Design of Standardized Administrative Management System of area A based on JBPM

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ABSTRACT: With the continuous development of computer technology, e-government systems continue to be promoted and applied, which improves the efficiency of administration greatly. However, the e-government development of standardized administrative management is relatively slow. There are few studies on standardized administrative management system in our country. In order to further improve the efficiency of standardized administrative management and the popularization and application of e-government, the JBPM workflow engine was utilized to carry out the system design of the regional standardized administration, so as to solve the problems of low efficiency of traditional manual management and the difficulty of data preservation in this study. Through the system requirement analysis, 12 function management modules were divided, and the ORACLE database was selected on the basis of JBPM workflow engine. After the completion of the system development and design, the function test and performance test of the system were carried out. It can be seen through the test that the performance and function of the system can meet the needs of users, and can be applied to the specific work practice.

INTRODUCTION

With the continuous development of modern computer technology and Internet technology, the application of information technology in modern production and life is also increasing. This facilitates people's way of life greatly, and also enhances the efficiency of people's work greatly. Especially after entering twenty-first Century, the degree of informatization has become one of the important indexes to measure the comprehensive international competition ability of an area and even a country [1]. To optimize the management of public service system based on information technology is an important development direction of our government's modernization reform. Through further price and continuous improvement of government website construction, e-government can improve the efficiency and accuracy of government management [2]. In the government management system, one of the typical representatives is standardized management. This work not only has many contents, but also renews quickly.

The traditional manual way has become more and more difficult to meet the needs of modern enterprise users and the management users of the quality supervision bureau. The traditional manual management methods need to use the paper material to carry on the related business. In the process of delivery and preservation of these materials, material damage and loss are easy to occur, and the efficiency is very low and the process is also opaque [3]. Therefore, the introduction of standardized management system can solve the problems of traditional manual management effectively.

Although standardized managements have some applications in business and production in China, the applications of standardized management in government administration are relatively small [4]. In view of standardized administrative management aimed at area A, a scalable management system was designed in this study. It can realize the information management of standardized management in area A. Through comprehensive comparative analysis, JBPM workflow engine is selected, which can give full play to its technical characteristics so as to better realize the standardized administration of area A. The development, design and application of this system will contribute to the popularization of standardized administrative management in China. This not only facilitates the standardized management of
enterprises, but also helps enterprises to standardize and standardize the update and application. On the other hand, standardized management based on the internet can avoid the flow of products that do not conform to the standardized management in the market, and can strengthen the quality management of the products. Therefore, the design and application of standardized administrative management system based on JBPM will strengthen the standardization of administrative management and standardization management of enterprises. This will help improve the international competitiveness of our enterprises and help to gain wider market recognition.

2. Research progress of JBPM workflow

2.1 JBPM technical features

Business process management (referred to as JBPM) is a workflow management system based on J2EE. Its standard language is JDPL, which itself is an open source, flexible, extensible and workflow engine that meets a variety of executable languages [5]. During the specific operation, JBPM can run both on the J2EE application server and in the Java application at the same time. In the face of different business environments and needs, it can also meet different business environments through different languages, and build a model based on the same technology on different process languages, which is called PVM [6]. At the moment, JBPM is supported by process languages such as Jpdl, Pageflow and WS-BPEL. With constant development and application, JBPM will support more process definition languages. JBPM has better scalability. Even if they are complex application products in enterprise, they also have better support. Business process diagrams are often better represented by using visual flow languages. In the process of enterprise application, JBPM has only a relatively small dependency, and can be replaced by the Java library during use. JBossJBPM and existing databases can be configured better and deployed on all application servers [7]. The JBPM architecture consists of three main components: process designer, workflow engine and process monitoring tool. With the continuous development of modern internet and information technology, the business process of enterprises is also more complex and changeable facing greater challenges. A more flexible approach is needed when business is involved, and programmers and designers of the process must also communicate flexibly and effectively [8].

In the specific application process, JBPM has the characteristics of convenient deployment and development. It can make enterprise level software development and maintenance become more concise and convenient [9]. When business analysts communicate with developers, the languages used are all technical terms. As a result, it is easier to translate user requirements directly into software design [10]. After completing the software design, JBPM can be used to continuously improve the efficiency of business process management, and the business process control method is more flexible. Based on this, the business processes are designed. Because the focus is on process concerns, it makes business processes smoother and easier, and also improves support for iterative development [11]. If the software business process changes more difficult, it will take more effort for the enterprise to do business process analysis before it develops. In the actual application process, many enterprises hope to develop successfully at one time. However, this is almost impossible to achieve in the actual application development process. JBPM can be used to record all the executing processes, and each step is recorded in the database, which makes it easy to audit and generate reports directly [12]. In addition to the JBPM workflow engine, there are other workflow engines, such as Shark. They have different characteristics, and there are some differences in their applications. The performance comparison of the two is shown in Table 1. However, the JBPM workflow engine has better comprehensive performance after considering extensibility, maintainability and configurability. Therefore, the JBPM is chosen as the workflow engine for the standardized administrative management system design [13].

| Table. 1 Comparison and analysis of JBPM and Shark workflow engine features |
|-----------------------------|-----------------------------|
| **Project features**        | **JBPM**                    | **Shark**                      |
| Installation deployment     | Can be deployed independently, comes with web management tools, different databases have a corresponding initialization script file | Can be deployed independently, also comes with web management tools, and can be integrated with other applications |
| Isomerism                   | You need to use remote access frameworks such as Java | You can open BORBA services |
| Reconstruction              | The activity event model is easy to extend, and the Jpdl file can extend the activity model according to the requirement, and it | The system and function are complex, and it is easy to expand based on modular thinking, and the Xpdl file is |
2.2 JBPM system structure

JBPM has a more intuitive process definition language and has less dependency, so it is very simple to use [14]. The work engine can be better to implement the four interfaces of the WFMC specification (as shown in Fig.1). At the same time, it effectively combines the UML modeling method so that the entire workflow model construction can be more easily integrated into the development of application software management [15]. These four interfaces can be represented as definitions, implementation, applications, and monitoring respectively. Among them, the definition interface refers to the definition of the deployment process of process developers. An instance interface can enable a system and user to operate a process. Application interfaces are interactions between the external and workflow systems that are initiated by the workflow system. The monitoring interface allows managers to understand the relevant data throughout the process’s operations for audit purposes [16]. JBPM uses language flow definition tool based on the JDPL to translate business logic into a process definition that can run in the workflow engine.

![Fig. 1 Four interface diagrams of the WFMC model specification implemented based on JBPM](image)

The process engine kernel determines whether or not the structure of the process engine is clear. The keys to the engine kernel are the definition, scheduling, execution, and instance (Santoro M, et al. 2016) [17]. Process management system based JBPM uses JBPN management engine to achieve the purpose of running in the system. There is also a certain mutual coordination among the sub items. This ensures that the workflow engine is able to stay in good shape during its operation. The architecture of JBPM is shown in Fig.2. The responsibilities of a workflow engine based on JBPM are clear and unambiguous. That is to say, the process is from one node to another and can execute the current node correctly in the specific process definition [18]. Based on JBPM, you can better achieve the processes of development, release, implementation, and Web, Service and other functions. It is because JBPM has a more streamlined open source process engine that its application has relatively wide range. And it is also very convenient in the process of use. Because it provides a relatively flexible conditional expression mechanism, it can handle parsing of scripts and parsing of auxiliary conditions. And because of the ORM advantage of Hibernate, it can also better support a variety of databases and has better adaptability [19].

![Fig. 2 JBPM architecture diagram](image)

3. Design of standardized administration system of area A based on JBPM

3.1 Standardized task node delegate

In the traditional standardized approval process, the most important process is approval. Government approval process is generally relatively fixed. However, if the process business node in the developed system has changed, it is likely to make
the system not applicable and need to be re-developed [20]. In view of the instability of modern process business, JBPM workflow technology is introduced to standardize the construction of business process and develop the corresponding system. Finally, a standardized application platform for area A is formed, which is applied to the actual standardized management business. According to the characteristics of standardized administrative management, the system nodes are mainly based on approval, so the specific process nodes include the judgment node, the artificial participation node, the start node and the end node. According to the standardized business process characteristics, the corresponding steps are constructed. It is divided into four steps. The first step is to define the process and the second step is to define the form. The third step is to bind form data and the fourth step is the operation of concrete form data.

Each task node runs in the standardized process. Each task node should be delegated to the corresponding manager. The dynamic delegation of the task nodes should be carried out according to the combination of the organizational tree and the specific functional points so as to expand the JBPM delegate function. Standardized administrative management system users in area A are divided into three levels of management users from top to bottom. When the task node is delegated, it not only requires the user to have the function point of the task node, but also associates the location of the user in the organization tree. Different levels of management users have a certain degree of approval authority, and higher users have higher level of approval authority and management function. Each of the different function points has access to the function, but users without permissions can’t illegally access to the appropriate resources. Only after the user has legal authority to enter can the corresponding approval process be conducted. This ensures system security and reduces system coupling. Even if the system needs to be upgraded and maintained, it will only affect the current function point users. And other users of the entire system will not have an impact.

AssignByDiviAndFunc can be used to achieve good function point and organization code integration task assignment. In the specific process of process running, codes of function points and administrative divisions can be automatically filled in according to the file configuration so as to standardize dynamic allocation of task nodes. The task node allocation process is considered as an example, which is shown in Fig.3. Firstly, it is necessary to determine the assignment of the task nodes. If the node has been assigned, the node has been executed by the user. Then you can continue to assign the node to the last user who executed the node. If the node has not been implemented, the code needs to be divided code and functions points based on the specific administrative. The list of eligible users is selected for distribution from the system database table. If you select more than one user, you need to further determine if the list length is greater than 1. If it is greater than 1, it means that a number of conditions are in line. If the length is 1, you can delegate the task directly to the user.

![Fig.3 The process of delegating using AssignByDiviAndFunc](image)

3.2 System requirement analysis and design

According to the specific application requirements of area A standardization administration system, it can be specifically divided into enterprise product execution standard registration, enterprise standard filing management, user management, privilege management, service industry standardization pilot management, standardized innovation contribution award management, standardized good behavior, enterprise management, standard early warning management and agricultural standardization demonstration area management pending. In addition to these functional requirements, there are other system requirements, such as system security requirements, scalability requirements and performance requirements. Through the system, you can conduct nationwide online standards inquiries. Through a large number of standard collections, you can do all the required standards on the internet. Standardized applications, queries, confirmation and novelty retrieval are implemented online. Based on JBPM, the purposes of standardization management system design in area A are as follows: (1) Fast and convenient service based
The internet is provided for standardized managers in area A so as to apply, record and audit online. (2) Comprehensive standard inquiry is provided for enterprise customers, and the latest standards are updated continuously. (3) It can provide the corresponding basis for the quality orientation of the enterprise. (4) The standard timeliness of the system user is analyzed and judged, and the user standard is carried out according to the latest standardization standard. (5) To avoid the absence of timely updating of enterprise standards so that enterprises can always keep up to date with the latest standards and specifications. (6) The system website is used for product inquiries so as to prevent the circulation and appearance of the unmarked products in the market.

According to the related functional requirements of area A standardization administrative system, it can be divided into twelve modules which include enterprise product execution standard registration, user management and authority management. Specific results are shown in Fig.4. The economic function structure diagram of enterprise product execution standard registration, user management modules and authority management modules are introduced in detail in the figure.

The user management module class diagram is shown in Fig.5. User management module is mainly responsible for user operations, which include the user's registration, login and personal information. Among them, UserForm represents the single entity class in the user table. When the user logs in and registers, SpringMVC fills in by using the data that the user fills in. After the UserController receiving the front request, the appropriate methods are assigned. UserService is the user business logic class that performs business level logical processing. Take user registration as an example, when users register, they first use registerUser() to do the corresponding logical judgment and determine whether the registered user name already exists in the database. If it exists, it returns false. The UseDao is primarily responsible for interacting with the database. According to the business logic requirements, the corresponding data corresponding to the business logic are obtained from the database.
At present, large Web applications require large amounts of data to access, which often results in slower server response and even conflicts between response time and user tolerance. And the number of standardized administrative system users in area A is more, the database needs to store large amount of data. Therefore, a good database must be designed. According to the requirements of the system and the performance analysis of the existing database, the ORACLE database is selected. The database currently accounts for more than 90% of the market. This database is not only safe and reliable, but also easy to use. In order to meet the needs of the system and modules, it is necessary to design the corresponding table structure according to the business needs.

### Table 2: The role table and permission table of database table structure design

<table>
<thead>
<tr>
<th>Database table</th>
<th>Primary key</th>
<th>Field name</th>
<th>Type</th>
<th>Length</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role table</td>
<td>TRUE</td>
<td>DBID_</td>
<td>NUMBER</td>
<td>10</td>
<td>Primary key</td>
</tr>
<tr>
<td></td>
<td>FALSE</td>
<td>TYPE_</td>
<td>VARCHAR2</td>
<td>1</td>
<td>type</td>
</tr>
<tr>
<td></td>
<td>FALSE</td>
<td>DISABLED_</td>
<td>VARCHAR2</td>
<td>1</td>
<td>Disable</td>
</tr>
<tr>
<td></td>
<td>FALSE</td>
<td>NAME_</td>
<td>VARCHAR2</td>
<td>50</td>
<td>Name</td>
</tr>
<tr>
<td></td>
<td>TRUE</td>
<td>DBID_</td>
<td>NUMBER</td>
<td>10</td>
<td>Primary key</td>
</tr>
<tr>
<td></td>
<td>FALSE</td>
<td>ID_</td>
<td>VARCHAR2</td>
<td>50</td>
<td>Identification</td>
</tr>
<tr>
<td>Permission table</td>
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<td>VARCHAR2</td>
<td>50</td>
<td>Subsystem foreign key</td>
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<tr>
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<td>VARCHAR2</td>
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<td>Disable</td>
</tr>
<tr>
<td></td>
<td>FALSE</td>
<td>URL_</td>
<td>VARCHAR2</td>
<td>100</td>
<td>Corresponding URL</td>
</tr>
<tr>
<td></td>
<td>FALSE</td>
<td>NAME_</td>
<td>VARCHAR2</td>
<td>100</td>
<td>Name</td>
</tr>
</tbody>
</table>

### 4. System test

#### 4.1 Function test

In view of the development of the design of standardization administrative management system in area A, each function test and performance test were carried out. According to the module of development design, the main functions of the test were mainly focused on user management, product execution standard registration and review. The smooth implementation of these functions means that the whole system can implement standardized administrative management successfully.

The first is the user login. Existing accounts and passwords are used to log on to the system. Only the user name and mailbox are homologous and pass the database validation successfully can you conduct login. And the landing of this choice is the standard implementation of the product registration system. If you are a new user, you need to register, which is shown in Fig.6. Organization code and unorganized organization code can be selected respectively. The
application for the new account can be successfully carried out only when the requested information is filled out. There is a warm reminder below the user registration. The information that may appear in the process of filling out the situation that does not meet the requirements will be highlighted.

After users entering to the system, product implementation standards are conducted as an application enterprise user. The "apply for" is clicked to enter the new registration product. The application form is submitted after filling in the corresponding information. The information contained in the registration form is shown in Fig. 7. It contains the name, organization code, legal person name and address of the manufacturer, and the "new registration products" button. After clicking, the corresponding product name, execution standard, number, name and so on can be filled out. When all the information has been completed, "submit the registration form" is clicked. At last, the relevant audit department will examine and approve it.

The management system is logged into as an administrator. After checking the administrator's authority in the database, the enterprise standard registration form submitted can be reviewed. Specific results are shown in Fig. 8. This interface can be used to view the names of different products, the standard categories, the standard names and the numbers. After the audit, whether or not it meets the requirements and judge whether or not it has passed the examination can be known, and finally the audit opinion can be given. After a given audit opinion is saved, the enterprise user can use the system to query whether it goes through for the approval.

In addition, the comprehensive test of other functions of the system has been successfully achieved the desired goal. All operations can be implemented smoothly. The standardized administrative management of the various affairs management can be completed, and it can be applied to the standardized registration application and approval of management users and enterprise users. At the same time, the system can be used to query the relevant standards of standardization.

### 4.2 Performance test

Because of the organizational tree in area A is divided into three layers, there are many organizations and management structures under its jurisdiction, so the number of users is relatively large. The number of administrators is relatively fixed. However, there will be a great change in the number of enterprise users. In order to comprehensively investigate the performance of the system under varying number of online users, the response time was used to test the system. The number of user tests consists of 200-1000 users, which is fully able to meet the needs of users in area A.

200, 400, 600, 800 and 1000 users were tested respectively, and the corresponding 90% request response times were also examined, and a change trend figure in response time with online users was obtained, as shown in Fig. 9. It can be seen from Fig.9 that request response time increased with the number of online users increased. When the user...
increased to 1000 users, the response time was 9.8 seconds. It can be seen that the performance of the system is better, which can meet the online use of no more than 1000 users at the same time.

![Fig. 9 The system response time varies with online users](image)

In addition, the security performance of the system is relatively good, and it can meet the security needs of the system. It can be seen from comprehensive test that the design of JBPM based area A standardization administrative system has good use effect. Each function can be realized smoothly. Omissions and loopholes in the testing process have also been improved. The system can be applied directly to the specific standardized administration in the region.

5. Conclusions

With the continuous deepening of global information technology, China has further promoted the reform and development of e-government in recent years. And standardized administrative management involves a large amount of applications and audits. The relevant standards and specifications update faster, so it is urgent to promote the work of e-government management. In order to ensure the stability of e-government management system, JBPM workflow technology was introduced for the development of related systems design. In the process of standardized management, each task node was assigned to the corresponding managers and was expanded. AssignByDiviAndFunc was used to implement task delegation between function point and organization. Through the requirement analysis of the system, the functional modules of the system were divided into 12 functional modules. In order to meet the demand of large amount of data storage, the design and application of ORACLE database were adopted. User management, product execution standard registration and testing of these three functions were focused on in system functional testing. Through the test, all functions of the system were successfully implemented. Performance testing of the system was conducted further. The test results show that the system response time also increases with the increasing of users’ number. When the number of online users increases to 1000, the response time is 9.8 seconds, which can meet the system's usage requirements. After improvement, the system can be applied to the specific standardized management work. However, further practice is needed to understand the operation of the system.

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