-box testing) and unit testing (white-box testing). The software and hardware environment for testing is shown in Table 1 below. The building of the testing environment is mainly to prepare development tools and testing tools, and the unit testing is mainly realized by Junit framework, which provides the main implementation mode and is very convenient to use in IDEA. Just add relevant dependencies and add @Test comments to the testing methods. Interface testing mainly relies on Postman testing tool. After running the service, you can enter the interface address and input parameters needed by the interface in Postman testing tool, and click Send to observe the information returned by the interface and the execution speed. Manual function testing is mainly aimed at the test of friendly interface, user interaction, user experience and other aspects. It mainly tests and evaluates the system function from the user's point of view, and needs to pay special attention to the correctness of data, functional business and interface layout.

Table 1. Test Software and Hardware Environment

Server hardware	CPU model i7, memory size 4g, hard disk model size 512G solid state.
Database software version	Mysql 8.0.21
Client version	Chrome80 (64-bit)
Interface testing tool.	Postman v8.3.0
Code editing and debugging tool	IntelliJ IDEA 2019.3.5
JAVA version	JDK8
Operating system version	Windows10 Professional Edition

3.2 Analysis of test results

The recovery management system of electricity charge in the local power supply company uses the function test software QTP to design and test the operation of each sub-module of the system. In the process of system functional testing, in order to have a comprehensive analysis and control of the system, the problems found in the system testing process are classified into A, B, C and D grades, with A being the highest and D the lowest. The statistical data are shown in Table 2 [7-9].

Table 2. Statistical Table of System Testing Problems

grade	problem description	frequency of occurrence
A	A system bug caused the system to crash and could not run.	0
B	The system bug caused the core business of the system function to fail to operate normally.	2
C	A system bug caused a single function operation to fail, but it did not affect other function modules.	3
D	System bug appear under certain conditions, which do not affect most functional operations, and can be optimized.	9

As can be seen from Table 2, after testing the system, a total of 0 class A problems, 2 class B problems, 3 class C problems and 9 class D problems were found. These problems have been modified and re-verified. Finally, the system function test has been completed. The test results show that the system can meet the requirements of system design. It effectively improves the efficiency of recovery management and service quality of electricity charge in local power supply companies[10].

4 Conclusion

This article mainly completes the development and design of the electricity fee recovery management system for power supply companies, and uses this system to carry out information management of existing electricity fee recovery in power supply companies. Thus, the efficiency of electricity fee recovery management in power supply companies can be improved through informatization. Through the deployment and application of this system, the work efficiency of staff can be improved, the electricity payment process can be simplified, and the service quality and efficiency of power companies can be improved. With the rapid development of information technology, more and more new technologies have emerged.

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